Report No. 640/84

WELDING OF ARMOR

Summary of Ballistic Shock Test Results on 1-1/2 Inch Homogeneous Armor "H" Plates Welded with Austenitic Electrodes and Tested at Aberdeen Proving Ground during the Period from 1 October 1942 through 31 March 1943

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WATERTOWN ARSENAL
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OBJECT

To tabulate firing record data for subject plates and to present a comparison of ballistic shock performance of plates made with various materials and welding procedures.

SUMMARY

1. Data from 172 Aberdeen Proving Ground firing records have been tabulated on accompanying charts and tables.

2. Within the range of chemical composition of commercial rolled homogeneous armor, steel quality was indicated as having more influence on ballistic performance of hand welded plates than variations in chemical analysis. Armor compositions of very high hardenability have been successfully welded.

3. While superior ballistic performance was indicated for certain brands of electrodes, no grouping of electrodes according to chemical analysis was possible on the basis of ballistic efficiency.

4. Improved shock test results were obtained when two or more beads were deposited at the root, when stringer beads or overlapping beads rather than a full weave were used for the body, and when an annealing bead technique was employed.

5. Of twenty-six Unionmelt welded plates, only two were comparable in ballistic performance to satisfactory hand welded plates. These two plates failed the radiographic examination.

6. Cast assemblies showed a higher proportion of cracking in the unaffected plate than in the weld, fusion, and heat-affected zones. Ratio of plate to weld cracking decreases with increase in hardenability and with improvement in radiographic soundness of cast armor.

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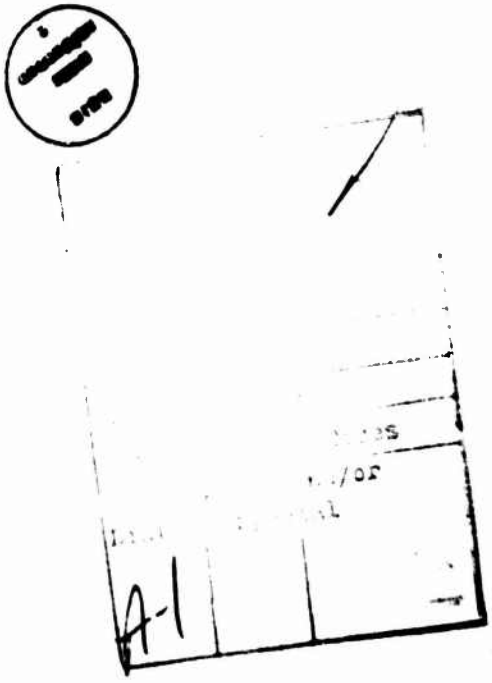

INTRODUCTION

On the accompanying charts (Appendix A) are tabulated data taken from 172 firing records representing qualification and development tests of H plates welded with austenitic electrodes. The tabulation includes all firing records received by this arsenal for H plates assembled from 1-1/2 inch thick homogeneous rolled or cast armor by welding with austenitic elsctrodes and fired at Aberdeen Proving Ground during the period from 1 October 1942 to 31 March 1943.

The purpose of these tabulations is to make available to persons concerned with welding of armored structures information as to ballistic performance of H plates made with various materials and procedures by commercial fabricators. A report (W.A. 640/73) giving a summary of ballistic test results on all 1 inch and 1-1/2 inch thick homogeneous armor H plates welded with ferritic electrodes and tested at Aberdeen Proving Ground through 25 February 1943 has been issued. A subsequent report will deal with development and qualification tests of H plates assembled from homogeneous rolled or cast armor of plate thicknesses other than 1-1/2 inch by welding with austonitic olectrodes and fired at Aberdeen Proving Ground during the period of 1 October 1942 through 31 March 1943.

An index to Fabricators, Armor Manufacturers, and Electrode Manufacturers is given in Table I. The tabulation has been divided into three groups: (1) all plates assembled from rolled armor by hand welding; (2) all plates assembled from rolled armor by Unionmelt welding; (3) all plates assembled from cast armor by hand welding. There were no cast assemblies welded by the Unionmelt process. A summary of current ballistic shock test specification requirements for H plates welded with austenitic electrodes and a key to the tabulation method and symbols used in this report are included in Appendix A.

GENERAL COMMENTS

Ballistic performance of H plates is best evaluated by amount of cracking for each round, but the cracking is influenced by the variables in the ballistic test as well as by those introduced by the materials and welding procedures. Therefore, it is necessary to make corrections or allowances for varying projectile velocities and effect of prior impacts when comparing amounts of cracking produced by the various impacts.

Tabulation of the average plate and average weld cracking of tested rolled plates grouped according to the severity of their ballistic testing, as shown in Table II, suggested the corrections for weld cracking given in Table III. Firing record data show cracking as located in weld metal, fusion zone, heat-affected zone or plate based only upon surface appearance. Experience has shown that a crack in the vicinity of the weld may proceed through portions of weld metal, fusion zone, and heat-affected zone regardless of surface appearance. For the purpose of the tables in this report all cracking within one-eighth inch of edge of weld is included as weld cracking and the remainder as plate cracking.

Plate cracking other than heat-affected zone cracking was negligible in the tested rolled plates as shown by Table II and so was not taken into consideration in evaluating the rolled H plates. Tabulation of the average plate and average weld cracking in cast plates (Table II) grouped according to the severity of the ballistic testing showed a very high ratio of plate to weld cracking. Inasmuch as virgin cast armor would not ordinarily develop cracking under the same testing conditions as those used for the welded plates, it is necessary to consider plate cracking in evaluating the cast H plates. Because the small number of tests included in Table II failed to show the severity of the ballistic test as an important variable, weld cracking was corrected in a manner similar to that used for the rolled plates and no attempt was made to correct plate cracking.

Generally, for a 75 mm. test projectile to produce weld cracking in 1-1/2 inch plate at a velocity of 1100 f/s, it must touch or overlap the weld. Rounds impacting at a distance from the center of impact to center of weld of over two inches are therefore considered unfair hits. In the rolled H plates there were twelve such rounds, only two of which produced more than two inches of cracking. These two rounds resulted in 36 inches and 16-1/4 inches of weld cracking, respectively, and because of these considerable amounts of cracking were included in the tables as fair rounds while the remaining unfair hits were omitted from these tabulations. In the cast assemblies there were 4 unfair hits, only one of which caused considerable cracking (8 inches of weld and 10-1/2 inches of plate). This round was included as a fair hit while the other 3 were omitted.

Decrease in temperature of the test plate at time of impact is known to have considerable effect in reducing the resistance to ballistic shock. Within the usual range of testing temperatures at Aberdeen Proving Ground, no correlation is evident between plate temperature and average weld or plate cracking for the plates included in these tabulations. However, one group of 10 plates welded by International Harvester Company and tested at 32°F. (lowest temperature of testing for any of the plates), performed badly. Although other variables were involved, temperature may have been an important factor contributing to the poor performance of these plates.

In Tables IV - XVI, changes in each of the more important variables introduced by welding materials and procedures are compared as to average amount of cracking per round after the corrections given in Table III for the severity of the ballistic testing had been made. This method of analysis is, of course, open to criticism unless a very large number of test results are available for each variable. The tables of this report are intended only to indicate trends and to encourage further observation and analysis.

Fabricators - Table IV

The performance of H plates welded by any one fabricator must be evaluated in terms of the armor and electrodes used as well as the welding procedure and inspection control.

Armor Data - Table V

Each composition of armor has been heat treated to a hardness level designed to pass the ballistic requirements for shock and penetration resistance of virgin armor, and an unwelded test plate has been tested from each heat of armor. Within the range of hardness which will meet this requirement, no correlation between plate hardness and average weld cracking is evident. Within the range of chemical compositions represented in Table V, no correlation is apparent between carbon and/or total alloy content and average weld cracking. With the exception of five plates from a .42 C, Mn-Cr-Mo-Si, heat which performed very poorly, there is little choice between armors of the upper and lower levels of C content and for hardenability listed in this table. This tabulation suggests that quality of steel (cleanliness and directional properties) is an important factor influencing the ballistic efficiency of a welded structure. In general, armor types which are usually very clean and armors which have been c oss-rolled performed best.

Electrodes - Table VI

Firing record data on electrode compositions and coatings very frequently were incomplete or questionable. When an electrode was used on a rather small number of plates, the results may have been influenced unduly by other factors. No correlation is shown between chemical composition of weld metal and amount of cracking. There is little difference in ballistic performance between plates welded with Mn-Mo modified (weld analysis - at least 1% Mn and 0.2% Mo) austenitic electrodes and those with Mn modified (weld analysis at least 1% Mn and no Mo) austenitic electrodes.

Joint Design - Table VII

With one exception ("K" type bevel), all joints were prepared with double V bevels.

Root gap does not appear in these tests to be an important factor as evidenced by ballistic performance. An included angle of 60° shows up more favorably than one of 45°. The number of plates with other sizes of included angle was not large enough to make comparisons.

The table indicates that plates with flame-cut edges that have been treated so that the hardened area due to flame cutting is removed, either by grinding, machining, or flame softening, performed better than plates with untreated flame-cut edges.

Welding Procedure - Table VIII

No correlation is apparent between the total number of passes and cracking. Some interesting trends as to influence of method of weld metal deposition are indicated. The use of two or more beads at root results in a slight improvement over the single root bead technique. The use of stringer beads, overlapping beads, or combinations of beads and layers, appears more desirable than a full weave technique for the body deposition. A multiple crown bead technique in which the last bead deposited does not touch the parent metal is indicated as preferable to a single crown bead technique.

Initial plate temperature varied from 70° to 200° F. No benefit of preheating within these ranges is apparent.

Radiographic Examination - Table IX

Of the 93 rolled homogeneous manually welded H plates, 19 failed the radiographic examination. Eleven of these plates passed the ballistic shock test (based upon the standards given in Specification AXS-497, Rev. 3, prior to amendment of 25 June 1943). In general, as shown by Table IX, radiographic unsoundness is associated with increased weld cracking.

UNIONMELT WELDED, ROLLED ARMOR, H PLATES

Fabricators - Table X

As compared with manually welded rolled H plates, Unionmelt welded plates exhibit very inferior shock resistance. In several instances, plates that withstood one round fairly well, failed badly on subsequent rounds.

Armor Data - Table XI

Three plates were assembled from Republic high alloy (4% Ni) armor. One plate was welded by one fabricator without the use of hand beads and failed on the first impact, while the other two plates welded by another fabricator stood up very well under ballistic impact. Three plates welded with 2.25 - 2.45 Cr, .71 Ni alloy armor plate performed poorly, as did other lower hardenability compositions.

Tables XII to XIV have been prepared to show variations in electrode, joint design, welding procedures, and ragiographic results for the Unionmelt welded plates. Influences of these factors are not apparent from the data available for these tabulations. It is interesting to note that the two ballistically best Unionmelt welds failed the radiographic examination because of blowholes, weld metal cracks and incomplete fusion.

HAND WELDED, CAST ARMOR, H PLATES

Armor Data - Table XVI

Ballistic performance of cast armor H plates is more erratic than that of rolled plates, and in many instances the amount of cracking in the vicinity of the weld is exceeded by plate cracking. Since unwelded cast armor plate of the same chemical compositions would ordinarily be unaffected by the H plate shock test, it is apparent that the welding process was responsible in some way for the extensive plate cracking. A recent report* has shown that good performance of armor at sub-zero temperatures or equivalently higher impact velocities at ordinary temperatures, is dependent upon development of a fully hardened microstructure during quenching. It would seem that the presence of a weld, with attendant high stresses and notching effect, initiates failure (under lesser ballistic shock than required for virgin plate) which then proceeds very rapidly through the weakest structure until the energy of impact has dissipated. If the armor plate has not been fully hardened during heat treatment, either due to insufficient alloy content or poor heat-treating practice, plate cracks are favored. If armor is properly hardened through during heat treatment most of the cracking should occur in the weld metal, fusion, and heat-affected zones.

Cast armor has generally been more deficient in deep hardening alloy elements than rolled armor, and cast armor is not subjected to as efficient a quenching practice as rolled armor with the result that many of the compositions shown in Table XVI are inadequate in hardenability. This table shows a definite trend toward decreased ratio of plate to weld cracking in the armor compositions known to be adequately heat treated. In the few instances where hardenability is comparatively good and plate cracking is excessive, steel quality, particularly radiographic unsoundness, appears to be a determining factor.

Strenuous efforts are being made to attain adequate hardenability in cast armor since this factor is of such importance in obtaining good ballistic performance at sub-zero temperatures and apparently also in welded plates. So long as a large proportion of the ballistic cracking is in the unaffected plate, no attempt at tabular comparison of welding variables seems justified. Presumably, cast armor is affected by welding variables in the same general manner as rolled armor.

* W.A. Report No. 710/534, "Correlation of Metallurgical Properties with Low Temperature Shock Characteristics of 1 to 2 inch Low Alloy Cast Armor," August, 1943.

TABLE I

Index to Plates

1-1/2 Inch Rolled Homogeneous Plate

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
1	2	American Loco.	Carnegie-Illinois	Harnischfeger
2	1	Baldwin Loco.	Disston	Lincoln Electric
3	2	Briggs Mfg.	Carnegie-Illinois	Crucible Steel Metal & Thermit
4	2	Chrysler-Plymouth	Carnegie-Illinois Ford	Alloy Rods Crucible Steel
5	1	Crucible Steel	Republic Steel	Crucible Steel
6-8	7	Federal Machine	Republic Great Lakes	Crucible Steel Harnischfeger Alloy Rods McKay
9-15	21	Fisher Tank	Great Lakes Jones & Laughlin Republic Steel	McKay Alloy Rods Reid-Avery
16	2	Fitzgibbons Boiler	Republic Steel	Harnischfeger Lincoln Electric Alloy Rods
17-18	4	Ford	Ford	Reid-Avery Crucible Steel Arcos Corp.
19	2	General Am. Trans.	Great Lakes	Crucible Steel McKay
20-21	4	General Motors Div. of Can.	Dominion Foundries and Steel	Lincoln Electric Harnischfeger
22	2	Ilco Ordnance	Republic Steel	Crucible Steel Metal & Thermit
23-29	21	International Harvester	Great Lakes Jones & Laughlin	Westinghouse El. & Mfg. Crucible Steel Page Steel & Wire McKay Alloy Rods

TABLE I (Cont.)

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
30	1	Lima Locomotive	Jones & Laughlin	Arcos Corp.
31	1	Midland Steel	Carnegie-Illinois	Crucible Steel
32-33	4	New York Air Brake	Jones & Laughlin Carnegie-Illinois	McKay Lincoln Electric Harnischfeger
34-35	5	Pressed Steel Car	Republic Steel Carnegie-Illinois	McKay
36-38	10	Pullman Standard	Republic Carnegie-Illinois	Reid-Avery Lincoln Electric Hollup & Champion McKay Metal & Thermit Champion Rivet Crucible Steel
39	1	York Safe & Lock	Disston	Alloy Rods
		1-1/2 Inch Unionmelt Plates		
40	1	American Loco.	Republic Steel	Linde Air Products
41	3	Fisher Tank	Great Lakes	McKay Linde Air Products Lincoln Electric
42	3	General Motors Div. of Can.	Dominion Foundries and Steel	Harnischfeger Lincoln Electric Linde Air Products
43-44	4	International Harvester	Great Lakes	Crucible Steel Linde Air Products
45-49	15	New York Air Brake	Republic Steel Jones & Laughlin Carnegie-Illinois	Alloy Rods McKay Lincoln Electric Linde Air Products

TABLE I (Cont.)

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
			1-1/2 Inch Cast Homogeneous	
50-51	5	Chrysler Plymouth	American Continental Roll	A. O. Smith McKay Alloy Rods
52-56	12	Federal Machine	Ordnance Steel General Steel American Radiator Symington Gould Buckeye Steel Continental Roll Pratt & Letchworth	Harnischfeger McKay Alloy Rods
57	1	Firestone Tire and Rubber	Utility Electric	Page Steel and Wire
58-59	7	Fisher Tank	American	Alloy Rods
60-61	6	Ford	Ford	Crucible Reid-Avery Arcos Corp.
62	1	Heil	Wehr Steel	A. O. Smith
63-64	5	International Harvester	Ordnance Steel	McKay Metal & Thermit
65	2	Kay-Brunner	Utility Steel	McKay
66-67	3	Lima Loco.	Pittsburgh Steel	Lincoln Electric Arcos
68	2	Pacific Car and Foundry	Pacific Car and Foundry	McKay
69-70	5	Pressed Steel Car	Union Steel Castings	McKay Crucible
71	1	Pullman Standard	Sivyer Steel	Metal & Thermit

TABLE II

Ballistic Severity Table for Rolled H Plates

Vel. f/s	1st Round No. of Rds.	1st Round Av. Plate Cracking	1st Round Av. Weld Cracking	2nd Round No. of Rds.	2nd Round Av. Plate Cracking	2nd Round Av. Weld Cracking	3rd Round No. of Rds.	3rd Round Av. Plate Cracking	3rd Round Av. Weld Cracking	4th Round No. of Rds.	4th Round Av. Plate Cracking	4th Round Av. Weld Cracking
1176-1300+				42	1.93"	13.36"	30	.80"	13.37"	8	.63"	13.13"
1126-1175	5		11.40"	23	.52	13.78	11	.73	17.09	2		10.50
*1076-1125	107	.27"	11.36	26	1.15	14.35	10		10.90	2	2.00	10.00
1025-1074	2		8.00	1		9.00						
975-1024												

Ballistic Severity Table for Cast H Plates

1126-1300+	7	9.43"	3.29"	20	7.00"	8.85"	14	3.57"	4.29"	8	4.88"	6.75"
1076-1125	23	7.57	3.78	10	11.90	3.70	3		4.33			
*1025-1075	16	5.69	3.88	7	14.14	5.71	4	5.75	10.00			
975-1024	1	8.00	7.00	1	5.00	13.00						
900-975	1	3.00	9.00									

Note: Distance from center of impact to center of weld no more than 2 inches.

* Specified Velocity Range

TABLE III

Weld Cracking Corrections for Ballistic Severity

(Center of impact no farther than 2" distant from center of weld)

Velocity f/s	1st Round	2nd Round	3rd Round	4th Round
	Corrections for Rolled H Plates			
1176-1300+	-1	-3	-5	-7
1126-1175	-.5	-2.5	-4.5	-6.5
1075-1125	0	-2	-4	-6
1025-1074	+.5	+2.5	+4.5	+6.5
950-1024	+1	+3	+5	+7
	Corrections for Cast H Plates			
1126-1200+	-1	-3	-5	-7
1076-1125	-.5	-2.5	-4.5	-6.5
1025-1075	0	-2	-4	-6
975-1024	+.5	+2.5	+4.5	+6.5
900- 974	+1	+3	+5	+7

TABLE IV

Fabricators of Hand Welded Rolled H Plates

Armor Fabricator	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
American Locomotive	2	5	12.35
Baldwin Locomotive	1	3	6.25
Briggs	2	6	7.17
Chrysler Plymouth	2	6	7.58
Crucible Steel	1	4	11.44
Federal Machine	7	22	2.33
Fisher Tank	21	49	12.19*
Fitzgibbons	2	5	7.55
Ford Motor	4	7	15.43
General American Trans. Corp.	2	4	11.38
General Motors	4	10	8.40
Ilco Ordnance	2	6	6.71
International	21	51	7.72
Lima Locomotive	1	2	16.12
Midland Steel	1	3	9.33
New York Air Brake	4	10	13.45
Pressed Steel	5	11	6.05
Pullman Standard	10	27	7.88
York Safe & Lock Co.	1	2	6.38

* Includes one unfair round.

TABLE V

Armor Data for Hand Welded Rolled H Plates

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Heat Treatment Hold (hrs.)	Heat Treatment Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Dominion Foundries & Steel	V High Alloy	.26 - .30 C .57 - .69 Mn .30 - .50 Si 2.25 - 2.45 Cr .65 - .75 Ni .28 - .51 Mo	1650 1650 1125-1150	8 - 10 4 5 - 6	Air Water Air	277-285	4	10	8.45
Carnegie-Illinois	I Mn-Cr-Ni-Mo	.24 - .30 C .94 - 1.19 Mn .16 - .27 Si .39 - .75 Cr .92 - 1.07 Ni .26 - .40 Mo	1544 1058	1-1/2 1-1/4 - 2-1/4	Water Water	228-302	11	28	10.53
	V High Alloy	.30 C .22 Mn .07 Si 1.20 Cr 3.23 Ni		Not given		293	1	4	6.37
	VI Special	.27 C 1.28 Mn .20 Si .82 Ni		Not given		265-282	1	2	5.37
		Average 3 Types					13	34	9.79

TABLE V (Cont.)

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Heat Treatment Hold (hrs.)	Heat Treatment Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Henry Disston & Sons	V High Alloy	.18 - .21 C .48 - .51 Mn .20 - .23 Si .09 - .10 Cr 4.66 - 4.77 Ni .31 - .34 Mo .05 - .10 V	1425	2	Water	269-286	2	5	6.3
Ford Motor Co.	II Mn-Cr-Mo	.26 - .30 C 1.35 - 1.42 Mn .21 - .34 Si .54 - .71 Cr .03 - .11 Ni .42 - .45 Mo	1650 1100	4 6	Water Air	262-292	2	4	12.13
	V High Alloy	.23 - .24 C .64 Mn .19 - .20 Si 1.40 - 1.61 Cr .12 Ni .62 - .64 Mo	1650 1100	4 6	Water Air	---	3	5	15.9
		Average 2 Types					5	9	14.22
Great Lakes	IV Mn-Cr-Mo-Si	.26 - .32 C .80 - .94 Mn .67 - .81 Si .60 - .70 Cr .17 - .22 Mo .07 - .09 Zr	1600-1650 1100-1260	1/2-3 1/2-4	Water	255-312	25	58	11.24

TABLE V (Cont.)

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Heat Treatment Hold (hrs.)	Heat Treatment Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Great Lakes	IV Mn-Cr-Mo-Si High C	.42 C .71 Mn .79 Si .56 Cr .16 Mo .08 Zr	1600 1150	2 4	Water Air	269	5	8	22.56*
		Average 2 Types					30	66	12.63
Jones and Laughlin	III Mn-Mo	.22 - .29 C 1.50 - 1.68 Mn .19 - .24 Si .41 - .52 Mo	1625 1200	1-3 2-1/2 - 4	Water Air	241-277	17	45	6.42
Republic	I Mn-Ni-Cr-Mo	.20 - .28 C .87 - 1.15 Mn .27 - .28 Si .67 - .98 Cr .89 - .98 Ni .47 - .52 Mo	1600 1200 1300 1600 1200	3 3-1/2 1 3/4 1-1/2	Water Air Air Spray -----	255-269 255	8	25	3.53
	V High Alloy	.25 - .26 C .44 - .93 Mn .19 - .27 Si .22 - 1.53 Cr 3.80 - 4.05 Ni .39 - .95 Mo	Not given			245-285	10	30	8.31
	?	Not given					4	9	2.96
		Average 3 Types					22	64	5.68

* Includes one unfair round.

TABLE VI a

Electrode Data for Hand Welded Rolled H Plates

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Alloy Rods	Armorarc Type A	.10 C 1.5 Mn .75 Si 19.0 Cr 9.25 Ni 3.0 Mo	Titania	1	4	.75
	Armorarc Type B	.08 - .14 C .03 - .75 Si 8.25 - 10.6 Ni 18.0 - 20.0 Cr 3.0 - 4.10 Mn	Titania	13	34	10.18
		Average 2 Brands		14	38	9.19
Arcos Corp.	Chromang	.09 - .10 C 3.27 - 3.75 Mn .32 - .75 Si 9.3 - 10.25 Ni 18.5 - 19.1 Cr .97 - 1.0 Mo	Lime	2	4	15.19
Champion Rivet Co.	308	.12 C 3.75 Mn 19.0 Cr 10.0 Ni		2	7	2.61

TABLE VI a (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Crucible Steel	Armorize	.06 - .12 C 1.70 - 2.10 Mn .19 - .50 Si 18.5 - 19.6 Cr 8.06 - 10.7 Ni 1.61 - 2.50 Mo .20 V	Titania	11	30	7.45
	Rezistol	.07 - .11 C 1.37 - 1.75 Mn .28 - .31 Si 17.8 - 19.2 Cr 9.8 - 10.1 Ni 1.09 - 2.26 Mo	Titania	2	3	12.92
	Average 2 Brands			13	33	7.95
Harnischfeger	Smootharc AW-3 (AW-3A)	.10 - .13 C 1.38 - 1.83 Mn .42 - .71 Si 18.49 - 20.4 Cr 10.3 - 10.9 Ni 1.61 - 2.25 Mo	Lime Titania ?	10	26	6.14
Lincoln Electric	Armorweld	.09 - .12 C 3.97 - 4.2 Mn .04 - .85 Si 19.45 - 20.5 Cr 8.56 - 10.0 Ni	Lime Titania ?	3	9	8.81
	Armorweld ARW-I	Not Given	Lime	1	3	12.58
	Average 2 Brands			4	12	9.75

TABLE VI a (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Metal & Thermit	Murex	.07 C 1.15 - 1.19 Mn .55 Si 18.8 - 19.0 Cr 9.93 - 10.0 Ni 2.10 - 2.13 Mo	Titania	3	8	4.66
McKay	Armorloy A-5 (AC-5 ?)	.08 - .11 C 1.5 - 4.0 Mn .03 - .53 Si 19.7 - 20.4 Cr 9.8 - 10.6 Ni	Lime Titania ?	23	55	9.40
	Armorloy A-6	.12 C 2.0 Mn .5 Si 23.0 Cr 10.0 Ni .21 Mo		5	11	6.05
	Average 2 Brands			28	66	8.84
Page	Stainless	.14 C 1.61 - 2.06 Mn .25 - .32 Si 17.98 - 19.02 Cr 10.72 - 11.58 Ni 1.56 - 2.07 Mo	Titania	1	3	5.33
Reid-Avery	Raco	.09 - .11 C 4.0 - 4.35 Mn .02 - .75 Si 18.4 - 20.0 Cr 9.0 - 9.85 Ni .81 - 1.25 Mo	Titania	10	21	13.29*

* Includes one unfair round.

TABLE VI a (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Westinghouse	—	.05 C 2.0 Mn .5 Si 18.5 Cr ? Ni 1.6 Mo	Titania	1	3	4.58

TABLE VI b

Electrode Type	Weld Analysis	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Mn-Mo Mod. 18/8	At least 1% Mn and .2% Mo	46	113	7.94
Mn Mod. 18/8	At least 1% Mn	41	69	9.15
Mo Mod. 18/8	At least .3% Mo and less than 1% Mn	No plates		

TABLE VII

Joint Design Data for Hand Welded Rolled H Plates

Angle of Bevel	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
45° DV	64	157	9.90*
60° DV	13	37	4.72
67½° DV	1	2	10.00
75° DV	1	2	3.75
90° DV	1	2	6.38

Root Gap (inches)	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
1/8	3	6	6.96
5/32	3	7	10.00
3/16	12	29	6.60
1/4	14	36	7.65
5/16	41	102	10.50*
3/8	10	29	6.89
7/16	2	5	2.90

Plate Preparation	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Flame Cutting	19	48	10.64
Flame Cutting and Grinding, Machining, or Flame Softening	63	160	8.23
Buttering	4	9	8.44

* Includes one unfair hit.

TABLE VIII

Welding Procedure for Hand Welded Rolled H Plates

No. of Passes	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
6	3	5	12.4
7	2	4	13.31
8	21	50	11.71*
9	7	19	10.20
10	3	6	6.83
11	4	9	14.11
12	3	8	10.87
13	2	6	5.17
14	3	9	3.44
15	4	11	7.07
16	7	18	10.33
17	1	2	13.00
18	15	40	6.94
19	1	2	10.00
20	2	5	7.55
21	3	7	5.21
22	2	4	6.44
23	1	2	5.13
24	2	6	6.67
25	2	4	10.25
26	2	6	8.25
27	1	3	6.25
28	1	4	0
56	1	3	.50

Backing	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Copper	69	175	9.17
SAE 1015	1	2	16.13
No Backing	3	8	9.4

* Includes one unfair round.

TABLE VIII (Cont.)

Root Deposition Type		No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
I	Single bead at root	8	18	10.40
II	Two beads at root	81	204	8.98
	More than two beads at root	4	11	3.64
Body Deposition Type				
I	Layers only	54	133	10.34*
II	Beads only	7	21	3.42
III	Layers and beads	32	79	7.75
Crown Deposition Type				
I	Single crown	41	96	11.27
II and III	Multiple crown	52	137	7.17

Preheat °F	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected)(inches)
Room Temp.	53	130	9.13*
75 - 100	29	76	7.48
125	4	10	6.28
150	6	15	12.10
200	1	2	29.63

* Includes one unfair round.

TABLE IX

Radiographic Data for Hand Welded Rolled H Plates

Radiographic Results	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Passing	74	191	7.97*
Failing	97	42	12.82

TABLE X

Unionmelt Fabricators

Fabricator	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
American Locomotive	1	1	22.00
Fisher Tank	3	4	31.56
General Motors of Canada	3	4	29.19
International	4	5	27.05
New York Air Brake	15	24	20.17*

* Includes one unfair round.

TABLE XI

Armor Data for Unionmelt Welded Rolled H Plates

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F	Heat Treatment Hold (hrs.)	Heat Treatment Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (inches)
Carnegie-Illinois	V High Alloy	.30 C .98 Mn .47 Si .58 Cr .99 Ni .34 Mo	1544 1050	1-1/2 2-1/4	Water Water	228	1	1	34.0
Dominion Foundries and Steel	V High Alloy	.26 - .28 C .57 - .69 Mn .34 - .39 Si 2.25 - 2.45 Cr .71 - .72 Ni .28 - .30 Mo	1650 1650 1150	10 6 5	Air Water Air	---	3	4	29.19
Great Lakes	IV Mn-Cr-Mo-Si	.26 - .30 C .92 - .94 Mn .67 - .79 Si .59 - .63 Cr .17 - .18 Mo .09 Zr	1650 1150	— 2	— Air	269-300	4	6	24.79
	IV Mn-Cr-Mo-Si High C	.42 C .71 Mn .79 Si .56 Cr .16 Mo .08 Zr	1600 1150 1600 1240	2 4 2 —	Spray — Water —	269 269-286	3	3	37.58
	Average 2 Types						7	9	29.06

TABLE XI (Cont.)

Manufacturer	Armor Type	Chemical Composition	°F	Heat Treatment Hold (hrs.)	Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (inches)
Jones and Laughlin	III Mn-Mo	.25 C 1.50 Mn .23 Si .41 Mo	1625 1080 1080	2-1/2 2-3/4 3	Water Air —	275-300	11	14	28.36*
Republic	V High Alloy	.24 - .28 C .47 Mn .22 Si .22 Cr 4.05 Ni .39 Mo	1600 1160	2-1/2 3-1/2	Water —	252	3	8	5.47
	I Mn-Ni-Cr-Mo	.24 C .71 Mn .26 Si .69 Cr 1.23 Ni .47 Mo	1600 1160	2-1/2 3-1/2	Water —	——	1	2	15.63
	Average 2 Types						4	10	7.50

* Includes one unfair round.

TABLE XII

Electrode Data for Unionmelt Welded Rolled H Plates

Electrode Manufacturer	Brand	Weld Metal Composition	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Linde Air Products	Oxweld #41	.20 C 3.01 Mn .60 Si 17.42 Cr 11.50 Ni .37 Mo	1	1	22.00
	Oxweld #42	.25 C 3.90 Mn .50 Si 7.50 Cr ? 9.00 Ni .25 Mo	1	1	36.00
		Average 2 Types		2	29.00
Lincoln and Linde Air	Armorweld and Oxweld #42	Armorweld Composition .09 C 3.97 Mn .04 Si 19.45 Cr ? 8.56 Ni .032 Mo	6	10	25.10
	ARW - 1 and Oxweld #41	Not Given	1	2	24.50

TABLE XII (Cont.)

Electrode Manufacturer	Brand	Weld Metal Composition	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Harnischfeger and Linde Air	AW-3-A and Oxweld #41	AW-3-A Composition .10 - .13 C 1.38 - 1.83 Mn .42 - .71 Si 18.49 - 20.40 Cr 10.30 - 10.90 Ni 1.61 - 2.25 Mo	2	2	33.88
Crucible Steel and Linde Air	Armorize and Oxweld #42	Armorize Composition .06 - .12 C 1.70 - 2.10 Mn .19 - .50 Si 18.50 - 19.60 Cr 8.06 - 10.70 Ni 1.61 - 2.50 Mo .20 V	4	5	27.05
McKay and Linde Air	Armorloy AC-5 and Oxweld #42	Armorloy AC-5 .12 C .40 Mn ? .80 Si 20.00 Cr 9.70 Ni	1	1	36.00
	Armorloy and Oxweld #42	Not Given	7	8	27.97*
Alloy Rods and Linde Air	Armorarc and Oxweld #42		2	7	3.11

* Includes one unfair round.

TABLE XIII

Joint Design Data for Unionmelt Welded Rolled H Plates

Angle of Bevel	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
45°	19	28	22.65
90°	2	3	16.42

Root Gap (inches)	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
3/16	4	5	27.05
1/4	13	19	27.25
5/16	3	4	31.56
3/8	1	1	31.75

Plate Preparation	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Flame cutting	5	9	9.94
Flame cutting and grinding	16	21	27.65*

* Includes one unfair round.

TABLE XIV

Welding Procedure Data for Unionmelt Welded Rolled H Plates

No. of Passes	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
2 UM	2	2	29.00
1 Layer & 2 UM	2	3	27.33*
2 Layers & 2 UM	3	8	8.09
3 Layers & 2 UM	2	2	40.63
4 Layers & 2 UM	14	19	26.26
5 Layers & 2 UM	1	2	13.63
8 Layers & 2 UM	1	1	36.00
9 Layers & 2 UM	1	1	36.00

Root Type Deposition		No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (inches)
I	One hand bead at root	3	4	32.88*
II	Two hand beads at root	20	31	21.39
	More than two hand beads	1	1	31.75
Special	No hand welding	2	2	29.00
Body Type Deposition				
IV	UM only	13	13	17.35*
V	UM & hand beads	13	25	26.35

* Includes one unfair round.

TABLE XIV (Cont.)

Preheat °F.	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Room Temperature	11	13	32.48*
125	1	1	31.75
150 - 200	12	19	15.45
300	2	3	29.25

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TABLE XV

Radiographic Data for Unionmelt Welded Rolled H Plates

Radiographic Results	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Passing	14	19	25.84*
Failing	12	19	20.69

* Includes one unfair round.

TABLE XVI

Armor Data for Hand Welded Cast H Plates

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Hold(hrs.)	Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (ins.)	Av. Plate Cracking per Round (inches)
American Radiator & Standard Sanitary Corp.	II Mn-Cr-Mo	.29 C 1.58 Mn .45 Si .33 Mo .49 Cr	1200 1150 1650	2 7 5	Air Air Water	240-275	1	4	3.38	2.06
American Steel Foundries	II Mn-Cr-Mo	.26 - .29 C 1.52 - 1.53 Mn .47 - .48 Si .35 - .36 Cr .16 Mo	Not Given			197	7	21	3.23	2.20
Buckeye Steel Castings Corp.	III Mn-Mo	.27 C 1.58 Mn .44 Si .42 Mo	1825 1625 1200	8 3 6	Air Water Water	212-228	1	3	2.5	3.42
Continental Roll & Steel Foundry Co.	I Mn-Cr-Mo-Ni	.34 - .35 C .79 - .80 Mn .33 - .38 Si .42 - .49 Cr .53 - .60 Ni .44 - .45 Mo	1650 1550 1180 1650 1575 1210	- 8 10 - - -	Air Water Water Air Water Furnace	229-269	3	5	7.5	13.8
Ford Motor	II Mn-Cr-Mo	.27 - .29 C 1.11 - 1.30 Mn .35 - .60 Si .50 - .60 Cr .35 - .41 Mo	1800 1700 1100	5 3 6	Air Water Water	241-248	3	5	7.05	3.0
	?	Not Given	Same as above				3	5	9.2	10.9

TABLE XVI (Cont.)

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Hold(hrs.)	Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (ins.)	Av. Plate Cracking per Round (inches)
General Steel Castings Corp.	III Mn-Mo	.29 C 1.56 Mn .40 Si .46 Mo .11 Cr	1975 1250 1575	10 4 4	Air Air Water	270-281	1	3	2.33	3.92
Ordnance Steel Foundry	III Mn-Mo	.27 - .31 C 1.45 - 1.72 Mn .39 - .45 Si .27 - .45 Mo	1750 1575-1600 1125-1150	2-1/2 1-1/4 4	Air Water Air or Water	245-321	6	16	3.59	3.02
Pacific Car & Foundry	III Mn-Mo	.21 C 1.06 - 1.10 Mn .64 - .66 Si .42 - .47 Mo	1850 1625 1200	6 3 4	Air Water Air	197-212	2	3	4.08	29.0
Pittsburgh Steel	I Mn-Cr-Mo-Ni	.30 C 1.03 Mn .40 Si .53 Cr .50 Ni .48 Mo	1050 1200 1600 1150	6 6 6 8	Air Furnace Water Cooled in furnace to 700°, then air	269-277	3	5	18.4	2.75
Pratt & Letchworth	III Mn-Mo	.25 - .27 C 1.34 - 1.36 Mn .37 - .42 Si .32 - .36 Mo	1725 1625 1050	3 2 4	Air Water Air	248-286	3	7	-.93	12.64
Sivyer Steel Castings Co.	I Mn-Cr-Mo-Ni	.30 C .86 Mn .43 Si .44 Cr .46 Ni .46 Mo	Not Given			235	1	2	2.	1.13

TABLE XVI (Cont.)

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F	Hold (hrs.)	Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corr.) (ins.)	Av. Plate Cracking per Round (inches)
Symington-Gould Corp.	II Mn-Cr-Mo	.26 C 1.38 Mn .35 Si .37 Cr .40 Mo	1850 1650 1150-1180	7 5 6	Air Water Water	255-258	1	2	12.37	4.38
Union Steel Castings Co.	III Mn-Mo	.27 - .31 C 1.36 - 1.60 Mn .34 - .42 Si .53 - .57 Mo	Not Given			220-285	5	9	5.64	19.5
Utility Electric Steel	I Mn-Cr-Mo-Ni	.27 - .35 C 1.07 Mn .38 - .53 Si .47 - .50 Cr .63 - .74 Ni .21 - .31 Mo	1850 1250 1650-1600 1250-1200	6 5 1/3-2 6	Air Air Water Air	229	3	8	3.44	4.94
Wehr Steel Co.	I Mn-Cr-Mo-Ni	.33 C .86 Mn .46 Si .84 Cr .55 Ni ? .45 Mo	Not Given			225	1	2	7.75	10.0

APPENDIX A

1. Key to tabulation method and symbols.

2. Specification requirements for H plates welded with austenitic electrodes.

3. Tabulation of firing record data on H plates welded with austenitic electrodes.

Ballistic data tabulated by:

Mary M. Sliney
Jr. Statistical Clerk
Watertown Arsenal

KEY TO TABULATION METHOD AND SYMBOLS

Figure 2 is a sample tabulation of firing record data and gives a key to symbols and method of tabulation. A brief explanation of the items in the tabulation follows:

1. Identification of Test

   Information in the first column identifies the test.

2. Armor Data

   A. Plate Thickness

      Plates in this tabulation are of 1-1/2 inch thick homogeneous armor.

   B. Type Armor

      The following types are used:

R (Rolled)

Typical Analysis

Type		C	Mn	Si	Cr	Mo	Ni	Zr
I	Mn-Ni-Cr-Mo	.26	1.15	.20	.60	.20	1.00	
II	Mn-Cr-Mo	.27	1.30	.25	.55	.42		
III	Mn-Mo	.25	1.60	.22	—	.37		
IV	Mn-Cr-Mo-Si	.27	.86	.79	.62	.17		.09
V	High Alloy	(Compositions noted in tabulation)						
VI	Special	"		"	"	"		

C (Cast)

I	Mn-Cr-Mo-Ni	.32	.80	.35	.55	.40	.45
II	Mn-Cr-Mo	.28	1.55	.45	.40	.12	
III	Mn-Mo	.30	1.58	.40	—	.30	
IV	Special	(Compositions noted in tabulation)					

   C. Carbon Content

      Carbon content is listed whenever given.

   D. Brinell Hardness Number (BHN)

      Brinell hardness number on both the front and back of plates is tabulated when given.

E. Process

This refers to the melting practice and is tabulated as open hearth, electric, basic or acid.

F. Heat Treatment

The temperature, time of hold, and type of quench and draw are recorded as given.

3. Electrode Data

These data, often incomplete, are listed as given in each firing record.

A. Type

Since alloys are sometimes added in the coating, electrodes are typed according to the chemical analysis of the weld metal when given.

The electrodes are typed as follows:

(1) (Austenitic)

I Mn-Mo Modified 18/8 (Cr-Ni-Fe Alloy)
Weld Analysis - at least 1% Mn and .3% Mo

II Mn Modified 18/8 (Cr-Ni-Fe Alloy)
Weld Analysis - at least 1% Mn and less than .3% Mo

III Mo Modified 18/8 (Cr-Ni-Fe Alloy)
Weld Analysis - at least .3% Mo and less than 1% Mn

IV Special

B. and C. Trade Name and Coating

Trade names and types of coating are listed when given.

D. Current and Polarity

These data are tabulated as DC straight (str.), DC reversed (rev.), or AC.

4. Joint Design

A. Groove, etc.

This item includes the type of groove (Single V bevel or double V bevel), the included angle, and the width of the root face whenever given.

B. Root Gap

This is the distance between the plates as set up for welding.

C. Plate Preparation

This indicates whether the plate edges to be welded together were flame cut, ground, machined, buttered, etc.

5. Welding Procedure

A. Backing

Backing if used, i.e. back-up bar, chill, filler and spacer strips, is noted.

B. Deposition

Figure 3 shows how the weld deposition is broken up into the root, body, and crown types. The size electrode is noted with the number of passes, type of passes, and the current and voltage. Passes are divided into two kinds: (1) layer, if the pass bridges the gap; and (2), bead, if the pass does not bridge the gap.

C. Total Welding Time and Interpass Temperature

These are listed as given.

D. Remarks

Any comments on chipping, grinding, and other special techniques used and not noted above which affect the ballistic results are listed under "remarks."

6. Heat

Preheat and postheat are tabulated when given.

7. Ballistic Results

Unless otherwise specified, the 75 mm. TP projectile was used in the tests tabulated. Hits, velocity and location of each, cracking and remarks on cracking are listed. The types of weld and plate cracking are as follows:

Type I Cracking in fusion or heat-affected zones on front and back of plate.

Type II Cracking in fusion or heat-affected zones on one side of plate and weld metal on the other.

Type III Cracking in weld metal on both front and back of plate.
Type IV Star plate cracking.
Type V Linear plate cracks.

The remarks on cracking and results of radiographic examination are recorded in the last column.

SPECIFICATION REQUIREMENTS FOR "H" WELDED PLATES

The following extracts from Specification AXS-497, Rev. 3, describe the present ballistic shock test:

Paragraph F-3a. (2) "Shock Tests. The welded plate shown in Fig. 1 shall be tested as shown below. Fig. 1 shows the areas designated for shock impacts. For the purpose of description these are divided in four 'specified areas' one above and one below the crossbar on each of the two vertical leg welds. Aiming points are indicated in Fig. 1.

"If the first round falls outside of the one of the four specified areas, another round shall be fired at a second specified area. If the second impact falls outside of the specified area and no cracking occurs in the weld, another round will be fired at a third specified area. This shall be continued until an impact is obtained within one of the four specified areas, but no more than four rounds will be fired at one plate. If the plate withstands all four rounds, all of which fall outside the specified areas, and the weld is not cracked, the plate will be considered acceptable."

BALLISTIC SHOCK TEST*

Plate Thickness	Type	Projectile	Velocity f/s	Allowable Distance, Center of impact to center of weld	Maximum Allowable Cracking(1,2)** Weld	Plate
1-1/2"	R.H.	75 mm. PP T21	1100	2"	15"	8"
1-1/2"	C.H.	75 mm. PP T21	1050±6f/s per .01"	2"	15"	8"

* Effective during the period in which the plates in this tabulation were tested.

** Notes:

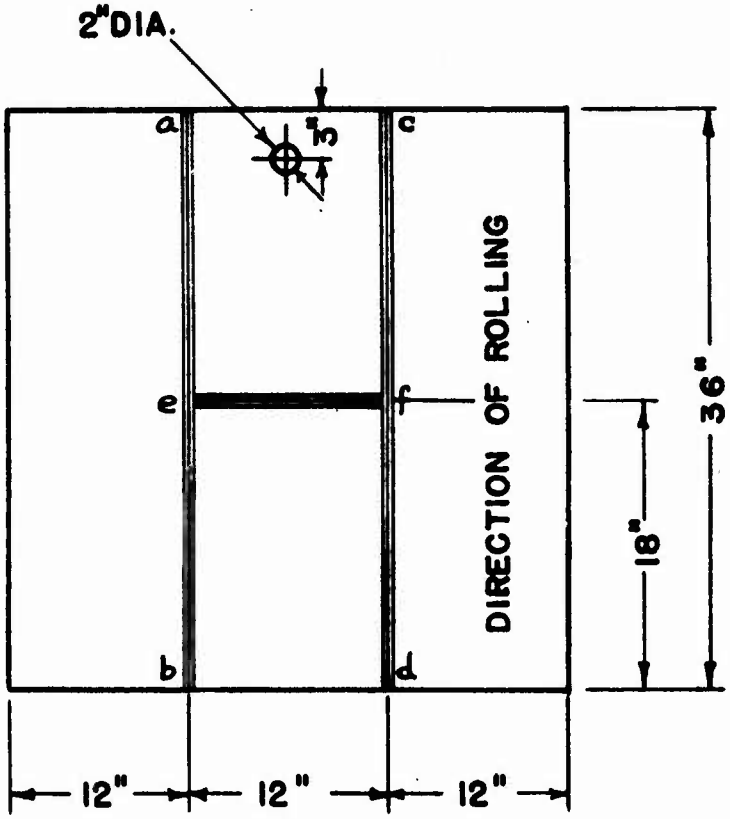
1. Cracks in the armor parallel to the weld and within 1/8" of the edge of the weld shall be considerod in the total weld cracking.

2. Limits of Armor Cracking - The maximum length of any plate crack originating or passing through the impact impression shall not exceed 8" as measured from the center of the impression. Any other plate crack shall not exceed a total of 8".

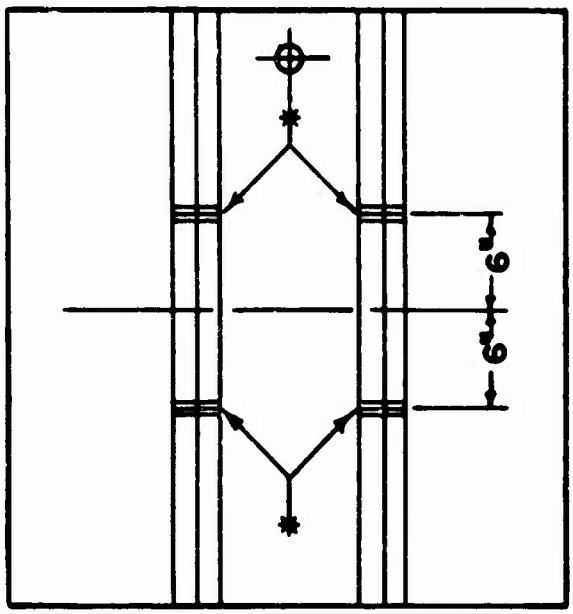
Amendment to Specification AXS-497, Rev. 3, effective as of June 25, 1943.

Thickness	Type	Projectile	Striking Vel. ±25	Allowable Weld Cracking
1-1/2"	R.H.	75 mm. PP T21	1200 f/s	15"
1-1/2"	C.H.	75 mm. PP T21	1050 f/s	10"

WELD SEQUENCE:
ab, cd, fe.



QUALIFICATION SHOCK TEST PLATE



* INTENDED AIMING POINTS

FIG. 1

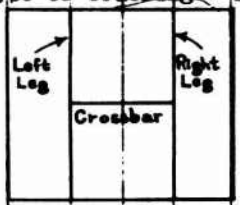
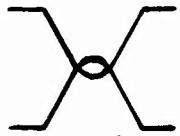
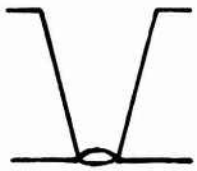
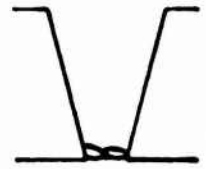
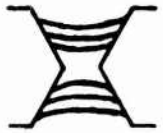
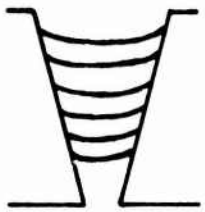
A. PLATE NUMBER OR B. HEAT OF TEST B. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. PASSES 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
				KEY TO SYMBOLS											
---- indicates that information not given in firing record.	Armor Types R (Rolled) I (Mn-Ni-Cr-Mo) II (Mn-Cr-Mo) III (Mn-Mo) IV (Mn-Cr-Mo-Si) V (High Alloy) VI (Special) C (Cast) I (Mn-Cr-Mo-Ni) II (Mn-Cr-Mo) III (Mn-Mo) IV (Special) B.O.H. - basic open hearth A.O.H. - acid open hearth B.Elec. - basic electric A.Elec. - acid electric	Electrode Types A (Austenitic) I (Mn-Mo Mod. 18-8) II (Mn Mod. 18-8) III (Mo Mod. 18-8) IV (Special) F (Ferritic)	Double V (DV) Bevel Included Angle Root Face (RF) Root Gap Single V (SV) Bevel Included Angle Root Gap	a - layer b - bead Types of deposition illustrated by Figure 3			H - Hit F/S - Feet per second L.L. - Left leg R.L. - Right leg CB - Crossbar LOC. - Location R - Right of L - Left of X - On weld U - Above D - Below Imp - Running from or through impact O - Not running from or through impact Type of cracking - refer to text  						
EXAMPLE---SAMPLE TABULATION OF DATA FROM ABERDEEN FIRING RECORD NO. AD-22															
A. AD-22 B. 9/23/42 C. W-10 D. Ford E. Hollup Armor F. Ford	A. 1-1/2" B. C-II C. .27 D. --- E. --- F. ---	A. A-III B. Armorod C. --- D. ---	A. 45°DV, 0"RF B. 5/32" C. ---	A. --- B. 1. I 5/32" 1a 160 - 53 2. I 1/8" 1a 110 - 50 5/32" 1a 160 - 53 3/16" 1a 200 - 53 1/4" 2a 220 - 55 3. II 1/4" 2b 220 - 55 3/16" 2b 200 - 53 C. --- not more than 120°F. D. Chipping after each pass.	A. None B. None	1 2	1058 1100	3/4" R X		4" U 5 1/2" D	Imp Imp	I II III V	5 1/2" 1/2" 5 1/2" 2 1/2" 14 1/2"	Passed radiograph Area of incomplete fusion; repair weld in casting near upper left leg on face of plate.

FIGURE 2. SAMPLE CHART FOR TABULATION OF FIRING RECORD DATA ON WELDED H PLATES.

ROOT TYPES	TYPE I	TYPE II
DOUBLE V BEVEL	 SINGLE ROOT BEAD AT CENTER OF ROOT	 ETC. MORE THAN ONE BEAD AT ROOT
SINGLE V BEVEL	 SINGLE BEAD BRIDGING ROOT GAP	 ETC. MORE THAN ONE BEAD BRIDGING ROOT GAP

BODY TYPES	TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V
DOUBLE V BEVEL	 LAYERS ONLY	 BEADS ONLY	 LAYERS & BEADS	UNIONMELT	SPECIAL
SINGLE V BEVEL	 LAYERS ONLY	 BEADS ONLY	 LAYERS & BEADS	UNIONMELT	SPECIAL

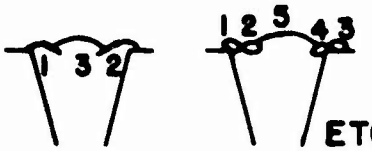
CROWN TYPES	TYPE I	TYPE II	TYPE III
DOUBLE V & SINGLE V BEVEL	 SINGLE CROWN SINGLE PASS BRIDGES GAP	 MULTIPLE CROWN LAST BEAD TOUCHES PARENT METAL	 ETC. MULTIPLE CROWN LAST BEAD DOES NOT TOUCH PARENT METAL

FIG. 3 WELD METAL DEPOSITION TYPES

SPECIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. Purex Ordnance No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manufr. F. Armor Fabricator	A. Plate Thickness B. Type C. Carbon Content D. Hrn E. Process F. Heat Treatment Temp Time Quench	A. Type B. Trade Name C. Coating D. Current & Polarity	A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing B. Deposition Size El. No. Type Amp V. Passes 1. Root Type 2. Body Type 3. Groove Type C. Total Welding Time & Inter Pass Temperature D. Remarks	A. Pre B. Post	N	Vel. F/S	Location of H: L.L.	R.L.	S.S.	Cracking: Loc.	Type	Amt.	
A. AD-321 B. 3/9/43 C. 557 D. Carnegie-Illinois Steel Co E. Harnischfeger Corp. F. American Locomotive Co.	A. 1-1/2" B. R-I (.94Mn,.168i, .54Cr,.99Ni, .4CMo) C. .25 D. Face 286 Back 293 E. B.O.H. F. 1544°F. 1½ hrs. Water 1050°F. 2½ hrs. Water	A. A-I (.11C,1.59 Mn,.608i, 18.49Cr, 10.51Ni, 1.61Mo)* B. AW-3 C. Lime-Tio D. DC REV	A. 45°DV B. 1/4" C. ---	A. Not given B. 1. I 3/16" 1a 120 - 25 2. III 1/4" 1a 260 - 29 3/16" 1a 160 - 28 1/4" 1a 250 - 29 1/4" 1a 2b 240 - 29 1/4" 1a 260 - 30 1/4" 2b 230 - 28 1/4" 1a 240 - 30 3. III 1/4" 3b 230 - 29 1/4" 3b 240 - 29 C. 27 hrs. 100° - 230°F. D. 2" (Hi Spot) chipped after sixth pass. One more pass in crossbar. Severe cracking along fusion zone in under side of root bead. This section was chipped and rewelded before completing the welding. Defect was not completely removed and the plate was submitted for development.	A. None B. None	1	1096		1½" L	5" D	Imp	I II II	1⅜" 2" 8½"	Failed radiograph due to excessive cracking
						2	1147		5/8" R	5" U	0	I II	1⅜" 1⅞"	
											Imp	I II	4½" 8"	
													28½"	
A. AD-331 B. 3/19/43 C. 560 D. Carnegie-Illinois Steel Co E. Harnischfeger Corp. F. American Locomotive Co.	A. 1-1/2" B. R-I (.94Mn,.168i, .54Cr,.99Ni, .4CMo) C. .25 D. Face 286 Back 293 E. B.O.H. F. 1544°F. 1½ hrs. Water 1050°F. 2½ hrs. Water	A. A-I (.12C,1.83 Mn,.718i, 18.8Cr, 10.3Ni, 2.18Mo)* B. AW-3 C. Lime D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Not given B. 1. II 3/16" 1a 110 - 28 3/16" 1a 200 - 28 2. I 1/4" 6a 290 - 30 1/4" 1a 310 - 30 3. III 1/4" 6b 290 - 30 C. 23 hrs. 105° - 280°F. D. 2" (in test coupon) chipped after fourth pass.	A. 75°F B. None	1	1103	⅜" L		6½" U	Imp	I II V	8½" 7½" ⅜"	Passed radiograph
						2	1169		1" L	5½" D	Imp	III	1"	
						3	1195		⅜" R	4½" U	Imp	I II III	8½" 1½" 17"	
													44½"	

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. PERS RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING PASSES B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	R.L.	G.B.	CRACKING LOC	TYPE	AMT	
A. AD-104 B. 11/7/42 C. 28 D. Henry Disston & Sons E. Lincoln Elec. F. Baldwin Loco-motive Works	A. 1-1/2" B. R-V (.48Mn,.233i, .09Cr,4.66Ni, .31Mo,.05V) C. .18 D. Face 286 E. B.Elec. F. ---	A. A-II (.12C,4.2 Mn,.88i, 20.5Cr, 10.00Ni)* B. Armor-weld C. Lime D. DC REV	A. DV B. 3/16" C. Flame Cutting	A. Not given B. 1. II 5/32" 2a 155 - 25 2. III 5/32" 1a 156 - 25 3/16" 2a 190 - 25 1/4" 7b 245 - 24 remainder not given 3. I C. 12 hrs. --- --- D.	A. None B. None	1	1099		1 1/2" L	6" U				Passed radiograph
						2	1208	1 1/2" R		8" D	Imp	I II III	1 1/2" 5 1/2" 7"	
						3	1199		X	6 1/2" D	Imp	I III	3 1/2" 9" 26 1/2"	

*Weld Metal

INFORMATION A. Weld record no. B. Date of test C. Plate no. D. Welder manufacturer E. Electrode spec. no. F. Welder designator	BASE MET. A. Plate thickness B. Type C. Carbon content D. Size E. Process F. Heat treatment, temp. time cooling	ELECTRODE DATA A. Type B. Trade name C. Coating D. Current & polarity	JOINT DESIGN A. Groove included angle, root face B. Root gap C. Plate preparation	WELDING A. Backing B. Deposition sequence, no. type and size 1. Root type 2. Body type 3. Groove type C. Total welding time & inter pass temperature D. Remarks	HEAT A. Pre B. Post	B	WELD. V/S	BALLISTIC RESULTS LOCATION OF B C.L.	R.L.	S.E.	CRACKING Loc.	Type	Amt.	REMARKS OR CRACKED RADIOGRAPHIC RESULTS, ETC.
A. AD-323 B. 3/15/43 C. 39 D. Carnegie-Illinois Steel Co E. Metal & Thermit Corp. F. Briggs Mfg. Co	A. 1-1/2" B. R-I (1.19Mn,.22Si, .75Cr,1.07Ni, .26Mo) C. .27 D. Face 302 Back 302 E. B.O.H. F. 1544°F 1½ hrs. Water 1058°F 2½ hrs. Water	A. A-I (.07C,1.19 Mn,.55Si, 18.80Cr, 9.93Ni, 2.13Mo)* B. Murex C. Titanium D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 1/4" 2a 190 - 24 2. I 5/16" 2a 325 - 30 3/8" 2a 400 - 32 3. I 3/8" 2a 400 - 32 C. 6 hrs. 70° - 170°F D. Copper removed after first pass. Adhesions after second pass	A. None B. None	1 2 3	1099 1199 1092	1" R	1¾" R 1" L	6¾" U 7" D 5" D	Imp 0	I II III	4½" 7½" 6½" 18"	Passed radiograph
A. AD-323 B. 3/15/43 C. 40 D. Carnegie-Illinois Steel Co E. Crucible Steel Corp. F. Briggs Mfg. Co	A. 1-1/2" B. R-I (1.19Mn,.32Si, .75Cr,1.07Ni .26Mo) C. .27 D. Face 302 Back 302 E. B.O.H. F. 1544°F 1½ hrs. Water 1058°F 2½ hrs. Water	A. A-I (.08C,1.77 Mn,.19Si, 19.38Cr, 10.60Ni, 2.14Mo)* B. Armorize C. Titanium D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 1/4" 2a 190 - 24 2. I 5/16" 2a 325 - 30 3/8" 2a 400 - 32 3. I 3/8" 2a 400 - 32 C. 6 hrs. 70° - 170°F D. Copper removed after first pass. Adhesions after second pass	A. None B. None	1 2 3	1100 1100 1170	¼" R	1½" L 1½" R	7" D 6½" U 7" U	Imp Imp	II I	2½" 36" 38½"	Passed radiograph
		*Weld Metal													

IDENTIFICATION A. FIRM ASSIGNED NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE DEPOS. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	ELECTRODE (+) A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. PASSES TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.L.	CRACKING LOC.	TYPE	AMT.	REMARKS OR DRAWING RADIOGRAPHING RESULTS, ETC.
A. AD-83 B. 10/22/42 C. CP-44 D. Carnegie-Illinois Steel Co E. Alloy Rods F. Chrysler Plymouth Corp.	A. 1-1/2" B. R-V (.22Mn,.07Si, 1.20Cr,3.23 Ni) C. .30 D. Face 293 Back 293 E. B.O.H. F. ---	A. A-II (.14C,3.5 Mn,.75Si, 18.Cr, 8.25Ni)* A-IV (.06C,.17 Mn,.016Si, 21.3Cr, 10.22Ni)* 2nd analyses questionable B. Armoraro C. Titanium D. DC REV	A. 22-1/2°DV on one side, straight edge on other B. 3/8" C. Flame Cutting	A. Copper B. 1. II 1/4" 2a 240 - 27 2. I 1/4" 3a 240 - 27 5/16" 4a 320 - 27 3. III 1/4" 4b 240 - 27 5/16" 2b 320 - 27 C. 8 hrs. 130 - 333°F. D.	A. None B. None	1 2 3 4	1114 1159 1213 1267	 1" R 1½" L	X 1" L 	5" D 3½" U 6" U 5½" D	Imp 0 Imp Imp	III III II II	1½" 2" 1" 1½" 35 2" II 3½" III 6½" 40"	Passed radiograph
A. AD-302 B. 3/9/43 C. 53 D. Ford Motor Co. E. Crucible Steel Corp. F. Chrysler Plymouth Corp.	A. 1-1/2" B. R-II (1.42Mn,.348i, .71Cr,.11Ni, .43Mo) C. .30 D. Face 285 Back 293 E. B.O.H. F. 1650°F. 1½ hrs. Rice 2 hrs. Soak 1120°F. 1½ hrs. Rice	A. A-I (.12C,1.70 Mn,.50Si, 18.5Cr, 9.25 Ni, 1.35Mo)*	A. 67-1/2°DV B. 3/8" C. Flame Cutting	A. Copper B. 1. I 1/4" 1a 300 - 25 2. III 1/4" 2a 8b 300 - 25 5/16" 2a 280 - 30 3. III 1/4" 4b 300 - 25 5/16" 2b 280 - 30 C. 8 hrs. --- --- D.	A. None B. None	1 2	1104 1182	 X	¾" R	5½" D 6" U	Imp 0 Imp	II I II	8½" 2" 13½" 23"	Passed radiograph

*Weld Metal

SPECIFICATION A. PLATE ASSIGNED NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SUPPLIER F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.L.	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-103 B. 10/29/42 C. 1 D. Republic Steel Corp. E. Crucible Co. F. Crucible Steel Co.	A. 1-1/2" B. R-V (.44Mn,.195i, 1.53Cr,3.80 Ni,.56Mo) C. .36 D. Face 285 Back 285 E. --- F. ---	A. A-I (.08C,1.90 Mn,.23Si, 18.92Cr, 10.70Ni, 2.34Mo)* B. Rez. Armorize C. Mineral T102 Base D. DC REV	A. 45°DV B. 5/16" C. Machining	A. Copper B. 1. II 3/16" 2a 180 - 24 2. III 3/16" 2a 180 - 24 1/4" 8b 240 - 23 3. III 1/4" 6b 240 - 23 C. 4 hrs. Below 300° D. Cracking in passes one, ten and twelve, no grinding.	A. None B. None	1	1087		1 3/4" R	6 1/2" D	Imp	I	13"	Passed radiograph
														V	4"		
						2	1125	X		6 1/2" U	O	I	1"		
											Imp	I	12 1/2"		
												II	5 3/8"		
											O	V	1"		
											Imp	V	6 1/2"		
						3	1088		1 1/2" L	6 1/2" U	O	I	3"		
												II	3 1/2"		
													49 3/8"		
						4	1092		1" R	8 1/2" U	O	II	1"		
											Imp	I	19"		
											O	V	1"		
											Imp	V	3 1/2"		
													73 3/8"		
		*Weld Metal													

IDENTIFICATION A. Panel Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manufacturer. F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Hrn E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. Passes 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	N	BALLISTIC RESULTS Vel. f/s	Location of N L.L.	R.L.	S.S.	Cracking Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC.
A. AD-127 B. 11/23/42 C. 25 D. Republic Steel Corp. E. Crucible Steel Co. F. Federal Machine & Welder Co.	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B.Elec. F. 1300°F. 1 hr. anneal 1600°F. ¾ hr. spray 1200°F. 1½ hrs.	A. A-I (.09C,1.80 Mn,.37Si, 19.60Cr, 10.35Ni, 1.88Mo)* B. Armorize C. Titanium Mn-Mo D. AC	A. 60°DV B. 3/8" C. Flame Cutting Grinding	A. Copper B. 1. II 1/4" 2a 200 - 25 2. I 1/4" 2a 200 - 35 3/8" 2a 355 - 38 3. I 3/8" 2a 355 - 38 C. 6.51 hrs. 70° - 212°F. D. Chipping after all passes, grinding after first two. Time 1.54 hrs.	A. None B. None	1 2 3	1100 1158 1230	 ½" R 	1" R ½" L	5½" D 5" U 4½" U	 Imp Imp	 II I II III	 1" 1½" 8½" 12½"	Passed radiograph
A. AD-127 B. 11/23/42 C. 27 D. Republic Steel Corp. E. Harnischfeger Corp. F. Federal Machine & Welder Co.	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B.Elec. F. 1300°F. 1 hr. Anneal 1600°F. ¾ hr. Spray 1200°F. 1½ hrs.	A. A-I (.12C,1.72 Mn,.57Si, 19.5Cr, 10.4Ni, 1.88Mo)* B. Smoothare AW3 C. Lime D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 4b 150 - 20 2. II 5/32" 15b 150 - 20 5/32" 20b 155 - 20 3. II 5/32" 17b 155 - 20 C. 47.07 hrs. 70° - 190°F. D. Chipping after all passes except the last. Eleven less passes in crossbar	A. None B. None	1 2 3 4	1100 1097 1145 1157	2½" R 1½" L 	1¾" R ½" R	6½" D 7" U 7" U 6¾" D	 Imp Imp Imp	 II III II III	 1¾" 3" 1¾" 8 14½"	Passed radiograph
A. AD-127 B. 11/25/42 C. 29 D. Republic Steel Corp. E. Alloy Rods Co. F. Federal Machine & Welder Co.	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B.Elec. F. 1300°F. 1 hr. Anneal 1600°F. ¾ hr. Spray 1200°F. 1½ hrs.	A. A-II (.11C,4.00 Mn,.50Si, 20.00Cr, 9.00Ni)* B. Armoraro Type B C. Titanium Mn D. DC REV	A. 60°DV B. 1/4" C. Flame Cutting Grinding	A. Copper B. 1. II 3/16" 1a 165 - 22 3/16" 1a 180 - 22 2. II 3/16" 11b 180 - 22 3/16" 1b 185 - 22 1/4" 2b 210 - 24 1/4" 2b 215 - 24 3. III 3/16" 4b 170 - 22 1/4" 2b 225 - 24 C. 31.17 hrs. 70° - 212°F. D. Chipping after all passes except the 2nd, 15th and last. One less pass in crossbar	A. 70°F. B. None	1 2 3	1079 1191 1199	X 1½" R	1½" R 	3½" U 7½" D 6½" D	Imp Imp	III I II III V I II	½" 3" 1½" 6½" 3¾" 5" 9" 29¼"	Passed radiograph
		*Weld Metal															

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANG. Æ, ROOT FACE B. BODY GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.D.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC.
A. AD-246 B. 2/6/43 D. Republic Steel Corp. E. Harnischfeger Corp. F. Federal Machine & Welder Company C. 31	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B.Elec. F. 1300°F. 1 hr. Anneal 1600°F. 3/4 hr. Spray 1200°F. 1-1/2 hrs.	A. A-I (.11C,1.50 Mn,18.8Cr 10.4Ni 2.25Mo)* B. AW-3 C. Lime D. DC REV	A. 60°DV B. 3/16" C. ---	A. Not given B. 1. I 5/32" 1a 115 - 18 2. I 5/32" 4a 115 - 18 5/32" 2a 118 - 18 3/16" 3a 140 - 22 3. I 5/32" 2a 110 - 18 C. 24.15 hrs. 70° - 160°F. D. Chipping after each pass	A. 70°F. B. None	1 2 3	1095 1151 1161	 1 1/4" R 1/8" R	X 	5" U 7" D 5 3/4" U	Imp Imp Imp	II III II III I II III V	3 1/8" 3/4" 4 1/4" 1 1/4" 3/4" 4 1/4" 7 1/4" 1 1/4" 3 26 1/8"	Passed radiograph
A. AD-246 B. 2/9/43 C. 38 D. Great Lakes Steel Corp. E. Harnischfeger Corp. F. Federal Machine & Welder Co. Heat treated by - Standard Steel Spring Company	A. 1-1/2" B. R-IV (.89Mn,.68Si, .61Cr,.16Mo .08Zr) C. .29 D. Face 255 Back 355 E. B.O.H. F. 1650°F. 1/2 hr. Water 1200°F. 1/2 hr.	A. A-I (.10C,1.38 Mn,.61Si, 20.4Cr, 10.9Ni, 2.20Mo)* B. Smootharc AW-3 C. Lime - Mn-Mo D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding	A. Copper B. 1. II 3/16" 1a 170 - 22 3/16" 1a 190 - 22 2. II 3/16" 1b 170 - 22 3/16" 3b 190 - 22 1/4" 2b 235 - 24 1/4" 4b 240 - 26 3. III 3/16" 4b 175 - 24 1/4" 2b 260 - 26 C. 22.30 hrs. 70° - 212°F. D. Two less passes in crossbar. Chipping after the first thress passes.	A. 70°F. B. None	1 2 3	1081 1201 1158	 1 3/4" R 	1/4" R 1/4" L	6" D 6 1/8" U 4 1/4" U	 Imp Imp	 III V II	 1 9 1/8" 9 3/4" 20 1/4"	Failed radiograph 2-1/2" crossbar weld crack
A. AD-246 B. 2/2/43 C. 39 D. Republic Steel Corp. E. McKay Company F. Federal Machine & Welder Company	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B.Elec. F. 1300°F. 1 hr. Anneal 1600°F. 3/4 hr. Spray 1200°F. 1-1/2 hrs.	A. A-II (.11C,3.90 Mn,.55Si, 20.00Cr, 10.00Ni)* B. Armorloy A-5 C. Lime D. DC REV	A. 60°DV B. 1/4" C. Flame Cutting Grinding	A. Copper B. 1. II 3/16" 2a 165 - 22 2. II 3/16" 12b 165 - 22 3/16" 6b 185 - 22 3. III 3/16" 4b 165 - 22 3/16" 2b 185 - 22 C. 11.53 hrs. 70° - 170°F. D. Cracking in first two passes. Chipping after all passes except the last. Time 3.54 hrs.	A. 70°F. B. None	1 2 3	1100 1176 1200	1/8" L 1" R	 1" L 	6" U 6 1/8" D 6 1/4" D	Imp O Imp Imp	II II I II I	5 1/8" 1 1/8" 1 1/8" 11 1/8" 1/8" 19 3/4"	Passed radiograph
		*Weld Metal															

IDENTIFICATION A. PLATE ORDER NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE DESIG. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	S.B.	CRACKING LOC	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-246 B. 2/2/43 C. 40 D. Republic Steel Corp. E. McKay Co. F. Federal Machine & Welder Co.	A. 1-1/2" B. R-1 (.27Ln,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E. B. Elec. F. 1300°F 1 hr. Anneal 1600°F 3/4 hr. Spray 1200° 1-1/2 hrs.	A. A-II (.11C,4.00 Mn,.55Si, 20.00Cr, 10.00Ni)* B. Armorloy A-5 C. Lime D. DC REV *Weld Metal	A. 60°DV B. 1/4" C. Flame Cutting Grinding	A. Copper back up B. 1. II 3/16" 2a 165 - 22 2. II 1/4" 4b 255 - 24 1/4" 1b 280 - 24 1/4" 13b 285 - 28 3. III 1/4" 8b 285 - 28 C. 19.18 hrs. 70° - 212°F D. Eight passes less in cross-bar Chipping in all passes except the last	A. 70°F B. None	1 2 3 4	1127 1195 1171 1224	½" L ½" R ¼" L	X	5" U 5½" D 7½" D 6½" U	Imp Imp Imp Imp	II III II II III	½" 5½" 2½" 1" 6" 15"	Passed radiograph

IDENTIFICATION A. Firing Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Supp. F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. BHN E. Process F. Heat Treatment, Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Passes Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	O.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-35 B. 10/2/42 C. 59 D. Great Lakes Steel Corp. E. McKay Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.94Mn,.81Si, .70Cr,.22Mo) C. .32 D. Face 269 Back 269 E. Basic F. 1650°F. 3 hrs. Water 1188°F. 4 hrs. Draw	A. A --- B. Armorloy C. Titanium D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 5/16" 1a 360 - 40 3/8" 1a 440 - 40 3. I 1/2" 2a 575 - 40 C. 1.34 hrs. 190° - 420°F. D.	A. None B. None	1 2	1099 1092	3/4" L	 1" R	4 1/2" D 6 1/2" U	O Imp O	I II III II	13" 2" 6 1/2" 1" 22 1/2"	Failed radiograph Excessive cracking along crossbar at weld junction. Slag inclusions and porosity
A. AD-35 B. 10/2/42 C. 60 D. Jones & Laughlin E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-III (1.60Mn,.24Si, .47Mo) C. .24 D. Face 241 Back 248 E. Basic F. 1650°F. 3 hrs. Water 1210°F. 4 hrs. Draw	A. A --- B. Armoraro C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 5/16" 1a 360 - 40 3/8" 1a 440 - 40 3. I 1/2" 2a 560 - 40 C. 1.43 hrs. 180° - 500°F. D.	A. None B. None	1 2	1097 1097	1 1/2" L	 X	6" D 6" D	O O Imp	III III III	13" 1" 3 1/2" 17 1/2"	Failed radiograph Several small cracks in crossbar. Slag inclusions and porosity along welds
A. AD-98 B. 10/8/42 C. 61 D. Great Lakes E. Reed-Avery F. Fisher Tank Division	A. 1-1/2" B. R-IV (.94Mn,.81Si, .70Cr,.22Mo) C. .32 D. Face 270 Back 270 E. Basic F. 1650°F. 3 hrs. Water 1180°F. 4 hrs. Draw	A. A-II (.08C,1.5 Mn,.37Si, 20.9Cr, 10.6Ni, 1.25Mo)* B. Rase C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 240 - 40 2. I 5/16" 1a 360 - 40 3/8" 3a 440 - 40 3. I 3/8" 3a 440 - 40 C. 1.56 hrs. 180° - 400°F. D.	A. None B. None	1	1109		1" R	4" D	Imp	I II III	1" 2 1/2" 16 1/2" 20"	Failed radiograph Several plate cracks. Large crack above cross weld.
A. AD-100 B. 10/13/42 C. 62 D. Great Lakes E. McKay Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 269 E. Basic F. 1600°F. 2 hrs. Water 1150°F. 4 hrs. Draw	A. A-II (.08C,1.5 Mn,.37Si, 20.9Cr, 10.6Ni, 1.25Mo)* B. Armorloy C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.56 hrs. 180° - 400°F. D.	A. None B. None	1 2 3	1097 1099 1107	3/4" L	 X X	5" D 5 1/2" U 6" D	Imp O Imp	II III III II	3 1/2" 3" 1" 3 2 1/2" 3 1/2" 43 1/2"	Failed radiograph Crack in crossbar near left weld junction.
		*Weld Metal													

A. [illegible] B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. (PASSES) 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.I.	R.L.	S.L.	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-100 B. 10/13/42 C. 63 D. Great Lakes Steel Co E. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08Zr) C. .43 D. Face 269 Back 269 E. --- F. ---	A. A- --- B. Paco C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 5/16" 1a 360 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.45 hrs 180° - 420°F D.	A.None B.None	1	1092		½" L	4½" U	0 Imp	I I II	11½" 2" 8½"	Failed radiograph Crack entire length of crossbar
						2	1100	1" R		4½" D	0 Imp	I I	9½" 18¾" 49¾"	
A. AD-10 B. 10/21/42 C. 64 D. Great Lakes Steel Corp. E. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 269 E. Basic F. 1650°F 3 hrs Water 1180°F Draw	A. A-I (.11C,4.0 Mn,.75Si, 19.0Cr, 1.25Mo, 9.0Ni,)* B. Raco C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.55 hrs 190° - 420°F D. Grinding after 4th pass	A.None B.None	1	1104	1½" R		6" U				Passed radiograph
						2	1149		2" L	5" D				
						3	1241		1" R	5" U	Imp	I III	8½" 10½"	
						4	1233	¾" L		8½" D	Imp	II III	5½" 9¾" 34"	
A. AD-100 B. 10/29/42 C. 65 D. Great Lakes Steel Corp. E. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08) C. .42 D. Face 269 Back 269 E. Basic F. 1600°F 2 hrs Water 1150°F 4 hrs Draw	A. A-I (.11C,4.0 Mn,.75Si, 19.0Cr, 9.0Ni, 1.25Mo)* B. Raco C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.54 hrs 160° - 460°F D. Grinding after 4th pass	A.None B.None	1	1107	1½" R		5" D	Imp	I II	16" 8¾"	Failed radiograph Crack entire length of cross-bar
						2	1110		X	5¼" U	0 Imp	I I	5¼" 18" 48"	

*Weld Metal

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IDENTIFICATION A. FISHER RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. PASSES TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.D.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-100 B. 10/31/42 C. 66 D. Great Lakes Steel Corp. E. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08Zr) C. .43 D. Face 269 Back 269 E. Basic F. 1600°F. 2 hrs. Water 1150°F. Draw	A. A-I (.11C,4.0 Mn,.75Si, 19.0Cr, 9.0Ni, 1.25Mo)* B. Raco C. Titania D. AC	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 40 1/4" 1a 250 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.52 hrs. 160° - 460°F. D. Grinding after 1st pass.	A. None B. None	1 2 3	1098 1104 1111	5" R 1" R	2½" R	4" U 6" D 5½" D	Imp 0 Imp	I II II I	15⅜" ⅜" ⅜" 15⅜" 33½"	Passed radiograph
A. AD-100 B. 10/31/42 C. 67 D. Great Lakes Steel Corp. E. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63 Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 269 E. Basic F. 1600°F. 2 hrs. Water 1150°F. 4 hrs. Draw	A. A-I (.11C,4.0 Mn,.75Si, 19.0Cr,. 9.0Ni, 1.25Mo)* B. Raco C. Titania D. AC	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 180 - 40 1/4" 1a 250 - 40 2. I 5/16" 2a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.50 hrs. 190° - 420°F. D. Grinding after 2nd pass.	A. None B. None	1 2 3	1105 1161 1351	1" L X	1" L	5½" U 6" D 7" D	Imp	I II	4⅜" 26½" 31"	Passed radiograph
A. AD-99 B. 10/30/42 C. 68 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 262 Back 270 E. Basic F. 1675°F. 2½ hrs. Water 1300°F. 2½ hrs. Draw	A. A-II (.14C,4.05 Mn,.34Si, 19.7Cr, 10.6Ni)* B. Armoraro C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 3a 360 - 40 3. I 5/16" 2a 360 - 40 C. 1.59 hrs. 200° - 480°F. D. Grinding after 4th pass, also the fifth.	A. 150° F. B. None	1 2	1095 1134	½" R X	X	7⅝" U 4½" D	Imp Imp	II III I V	2⅜" 6⅜" 36" 3" 48⅜"	Failed radiograph 6" crack in cross-bar
		*Weld Metal															

IDENTIFICATION A. PENN RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS H	VEL. F/S	LOCATION OF H L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-99 B. 10/31/42 C. 69 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 362 Back 370 E. Basic F. 1675°F. 2½ hrs. Water 1200°F. 2½ hrs. Draw	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.03 hrs. 210° - 440°F. D. Grinding after 1st pass.	A. 150° F. B. None	1 2	1111 1163	¼" L	⅜" L	2½" U 6" D	Imp	I II	12⅜" 9⅝" 22"	Failed radiograph 2" crack along crossbar - along the root bead
A. AD-99 B. 10/31/42 C. 73 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 365 Back 365 E. Basic F. 1675°F. 2½ hrs. Water 1200°F. 2½ hrs. Air	A. A-II (.08C,3.6 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.02 hrs. 210°F. - 410°F. D.	A. 150° F. B. None	1 2 3	1117 1168 1217	¼" R	1" R ¼" R	5⅜" D 6" U 6" U	Imp Imp Imp	III II III	1" 8" 4½" 6½" 20"	Failed radiograph 3" weld crack in crossbar near right weld junction.
		*Weld Metal															

IDENTIFICATION A. FIRMS RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-99 B. 10/31/42 C. 70 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 262 Back 270 E. Basic F. 1675°F 2½ hrs Water 1200°F 2½ hrs Draw	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. ---	A. 45°DV B. 5/16" C. ---	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.02 hrs 198° - 500°F D. Grinding after 1st and 5th passes	A. 150°F B. None	1 2	1100 1108	 2½" L	1" R 6½" U	5¾" D 6½" U	Imp O	II III II	14¾" 4¾" 2½" 22"	Failed radiograph 2" deep seated crack in crossbar near right junction
A. AD-99 B. 10/31/42 C. 71 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 263 Back 270 E. Basic F. 1675°F 2½ hrs Water 1200°F 2½ hrs Draw	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. ---	A. 45°DV B. 5/16" C. ---	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.01 hrs 200° - 460°F D. Grinding after 3rd, 5th, and 7th passes	A. 150°F B. None	1 2 3	1109 1158 1154	 1" L 	1½" L ½" L	5½" D 5½" U 6½" O	 Imp Imp	 I II V I	 21¾" 3½" 6½" 36" 66½"	Passed radiograph
A. AD-99 B. 10/31/42 C. 72 D. Great Lakes Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.80Mn,.81Si, .64Cr,.19Mo, .07Zr) C. .29 D. Face 265 Back 265 E. Basic F. 1675°F 2½ hrs Water 1200°F 2½ hrs Air	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .013Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2 hrs 180° - 500°F D.	A. 150°F B. None	1 2 3	1120 1156 1209	 1" R 	X 1" R	3½" O 6" D 6" D	Imp Imp Imp	II III II III I II	2" 3½" 6" 2" 16" 11½" 41"	Passed radiograph
		*Weld Metal														

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-157 B. 1/1/43 C. 81 D. Jones & Laughlin E. Reid-Avery F. Fisher Tank Division	A. 1-1/2" B. R- --- C. --- D. --- E. --- F. ---	A. A-II (.10C,4.35 Mn,.029Si, 18.4Cr, 9.85Ni, .081Mo)* B. Raco C. Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. I 3/16" 1a 185 - 22 2. I 1/4" 3a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 1/2" 2a 600 - 40 C. 1.41 hrs. 360° - 540°F D.	A. None B. None	1 2	1091 1170	X	1/4" L	6" D 6" U	Imp Imp O	I II III III	6" 2 1/4" 5 3/4" 6" 20 3/4"	Passed radiograph
A. AD-157 B. 1/1/43 C. H-82 D. Jones & Laughlin E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R --- C. --- D. --- E. --- F. ---	A. A-II (.12C,3.10 Mn,.038i, 18.33Cr, 9.39Ni, .032Mo)* B. Armorarc C. Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. I 3/16" 1a 185 - 22 2. I 1/4" 3a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 1/2" 2a 600 - 40 C. 1.50 hrs. 290° - 540°F D.	A. None B. None	1 2	1093 1160	X	1/4" R	6" D 5 1/2" U	Imp Imp O	I II III I	4 3/4" 5 7 3/4" 4" 12 1/2" 5 1/2" 3 3/4" 43"	Passed radiograph
A. AD-320 B. 2/2/43 C. H-83 D. Republic Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-V (.80Mn,.27Si, .995Cr,.75Mo) C. .29 D. Face 260 Back 270 E. Basic-Elec. F. ---	A. A-I (.12C,3.10 Mn,.025Si 18.33Cr, 9.39Ni, .032Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. I 3/16" 1a 190 - 22 2. I 1/4" 2a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 1/2" 3a 600 - 40 C. 1.55 hrs. 230° - 560°F D.	A. None B. None	1 2 3	1095 1193 1153	1/2" L X	1/4" L	7 1/2" D 5 1/2" U 5 1/4" U	Imp Imp	III II III	12 3/4" 5 1/2" 9 1/2" 27 1/4"	Passed radiograph
A. AD-320 B. 2/2/43 C. H-84 D. Republic Steel Corp. E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. R-V (.80Mn,.36Si, .965Cr,.80Mo) C. .30 D. Face 260 Back 270 E. --- F. ---	A. A-I (.12C,3.10 Mn,.025Ni 18.33Cr, 9.39Ni, .032Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 190 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 1/2" 2a 700 - 40 C. 1.55 hrs. 210° - 580°F D.	A. None B. None	1 2 3	1099 1198 1165	3/16" L X	1 1/4" L	6" U 7" D 6" D	Imp Imp	II III I II III	8" 10" 2" 20 1/2" 41 1/2"	Passed radiograph

*Weld Metal

SPECIMEN A. Panel Number B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manufacturer F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Hardness E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Backing Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Groove Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. f/s	Location of B L.L.	R.L.	S.E.	Cracking Loc.	Type	Amt.	Remarks on Cracking Radiographic Results, etc.
A. AD-272 B. 2/16/43 C. H-86 D. Great Lakes Steel Corp. E. McKay Co. F. Fisher Tank Division	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo .09Zr) C. .29 D. Face 304 Back 302 E. Basic F. ---	A. A-II (.10C,4.0 Mn,.03Si, 19.99Cr, 9.83Ni, .014Mo)* B. Armorloy C. Lime D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Corner B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 22 3. I 1/4" 1a 350 - 22 5/16" 1a 360 - 22 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 2.09 hrs. 190° - 560°F D.	A. None B. None	1 2	1114 1222	 1½" R	3/4" R 	6 3/8" D 6" U	Imp O Imp	II II I II III V	1/2" 1 1/4" 8 3/4" 8 3/4" 6" 1 1/4" 25 1/2"	Passed radiograph
A. AD-277 B. 2/19/43 C. H-80 D. Great Lakes Steel Corp. E. Reid-Avery F. Fisher Tank Division	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo .09Zr) C. .29 D. --- E. Basic F. ---	A. A-II (.09C, 1.79 Mn,.09Si, 14.25Cr,π 9.93Ni, .063Mo)* B. Raco C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Corner bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 3. I 1/4" 1a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 3/8" 2a 440 - 40 C. 1.56 hrs. 240° - 500°F D.	A. None B. None	1	1094	 	1/4" L	7 1/2" D	Imp	I III III	4 1/2" 4 1/2" 6 3/4" 25 1/2"	Passed radiograph

*Weld Metal
πCr. analysis questionable

IDENTIFICATION A. PERS RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SEQ EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-36 B. 10/8/42 C. 7 D. Republic Steel Corp. E. Harnischfeger Corp. F. Fitzgibbons Boiler Co.Inc.	A. 1-1/2" B. R-V (.47Mn,.32Si, .23Cr,4.05Ni .39Mo) C. .38 D. --- E. --- F. ---	A. A-I (.11?C,1.50 Mn,.45Si, 18.8Cr, 10.4Ni, 2.25Mo)* B. AW-3 C. Lime D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting	A. None B. 1. II 5/32" 3a 110 - 25 2. II 5/32" 4b 110 - 25 3/16" 1b 190 - 25 3/16" 1b 195 - 25 3/16" 3b 300 - 25 1/4" 4b 290 - 25 3. III 1/4" 4b 290 - 25 5/16" 2b 325 - 25 C. 22 hrs 75° - 300°F D.	A.None B.None	1 2 3	1087 1110 1160	1½" R 1½" R	1¼" L	6" D 5⅝" D 5" D	Imp Imp	III III I II III V	8" ⅛" 2⅛" 5⅛" 2⅛" 3⅛" 22¾"	Passed radiograph
A. AD-91 B. 10/12/42 C. 8 D. Republic Steel Corp. E. Lincoln and Alloy Rods Co. F. Fitzgibbons Boiler Co.Inc.	A. 1-1/2" B. R-V (.47Mn,.32Si, .23Cr,4.05Ni .39Mo) C. .38 D. --- E. --- F. ---	A. A-II (.08-.13C, 3.5-4.5Mn .35-.70Si 19.0-21.0 Cr,8.5-10.5Ni)* (.08-.12C, 3.50-4.25 Mn,.45-.80 Si,19.0-20 .5Cr,8.5-10.0Ni)* B. Armorweld Armoraro C. Lime MG D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting	A. None B. 1. II 3/16" 1a 130 - 22 1/4" 1a 330 - 22 2. II 1/4" 2b 330 - 22 1/4" 2b 340 - 22 5/16" 8b 350 - 22 3. III 5/16" 6b 350 - 22 C. 26.45 hrs Below 350°F D. First six passes welded with armorweld, remaining passes with armoraro One more pass in crossbar	A.None B.None	1 2	1109 1207	1" R	X	7½" U 6½" D	Imp Imp	III II III	8" 3⅛" 10⅜" 21½"	Passed radiograph
		*Weld Metal															

A. AD-228 B. 11/16/42 C. W-16 D. Ford Motor Co. E. Reid-Avery Co. F. Ford Motor Co.	A. 1-1/2" B. R-V (.64Mn,.198i, 1.40Cr,.12Ni .64Mo) C. .23 D. --- E. B.O.H. F. 1650°F 4 hrs Water 1100°F 6 hrs Air	A. A-I (.08C,1.6 Mn,.23Si, 16.8Cr,π 9.9Ni, 1.7Mo)* B. Raco C. Titania D. AC REV	A. 45°DV B. 3/16" C. Flame Cutting	A. B. 1. III 3/16" 1a 175 - 1/4" 1a 250 - 2. I 5/16" 2a 320 - 3/8" 1a 400 - 3. I 3/8" 2a 400 - C. 8 hrs --- D. Three more passes in crossbar Chipping after each pass Time 1 hr.	A. None B. None	1	1070		1" L	8" D	Imp	I II III	4" 6" 1½"	Failed radiograph Incomplete weld fusion present in upper right and lower left legs
							2	1096	½" R		7" U	0 Imp	I I II III V	6½" 3½" 2½" 6½" 3½" 34½"	
A. AD-228 B. 11/16/42 C. W-21 D. Ford Motor Co. E. Crucible Steel Co. F. Ford Motor Co.	A. 1-1/2" B. R-V (.64Mn,.208i, 1.61Cr,.62Mo) C. .24 D. --- E. B.O.H. F. 1650°F 4 hrs Water 1100°F 6 hrs Air	A. A-I (.07C,1.37 Mn,.28Si, 17.8Cr, 10.6Ni, 1.9 Mo)* B. Rezistal C. Titania D. AC	A. 45°DV B. 3/16" C. Flame Cutting	A. Copper back up B. 1. II 3/16" 1a 150 - 1/4" 1a 220 - 2. I 1/4" 1a 220 - 5/16" 1a 365 - 3. I 3/8" 2a 460 - C. 8 hrs --- D. One more pass in crossbar Chipping after each pass Time 1 hr.	A. None B. None	1	1096		X	4½" U	Imp	I II	10½" 15½" 36"	Failed radiograph 4" incomplete fusion in crossbar 5" incomplete fusion in upper right leg. 1" crack near right weld junction
A. AD-228 B. 11/16/42 C. W-24 D. Ford Motor Co. E. Crucible Steel Co. F. Ford Motor Co.	A. 1-1/2" B. R --- C. --- D. --- E. B.O.H. F. 1650°F 4 hrs 1100°F 6 hrs Air	A. --- B. --- C. --- D. AC DC STR	A. 45°DV B. 3/16" C. Flame Cutting	A. Copper back up strip B. 1. II 3/16" 1a 150 - 3/16" 1a 175 - 2. I 1/4" 2a 265 - 3/8" 1a 440 - 3. I 3/8" 2a 440 - C. 8 hrs --- D. Chipping after each pass Time 1 hr.	A. None B. None	1	1106		1" R	6" D	Imp	I II III	4½" 6½" 1½"	Failed radiograph Incomplete weld fusion. Slag inclusions and porosity in welds
							2	1181	1" R		3½" U	Imp 0	I II III II	4" 6½" 3" 1" 27½"	
		*Weld Metal πCr. analysis questionable													

SPECIFICATION A. ARMOR GRADE OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE USED. F. ARMOR FABRICATOR	BASE MET. A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING A. BACKING PASSES B. DEPOSITION SEQ EL. NO. TYPE ZONE V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	V50	LOCATION OF B.L. L.L.	R.L.	S.B.	CRACKING LOC	TYPE	AMT	CONDITION OF TESTING AND REMARKS
A. AD-286 B. 2/25/43 C. W-57 D. Ford Motor Co. E. Arcos Corp. F. Ford Motor Co.	A. 1-1/2" B. R-II (1.35Mn,.21Si, .54Cr,.03Ni, .45 Mo) C. .26 D. Face --- Back 262 E. Basic O.H. F. 1650° 4 hrs. Water 1100° 6 hrs. Air Cool	A. A-I (.09C,3.75 Mn,.75Si, 19.1Cr, 9.3Ni, 1.0Mo)* B. Chromang C. Lime D. DC REV	A. --- B. --- C. Flame Cutting	A. 3/16" Copper back up strip B. 1. II 3/16" 2a 180 - 35 2. III 3/16" 16b 1a 180 - 35 3. III 3/16" 4b 180 - 35 C. 8 hrs. D.	A.None B.None	1	1022	1/4" L		5 3/4" U	Imp	I II	2 3/16	Passed radiograph
						2	1048		1" R	5 1/2" D	0 Imp	II II III	1 3/16 3 4 3/16 27	
						Tested as cast armor by error								
		*Weld Metal												

A. Plate Designation B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manufacturer F. Armor Fabricator	A. Plate Thickness B. Type C. Carbon Content D. Size E. Process F. Heat Treatment Temp Time Quench	A. Type B. Trade Name C. Coating D. Current & Polarity	A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing Passes B. Deposition Sequence No. Type Size V. 1. Root Type 2. Body Type 3. Groove Type C. Total Welding Time & Inter Pass Temperature D. Remarks	Heat A. Pre B. Post	N	Ballistic Results Vel. f/s	Location of N L.L.	R.L.	S.L.	Cracking Loc.	Type	Amt.	Remarks on Cracking Radiographic Results, etc.
A. AD-185 B. 1/13/43 C. 3-H D. Great Lakes Steel Co. E. Crucible Steel Co. F. Gen. American Trans. Corp.	A. 1-1/2" B. R-IV (.80Mn,.675i, .60Cr,.17Mo) C. .30 D. Face 269 Back 269 E. B.O.H. F. 1650°F. 2 hrs. Water 1210°F. 2 hrs. Air	A. A-I (.11C,1.74 Mn,.31Si, 19.18Cr, 9.81Ni, 2.26Mo)a B. Rezistal Stainless C. Mineral Titanium Dioxide D. DC REV	A. 60°DV B. 3/16" C. Machining Buttering	A. Not given B. 1. II 5/32" 1a 100 - 25 3/16" 1a 300 - 25 2. III 3/16" 2a 11b 300 - 25 3. III 3/16" 10b 300 - 25 C. 14.30 hrs. 80° - 190°F D.	A. None B. None	1	1103		1" L	6½" D	Imp	V	¼"	Passed radiograph
						2	1198	½" R		5½" U	Imp	I II III	8" 5½" 2" 15½"	
A. AD-289 B. 3/3/43 C. 4-H D. Great Lakes Steel Co. E. The McKay Co. F. Gen. American Trans. Corp.	A. 1-1/2" B. R-IV (.93Mn,.785i, .63Cr,.17Mo, .09Zr) C. .30 D. Face 262 Back 262 E. B.O.H. F. 1625°F 1/2 hr. Water 1260°F 3 hrs. Air	A. A-II (.11C,3.82 Mn,.38Si, 19.70Cr, 9.99Ni)a B. Armorloy C. Titanium Base D. DC REV	A. 60°DV B. --- C. Flame Cutting	A. Not given B. 1. I 3/16" 1a 200 - 25 2. III 3/16" 2a 2b 200 - 25 1/4" 8b 275 - 28 3. III 1/4" 1b 200 - 25 3/16" 1b 200 - 28 3/16" 6b 200 - 30 C. 11 hrs. 90° - 190°F D. Second pass was chipped and ground out	A. None B. 130°F	1	1100	1½" R		6½" D				Passed radiograph
						2	1200		7/8" R	5½" U	Imp	I	36"	

aWeld Metal

IDENTIFICATION A. Panel Number B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manufacturer F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Brh E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing Passes B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. F/S	Location of H L.L.	R.L.	S.B.	Cracking Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-37 B. 10/8/42 C. 1 D. Dominion Foundries & Steel E. Lincoln Elec. F. Gen. Motors Div. of Canada	A. 1-1/2" B. R-V (.67Mn,.30Si, 2.26Cr,.65Ni .51Mo) C. .20 D. Face 277 Back 285 E. Elec. F. 1650°F 8 hrs Air 1650°F 4 hrs Water 1150°F 6 hrs Air	A. A --- B. Armorweld AW-1 C. Lime D. DC REV	A. DV B. --- C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 190 - 24 2. III 3/16" 1a 10b 190 - 24 5/32" 6b 145 - 22 1/4" 1b 245 - 30 3. III 3/16" 6b 190 - 24 C. 5.05 hrs --- D. One more pass in left leg and two less in crossbar Chipping after all passes Cracking in the first two passes.	A.100° F B.None	1 2 3	1094 1091 1174	 1" R 	X X	5½" U 5½" D 8" D	Imp Imp Imp	III III III	8½" 8¼" 27½" 44¼"	Failed radiograph Lack of fusion present in lower left leg, crossbar, and upper right leg Slag inclusions in welds Welds ground flush
A. AD-133 B. 12/2/42 C. 2 D. Dominion Foundries & Steel E. Harnischfeger Corp. F. Gen. Motors Div. of Canada	A. 1-1/2" B. R-V (.58Mn,.50Si, 2.22Cr,.75Ni .37Mo) C. .29 D. --- E. Elec. F. 1650°F 8 hrs Air 1650°F 6 hrs Water 1125°F 6 hrs Air	A. A --- B. AW-3 C. --- D. DC REV	A. DV B. 1/4" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 2a 150 - 18 2. III 1/4" 1a 230 - 20 1/4" 1a 250 - 16 5/32" 6b 140 - 16 3. III 5/32" 4b 140 - 10 3/16" 2b 170 - 14 C. 4.45 hrs --- D. Chipping after all passes Cracking in first pass.	A.125° F B.None	1 2 3	1089 1186 1186	½" R 1" R	 1" R 	7" D 6" U 7½" U	Imp O Imp Imp	III III III V II III V	5" ¾" 7" 8¾" 5¾" 3" 7" 36¼"	Passed radiograph
A. AD-194 B. 1/13/43 C. 3 D. Dominion Foundries & Steel E. Harnischfeger Corp. F. General Motors Div. of Canada	A. 1-1/2" B. R-V (.69Mn,.43Si, 2.28Cr,.71Ni, .31Mo) C. .26 D. --- E. Elec. F. 1650°F. 10 hrs. Air 1650°F. 6 hrs. Water 1125°F. 5 hrs. Air	A. A-I (.13C,1.64 Mn,.55Si, 19.3Cr, 10.4Ni, 3.00Mn)* B. AW 3-A C. --- D. DC REV	A. DV B. 1/4" C. Flame Cutting	A. Copper back up bar B. 1. II 1/4" 2a 240 - 16 2. I 5/16" 4a 300 - 20 3. III 5/32" 4b 140 - 16 1/4" 2b 300 - 20 C. 4 hrs. --- --- D. Chipping after all passes. Cracking after first pass.	A.125° F. B.None	1 2	1091 1155	½" R 	 7/8" R	6" U 7" D	Imp Imp O	II III I II III II	5" 1" 9½" 3½" 4½" 3" 24"	Passed radiograph

*Weld Metal

SPECIMEN	BASE MTL.	WELDING PROCESS	EDGE PREP.	WELDING	HEAT	BALLISTIC RESULTS						REMARKS OR DESCRIPTION RADIOGRAPHIC RESULTS, ETC.
A. TYPE TEST OF B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. MN E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE DIMENSIONS ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.L.	CRACKING LOC.	TYPE	AMT.	
A. AD-192 B. 1/13/43 C. 4 D. Dominion Foundries & Steel E. Harnischfeger Corp. F. General Motors Div. of Canada	A. 1-1/2" B. R-V (.66Mn,.43Si, 2.28Cr,.71Ni, .31Mo) C. .28 D. --- E. Elec. F. 1650°F. 10 hrs. Air 1650°F. 6 hrs. Water 1150°F. 5 hrs. Air	A. A-I (.13C,1.64 Mn,.55Si, 19.3Cr, 10.4Ni, 2.00Mo)* B. AW 3-A C. --- D. DC REV	A. DV B. 1/4" C. Flame Cutting	A. Copper back up bar B. 1. II 1/4" 2a 270 - 10 2. III 1/4" 4b 270 - 18 5/16" 2a 310 - 20 3. III 5/32" 4b 150 - 16 3/16" 2b 180 - 18 C. 4.30 hrs. --- --- D. Chipping after all passes. Cracking after first pass.	A. 135° F. B. None	1 2	1113 1206	1¼" R	1½" R	6⅝" U 5" D	Imp O Imp	III III II III V	5½" 1" 2" 7⅛" 17⅝" 32¼"	Passed radiograph

*Weld Metal

SPECIMENS A. PLATE NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SUPPLIER F. ARMOR FABRICATOR	ARMOR PLATE A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE USED A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	S.L.	CRACKING LOC	TYPE	AMT.	REMARKS ON COMPLETED RADIOGRAPHS RESULTS, ETC.
A. AD-170 B. 1/7/43 C. 8 D. Republic Steel Corp. E. Crucible Steel Company F. Ilco Ordnance Corp.	A. 1-1/2" B. R-2 (.90Mn,.28Si, .71Cr,.98Ni, .47Mo) C. .28 D. Face 269 Back 255 E. B.O.H. F. 1600°F. 3 hrs. Water 1200°F. 3½ hrs. Air	A. A-I (.12C,2.07 Mn,.31Si, 19.2Cr, 9.68Ni, 2.40Mo)* B. Armorize C. Titanium D. DC REV	A. 60°DV B. 5/16" C. Flame Cutting	A. Copper chill B. 1. II 5/16" 1a 350 - 33 5/16" 1a 380 - 30 2. I 5/16" 5a 380 - 30 3. III 5/16" 6b 380 - 30 C. 6.15 hrs. 50° - 275°F D. Cracking after first pass. Chipping after all passes except first. One more pass in crossbar.	A. None B. None	1 2 3	1110 1102 1195	2" L	1¾" R 1" R	1½" D 9¼" U 5⅛" D	Imp 0 Imp	II II I II	1" 1" 6¾" 3¼" 32"	Passed radiograph
A. AD-284 B. 2/25/43 C. 12 D. Republic Steel Corp. E. Metal & Thermit Corp. F. Ilco Ordnance Corp.	A. 1-1/2" B. R-2 (1.15Mn,.28Si .98Cr,.47Ni) C. .28 D. Face 269 Back 255 E. B.O.H. F. 1600°F. 3 hrs. Water 1200°F. 3½ hrs. Air	A. A-I (1.15Mn,.50 Si,19.0Cr, 10.0Ni, 2.10Mo)* B. Murex C. Titanium D. DC REV	A. 60°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 1/4" 1a 340 - 25 1/4" 1a 390 - 25 2. I 1/4" 1a 300 - 30 1/4" 7a 390 - 25 3. III 1/4" 4b 160 - 24 1/4" 2b 385 - 25 C. 14 hrs. 70° - 170°F. D. Cracking in the first two passes Chipping to remove cracks in the first two passes	A. None B. None	1 2 3	1094 1195 1239	¼" L ¼" L	3/8" R	7⅛" U 4½" D 6⅛" D	Imp 0 Imp	I II I I II III	5½" 9" 1½" 6⅜" 9⅜" 1⅜" 33⅛"	Passed radiograph

*Weld Metal

IDENTIFICATION	BASE MTL.	ELECTRODE MTL.	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALANCED BEADS					REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. Panel Record No. B. Date of Test C. Plate No. D. Welder Identification E. Electrode Spec. F. Welder Fabricator	A. Plate Thickness B. Type C. Carbon Content D. Spec E. Process F. Heat Treatment Temp Time Quench	A. Type B. Trade Name C. Coating D. Current & Polarity	A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing Passes B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Groove Type C. Total Welding Time & Inter Pass Temperature D. Remarks	A. Pre B. Post	N	Vel. F/M	Location of N L.L.	R.L.	S.L.	Cracking Loc.	Type	Amt.	
A. AD-40 B. 10/8/42 C. IHC-28 D. Great Lakes Steel Corp. E. Westinghouse F. International Harvester Co.	A. 1-1/2" B. R-IV (.81Mn,.67Si, .65Cr,.19Mo) C. .30 D. Face 255 Back 255 E. B.O.H. F. 1650°F 3 hrs Water 1180°F 4hrs	A. A-I (.05C,.3Mn .50Si, 18.5Cr, 1.6Mo)* B. --- C. Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper back up B. 1. II 3/16" 2a 200 - 2. I 1/4" 5a 300 - 3. I 1/4" 2a 300 - C. 147 mins 120° - 320°F D. Grinding after 1st pass Time 77-1/2 mins.	A.100° F B.None	1 2 3 4	1111 1122 1125 1128	 4½" R 1½" R	¾" R 1" L	5½" D 5¾" U 5" D 4¾" U	Imp	I II	6¾" 4" 10¾"	Passed radiograph
A. AD-40 B. 10/10/42 C. IHC-27 D. Great Lakes Steel Corp. E. Crucible Steel Co. F. International Harvester Co.	A. 1-1/2" B. R-IV (.81Mn,.67Si, .65Cr,.19Mo) C. .30 D. Face 255 Back 255 E. B.O.H. F. 1650°F 3 hrs Water 1180°F 4 hrs	A. A-I (.06C,2.10 Mn,.22Si, 19.6Cr, 9.21Ni, 1.61Mo, .20V)* B. Armorize C. Titania D. DC REV	A. 45°DV B. 7/16" C. Flame Cutting Grinding Descale	A. Copper back up B. 1. II 5/32" 2b 135 - 3/16" 1b 135 - 2. III 1/4" 1b 200 - 1/4" 1a 1b 210 - 3/16" 2b 170 - 1/4" 6b 220 - 1/4" 3b 230 - 5/32" 1b 135 - 3. III 1/4" 2b 220 - 5/32" 3b 135 - 1/4" 1b 230 - C. 243 mins 130° - 250°F D. Grinding after 3rd pass Nose bead buttered	A.130° F B.None	1 2	1109 1086	 1½" R	½" L	6½" U 6½" D	Imp 0	II II	14" 3" 17"	Passed radiograph
A. AD-40 B. 10/10/42 C. IHC-26 D. Great Lakes Steel Corp. E. Page F. International Harvester Co.	A. 1-1/2" B. R-IV. (.81Mn,.67Si, .65Cr,.19Mo) C. .30 D. Face 255 Back 255 E. B.O.H. F. 1650°F 3 hrs Water 1180°F 4 hrs	A. A-I (.146C,1.61 Mn,.30Si, 17.98Cr, 10.72Ni, 2.07Mo)* (.143C,2.06 Mn,.32Si, 18.98Cr, 11.58Ni, 1.56Mo)* (.142C,1.86 Mn,.25Si, 19.02Cr, 11.55Ni, 1.60Mo)* B. Stainless C. Titania D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 1a 110 - 3/16" 1a 160 - 2. III 3/16" 1a 165 - 1/4" 3b 200 - 3/16" 3b 170 - 1/4" 1a 2b 220 - 3. III 5/32" 4b 135 - 1/4" 1b 210 - 1/4" 1b 220 - C. 315 mins 140° - 280°F D. Grinding after the first seven passes and after 9th pass. Time 240 mins.	A.135° F B.None	1 2 3	1106 1100 1095	 2" R 1" L	X	5½" U 5½" D 5½" U	Imp 0 Imp 0	II III I II III	2¾" 3½" ¾" 2" 12½" ¾" 22"	Passed radiograph
		*Weld Metal										

IDENTIFICATION A. Fusion Record No. B. Site of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. BHN E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	G.B.	CRACKING Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-82 B. 11/2/42 C. ~~IHC-29~~ D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.60Mn,.21Si .42Mo) C. .28 D. Face 369 Back 369 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-IV (.12C,.40 Mn,.80Si, 30.Cr, 9.7Ni)* B. AC 5 C. Lime D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 1a 110 - 3/16" 1a 185 - 2. III 1/4" 1a 1b 250 - 1/4" 1a 265 - 3/16" 4b 180 - 1/4" 2b 270 - 1/4" 1b 255 - 3. III 5/32" 3b 145 - 5/32" 1b 135 - 1/4" 2b 260 - C. 95 mins 100° - 300°F D.	A.100° F B.None	1 2 3	1116 1217 1211	1½" R ¾" L 1½" R		5½" U 7" D 7½" D	Imp 0	II III II III	5½" 6½" 1" ½" 13½"	Passed radiograph
A. AD-82 B. 11/2/42 C. IHC-30 D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.45Mn,.20Si .44Mo) C. .23 D. Face 262 Back 262 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-IV (.12C,.40 Mn,.80Si, 30.Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 1a 100 - 3/16" 1a 180 - 2. I 3/16" 1a 175 - 1/4" 3a 220 - 1/4" 3a 260 - 3. I 1/4" 1a 260 - 1/4" 1a 265 - C. 172 mins 135° - 255°F D.	A.100° F B.None	1 2 3 4	1110 1112 1093 1090	2¼" L 2" R 1½" L	1" R	5½" U 6¾" D 8" D 3¾" D	Imp 0	II III II III	14½" ¾" 1" 1¾" 18"	Passed radiograph
A. AD-82 B. 11/3/42 C. IHC-31 D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.55Mn,.22Si .45Mo) C. .25 D. Face 255 Back 247 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-IV (.12C,.40Mn .80Si,30.0 Cr,9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 1/8" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 1a 120 - 5/32" 1a 155 - 2. I 3/16" 2a 180 - 1/4" 1a 230 - 1/4" 3a 250 - 3. I 1/4" 2a 260 - C. 147 mins 135° - 255°F D.	A.100° F B.None	1 2	1104 1206	1½" R	½" R	6" U 6¾" D	Imp Imp	II I II	1" 8¾" 14½" 241½"	Passed radiograph
		*Weld Metal												

IDENTIFICATION A. FIRING AGENCY OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE DESIGN. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP. V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	BALLISTIC RESULTS VEL. F/S	LOCATION OF N L.L.	R.L.	G.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC
A. AD-82 B. 11/2/42 C. IHC-32 D. Jones & Laughlin E. McKay F. International Harveater Co.	A. 1-1/2" B. R-III (1.45Mn,.20Si, .44Mo) C. .23 D. Face 255 Back 241 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-IV (.12C,.40Mn, .80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 7/16" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 2b 135 - 3/16" 1b 180 - 2. III 1/4" 2a 1b 250 - 1/4" 8b 260 - 1/4" 1b 230 - 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 250 mins 150° - 250° D.	A. 100° F B. None	1 2 3 4 5	1140 1226 1099 1207 1214	 2¼" L ½" L 	1½" R ½" L 6" L	6" D 6" U 6" D 7½" U 2½" D	 Imp 0	 II III I III	1½" 1½" 2¾"	Passed radiograph
A. AD-82 B. 11/2/42 C. IHC-33 D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.53Mn,.32Si, .47Mo) C. .22 D. Face 269 Back 262 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2 hrs Air	A. A-IV (.12C,.40 Mn,.80Si, 20.0Cr, 9.7Ni,)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 3/16" 2a 175 - 2. III 1/4" 2a 5b 260 - 1/4" 1b 255 - 1/4" 2b 250 - 3. III 5/32" 3b 135 - 5/32" 1b 140 - 1/4" 2b 250 - C. 485 mins 155° - 250°F D.	A. 90°F B. None	1 2 3	1104 1208 1220	1½" R ½" L	 ½" R 	5½" U 7" D 7" D	 Imp Imp	 II I II	12½" 5" 14" 31½"	Passed radiograph
A. AD-82 B. 11/2/42 C. IHC-34 D. Jones & Laughlin E. Crucible Steel Co. F. International Harvester Co.	A. 1-1/2" B. R-III (1.45Mn,.20Si .44Mo) C. .23 D. Face 255 Back 255 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-I (.06C,2.10 Mn,19.2Cr, 9.2lNi, 1.61Mo, .20V)* B. Armorize C. Extruded D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 3/16" 1a 175 - 1/4" 1a 250 - 2. III 1/4" 2a 8b 250 - 3. III 5/32" 2b 140 - 5/32" 2b 145 - 1/4" 2b 250 - C. 133 min 130° - 260°F D.	A. 100° F B. None	1 2 3 4	1106 1201 1305 1245	½" R 1½" R	 1½" R 1¾" R 	5" U 7" D 5" U 7" D	 	 	 	Passed radiograph

*Weld Metal

IDENTIFICATION A. Prime Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Supplier F. Armor Fabricator	Armor Data A. Plate Thickness B. Type C. Carbon Content D. Hbn E. Process F. Heat Treatment Temp Time Quench	Electrode Data A. Type B. Trade Name C. Coating D. Current & Polarity	Joint Design A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	Welding Procedure A. Backing B. Deposition Size El. Passes No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	Heat A. Pre B. Post	Ballistic Results No.	Vel. F/S	Location of No. L.L.	R.L.	O.B.	Cracking Loc.	Type	Amt.	Remarks on Cracking Radiographic Results, Etc.
A. AD-82 B. 11/2/42 C. IHC-35 D. Jones & Laughlin E. Alloy Rods Co. F. International Harvester Co.	A. 1-1/2" B. R-III (1.45Mn,.22Si .45Mo) C. .29 D. Face 269 Back 262 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-I (.10C,1.5 Mn,.75Si, 19.0Cr, 9.25Ni, 3.00Mo)* B. Armorarc Type B π C. --- D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 3/16" 1a 155 - 3/16" 1a 180 - 2. III 1/4" 1a 345 - 1/4" 1a 4b 360 - 1/4" 2b 250 - 1/4" 1b 255 - 1/4" 1b 265 - 3. III 5/32" 4b 145 - 1/4" 1b 260 - 1/4" 1b 265 - C. 144.39 min 145° - 290°F D.	A. 100° F B. None	1 2 3 4	1110 1198 1223 1198	1¼" R 2" L	1" R ¾" L	6½" D 5" U 6" U 6" D	Imp	II II III	12¾" 2" 3¼" 18"	Passed radiograph
A. AD-82 B. 11/3/42 C. IHC-36 D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.54Mn,.20Si .52Mo) C. .27 D. Face 269 Back 259 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-IV (.12C,.4C Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 2a 4b 270 - 1/4" 1b 260 - 1/4" 1b 265 - 1/4 2b 275 - 3. III 5/32" 2b 150 - 5/32" 2b 145 - 1/4" 1b 280 - 1/4" 1b 265 - C. 210.84 min 100° - 310°F D.	A. 100° F B. None	1 2 3 4	1147 1203 1201 1211	¾" L 1" R	½" R X	6" D 4¼" U 7" D 5½" U	Imp Imp Imp	II III III I III	2" 3" ½" 4½" 1½" 11½"	Passed radiograph
A. AD-82 B. 11/2/42 C. IHC-37 D. Jones & Laughlin E. Crucilbe Steel Co. F. International Harvester Co.	A. 1-1/2" B. R-III (1.68Mn,.21Si .43Mo) C. .28 D. Face 269 Back 277 E. B.O.H. F. 1625°F 1 hr Water 1200°F 2½ hrs Air	A. A-I (.06C,2.10 Mn,19.16 Cr,9.21Ni, 1.61Mo, .20V)* B. Armorize C. Extruded D. ---	A. 45°DV B. 3/16" C. Flame Cutting Grinding Descale	A. Not given B. 1. II 5/32" 1a 110 - 3/16" 1a 180 - 2. III 3/16" 1a 180 - 1/4" 2a 275 - 1/4" 1a 270 - 1/4" 4b 265 - 3. III 5/32" 2b 150 - 5/32" 2b 145 - 1/4" 1b 260 - 1/4" 1b 250 - C. 234.13 min 110° - 265°F D. One more pass in crossbar.	A. 100° F B. None	1 2	1123 1219	¾" R	¾" R	6½" D 4½" U	Imp O Imp	I II III I I II	8½" 6¾" 2¼" 2" 6½" 7¾" 33¼"	Passed radiograph
		*Weld Metal πThis type does not contain Mo.															

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	O.S.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC
A. AD-82 B. 11/2/42 C. IHC-38 D. Jones & Laughlin E. McKay F. International Harvester Co.	A. 1-1/2" B. R-III (1.55Mn,.22Si, .45 Mo) C. .25 D. Face 269 Back 277 E. B.O.H. F. 1625°F 1 hr. Water 1200°F 2½ hrs Air	A. A-II (.12C,4.0Mn .80Si,20. Cr,9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 5/32" 1a 130 - 5/32" 1a 145 - 3. III 3/16" 3b 175 - 3/16" 5b 1a 180 - 1/4" 1b 250 - 1/4" 1b 255 - 1/4" 2b 260 - 3. III 5/32" 4b 150 - 1/4" 2b 260 - C. 265.89 min 120° - 300°F D.	A. 100° F B. None	1 2	1110 1211	X	½" R	5¾" D 4" U	Imp	I II	4" 12" 16"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 58 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 300 E. B.O.H. F. 1625°F. 2 hrs. Water 1200°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 2a 1b 265 - 1/4" 2b 250 - 1/4" 2b 255 - 1/4" 3b 270 - 3. III 5/32" 4b 140 - 1/4" 2b 250 - C. 3.59 hrs. 150° - 295°F. D. Grinding after first pass. Time 3.86 hrs.	A. 100° F. B. 120° F.	1 2.	1093 1169	¾" L	X	6¾" D 5½" U	Imp	I II	26" 2" 28"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 58 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo. .08Zr) C. .42 D. Face 269 Back 286 E. B.O.H. F. 1600°F. 2 hrs. Water 1240°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 135 - 3/16" 1a 180 - 2. III 1/4" 1a 270 - 1/4" 1a 2b 255 - 1/4" 3b 265 - 1/4" 2b 250 - 1/4" 1b 165 - 3. III 5/32" 4b 140 - 1/4" 2b 245 - C. 3.51 hrs. 190° - 310°F. D. Grinding after first pass. Time 3.39 hrs.	A. 200° F. B. None	1	1113	1 3/8" L		6" D	Imp	I	23½"	Passed radiograph
		*Weld Metal												

IDENTIFICATION A. PLATE RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE DEPOS. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	RADIATOR RESULTS LOCATION OF D L.L.	R.L.	S.L.	CRACKING LOC	TYPE	AMT.	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-287 B. 2/16/43 C. I.H.C. 47 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo, .09Zr) C. .26 D. Face 263 Back 300 E. B.O.H. F. 1650°F. 2 hrs. Water 1150°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 30.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 160 - 3/16" 1a 180 - 2. III 1/4" 2a 4b 260 - 1/4" 4b 250 - 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 3.62 hrs. 150° - 300°F. D. Grinding after first and third passes	A.100° F B.None	1 2	1085 1093	2" L	1" R	6¾" U 6½" D	Imp	I	36"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 48 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo, .09Zr) C. .26 D. Face 269 Back 300 E. B.O.H. F. 1650°F. 2 hrs. Water 1150°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 30.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 2a 4b 250 - 1/4" 3a 260 - 1/4" 1b 265 - 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 3.76 hrs. 150° - 310°F D. Chipping and grinding after first, second, fifth, 13th and 14th passes Chipping after 3rd, 4th 6th through 11th Time 3.91	A.100° F B.None	1 2	1093 1211	¾" R	5/8" R	5½" D 6½" U	Imp 0 Imp	II III II I II	5½" 5½" 1" 17" ½" 29½"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 49 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo, .09Zr) C. .26 D. Face 269 Back 300 E. B.O.H. F. 1650°F. 2 hrs. Water 1150°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 30.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 135 - 5/32" 1a 140 - 2. I 1/4" 4a 260 - 1/4" 3a 265 - 3. I 1/4" 2a 255 - C. 3.39 hrs. 140° - 280°F. D. Grinding after 1st, 3rd, 5th, 7th, 8th and 10th. Time 3.65 hrs.	A.100° F B.None	1 2	1100 1175	5/8" R	¼" R	7" D 6½" U	Imp Imp	I II I	14½" 2½" 36" 53½"	Passed radiograph
		*Weld Metal														

IDENTIFICATION A. FIRING RECORD NO B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS H	VEL. F/S	LOCATION OF H L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS,
A. AD-287 B. 2/16/43 C. I.H.C. 61 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 300 E. B.O.H. F. 1625°F. 2 hrs. Water 1200°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 145 - 3/16" 1a 180 - 2. III 1/4" 2a 6b 255 - 1/4" 2b 345 - 3. III 5/32" 4b 140 - 1/4" 2b 345 - C. 164 mins. 140° - 300°F. D. Grinding after first pass Time 53 mins.	A. 100° F. B. None	1	1100		1/2" R	5 1/4" U	Imp	I II III	5 1/4" 8 1/4" 1 1/4"	Passed radiograph
						2	1253	1 1/8" L		4 3/4" D	0 Imp	III II III V	1/4" 7" 1 1/4" 8" 32 1/8"	
A. AD-287 B. 2/16/43 C. I.H.C. 63 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08Zr) C. .30 D. Face 269 Back 300 E. B.O.H. F. 1600°F. 2 hrs. Water 1240°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 145 - 3/16" 1a 180 - 2. III 1/4" 2a 1b 255 - 1/4" 4b 245 - 1/4" 3b 260 - 3. III 5/32" 4b 140 - 1/4" 2b 345 - C. 3.03 hrs. 150° - 280°F. D. Grinding after first pass. Time 1 hr.	A. 200° F. B. None	1	1113	3/8" R		4 1/4" U	Imp	I	36"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 64 D. Great Lakes Steel Corp. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 300 E. B.O.H. F. 1625°F. 2 hrs. Water 1600°F. 2 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 145 - 3/16" 1a 185 - 2. I 1/4" 7a 255 - 3. I 1/4" 2a 250 - C. 5.20 hrs. 130° - 280°F. D. Grinding after first pass. Time .76 hr.	A. 100° F. B. None	1	1100	1/2" L		4 1/4" U	Imp	I II	16" 1 1/8"	Passed radiograph
						2	1171		1/2" L	6 1/4" D	Imp	I	36" 53 1/8"	
		*Weld Metal												

IDENTIFICATION A. Press Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Hbn E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. Amps Type Arc V. Passes 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. f/s	Location of N C.L.	R.L.	B.L.	Cracking Loc.	Type	Amt.	REMARKS OR CRACKING DISCONTINUOUS SECTS. NO.
A. AD-123 B. 11/30/42 C. 5 D. Jones & Laughlin E. Arcos Corp. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.60Mn,.19Si, .52Mo) C. .28 D. --- E. B.O.H. F. ---	A. A-I (.104C,3.27 Mn,.32Si, 18.50Cr, 10.25Ni, .97Mo)* B. Chromang C. --- D. DC REV	A. DV, 0°RF B. 5/32" C. Machining	A. Sas 1015 backing strip B. 1. II 5/32" 2a 155 - 20-30 2. III 3/16" 2a 4b 210 - 20-30 1/4" 4b 245 - 20-30 3. III 1/4" 6b 245 - 20-30 C. 8.30 hrs. 100° - 200°F D.	A. None B, None	1 2	1128 1198	 1/2" R	3/4" R	4 1/2" D 4 1/2" U	Imp Imp	II I II	10" 6 1/2" 19 1/2" 35 3/4"	Passed radiograph

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS								REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SEQ. EL. NO. PASSES TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	
A. AD-137 B. 12/17/42 C. CR-36 D. Carnegie E. Crucible Steel Co. F. Midland Steel Products	A. 1-1/2" B. R-I (1.01Mn,.198i, .42Cr,1.0^{U}Ni, .37Mo) C. .24 D. --- E. B.O.H. F. ---	A. A-I (.12C,1.90 Mn,.28Si, 18.54Cr, 8.06Ni, 2.15Mo)* B. Armorize C. TiO_2 D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper backing B. 1. II 3/16" 2a 160 - 22 2. III 1/4" 4a 4b 220 - 25 3. III 3/16" 4b 160 - 22 1/4" 2b 220 - 25 C. 12 hrs 155° - 320°F D.	A. None B. None	1	1121	1" R		5 1/4" D				Passed radiograph
						2	1231		1/4" R	6 1/2" U	Imp	I II III V	6 1/2" 1 1/2" 9" 2 1/2"	
						3	1202	1 1/4" R		6" U	0 Imp	III I III	1" 17 1/2" 38 1/2"	

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	A.L.	O.D.	CRACKING LOC.	TYPE	AMT.	
A. AD-140 B. 12/5/42 C. NYAB-12 D. Jones & Laughlin E. McKay Company F. New York Air Brake Co.	A. 1-1/2" B. R-III (1.50Mn,.238i, .41Mo) C. .25 D. --- E. B.Elec. F. ---	A. A-II (.12C,4.00 Mn,.80Si, 20.00Cr, 9.90Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up strip 3/8" B. 1. II 3/16" 1a 170 - 1/4" 1a 240 - 2. I 5/16" 1a 300 - 3/8" 1a 400 - 3/8" 2a 410 - 3. I 3/8" 2a 410 - C. --- 70° - 375°F. D. 3/8" welding rods used in welding. Copper strip ground out before pass #3 put in. A 9th pass was used so that final pass would be flush, 5/16" rod at 300 Amps used.	A.None B.None	1 2 3	1095 1096 1090	 2" R 1/8" L	3/4" R	6" D 6" U 6 1/2" D	Imp 0 Imp	I II III III I II III	5 3/4" 4 1/2" 11 3/4" 1 1/2" 1 1/2" 21 1/2" 6 1/2" 52 1/4"	Failed radiograph Excessive amount of incomplete fusion. 1/2" crack near right weld junction.
A. AD-135 B. 12/11/42 C. NYAB-17 D. Jones & Laughlin E. Harnischfeger Corp. F. New York Air Brake Co.	A. 1-1/2" B. R-III ((1.50Mn,.238i, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A-I (.11C,1.5 Mn,.45Si, 10.4Ni, 18.8Cr, 2.25Mo)* B. AW-3 C. Titanium D. AC	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 2a 150 - 25 2. I 1/4" 2a 200 - 25 5/16" 1a 400 - 33 5/16" 1a 400 - 29 3. I 5/16" 1a 400 - 29 5/16" 1a 400 - 30 C. --- 90° - 190° D.	A.None B.None	1 2 3	1097 1211 1182	1" L	2 1/2" L 1" L	2 1/2" U 7" D 6 1/2" U	 Imp	 I II III	 12 1/2" 5 1/2" 2" 20"	Passed radiograph Lack of penetration evident in opened crack
A. AD-135 B. 12/11/42 C. NYAB-19 D. Jones & Laughlin E. Lincoln F. New York Air Brake Co.	A. 1-1/2" B. R-III (1.50Mn,.238i, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A-II (.10C,4.00 Mn,.80Si, 19.5Cr, 9.0Ni)* B. Armorweld C. Lime D. DC REV	A. DV B. --- C. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 1a 170 - 25 3/16" 1a 160 - 25 2. I 1/4" 2a 250 - 25 5/16" 2a 310 - 25 5/16" 1a 200 - 25 3. I 5/16" 1a 310 - 25 5/16" 1a 450 - 25 C. 10 hrs. 125° - 175°F. D. One less pass in crossbar	A.None B.None	1 2 3	1107 1199 1184	3/8" R 1 1/2" L X	 	4 1/2" U 6" U 4" D	Imp 0 Imp	III III I II III II III	4 1/2" 1" 3/4" 3" 9 1/2" 8 1/4" 21 1/2" 49 1/4"	Failed radiograph Incomplete fusion Scattered gas pores Crater crack at left junction 1-1/2" weld crack

*Weld Metal

IDENTIFICATION A. FIRM NAME OR NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME & MEDIUM	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. PASSES TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-340 B. 3/26/43 C. 37 D. Carnegie-Illinois E. Lincoln Elec. McKay Company F. New York Air Brake Company	A. 1-1/2" B. R-[illegible] (.98Mn,.17Si, .58Cr,.99Ni, .34Mo) C. .30 D. Face 238 Back 309 E. P.O.H. F. 1544°F. 1½ hrs. Water 1050°F. 1¢ hrs.	A. A L.E.Co (.12C,3.50 Mn..45Si, 19.0Cr, 8.5Ni)* McKay (.10C,3.50 Mn,.80Si, 19.0Cr, 9.20Ni)* B. Armorweld Armorloy C. --- D. DC REV *Weld Metal	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. 1/4" round strip B. 1. II 5/32" 1a 155 - 25 5/32" 1a 160 - 27 2. I 3/16" 3a 225 - 30 1/4" 3a 300 - 30 3. I 5/16" 3a 425 - 30 C. 48 hrs. 75° - 90° D. Grinding after first and third passes. Crossbar has four more passes in body	A. None B. None	1 2	1106 1209	X	¾" R	7¾" O 3¾" D	Imp O Imp	I II V I I II III	3½" 6½" 1" 2¾" 5" 13½" 6" 35¾"	Passed radiograph

A. AD-125 B. 11/30/42 C. MQ-25 D. Republic Steel Corp. E. McKay Company F. Pressed Steel Car Co.	A. 1-1/2" B. R --- C. --- D. Face 260 Back 260 E. --- F. ---	A. A-I (.12C,2.0 Mn,.50Si, 23.0Cr, 10.0Ni, 2.0Mo)* B. A-6 C. Slag D. AC STR	A. --- B. --- C. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 2a 130 - 2. III 3/16" 2a 2b 130 - 5/16" 1a 4b 425 - 3/8" 3b 425 - 1/4" 1b 425 - 3. III not given C. 30 hrs 150° - 200°F D. Two less passes in right leg and four less in cross-bar.	A. 70°F B. None	1 2 3	1068 1109 1221		3/4" L 3/4" R 1" R	8" D 6½" U 6" D	Imp Imp Imp O	III III V III V V	5" 11" 8½" 13" 11" 3½" 49½"	Passed radiograph
A. AD-125 B. 11/30/42 C. MQ-26 D. Republic Steel Corp. E. McKay Company F. Pressed Steel Car Co.	A. 1-1/2" B. R --- C. --- D. Face 255 Back 248 E. --- F. ---	A. A-I (.12C,2.0 Mn,.50Si, 23.0Cr, 10.0Ni, 2.0Mo)* B. A-6 C. Slag D. DC REV	A. --- B. --- C. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 1a 160 - 35 5/16" 1a 280 - 30 2. III 1/4" 1a 280 - 30 5/16" 1a 1b 340 - 35 5/16" 1a 3b 280 - 30 3. III 3/8" 3b 340 - 30 5/16" 3b 280 - 30 C. 36 hrs. 150° - 200°F D. Five more passes in cross-bar. Cracking and chipping in passes 3, 6, 7, 12, and 13. Time 6 hours.	A. 70°F B. None	1 2	1093 1198	1½" L	X	4¾" U 6" D	Imp Imp	II II III V	4" 8½" 6" 6½" 25"	Passed radiograph
A. AD-236 B. 2/11/43 C. MQ-28 D. Republic Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R --- C. --- D. Face 265 Back 267 E. --- F. ---	A. A-I (.12C,2.00 Mn,.50Si, 18.7-28.5 Cr, 9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. DC REV	A. DV B. --- D. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 2a 160 - 24 2. III 5/16" 5a 4b 300 - 26 3/16" 1a 160 - 24 5/16" 5a 280 - 26 remainder not given 3. III --- C. 22 hrs. 150° - 200°F. D. Cracking after 1st and 9th passes. Grinding after 1st, 4th, 5th, 7th, 8th, 9th and 13th passes. Five more passes in crossbar	A. None B. None	1 2	1101 1209		1" R ¾" R	5½" D 6⅜" U	Imp O Imp	II III III III	1½" 4¾" 6½" 13½"	Passed radiograph

*Weld Metal
**Base Wire

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR MAT'L A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	WELDING MAT'L A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	WELD PREP. A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP. V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	C.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC
A. AD-236 B. 2/11/43 C. MQ-30 D. Carnegie-Illinois Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R-V (1.28Mn,.20Si, .82Ni) C. .27 D. Face 265 Back 282 E. --- F. ---	A. A-I (.12C,2.00 Mn,.50Si, 18.7-28.5 Cr,9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. AC STR	A. DV B. --- C. ---	A. Not given B. 1. II 3/16" 2a 170 - 2. III 5/16" 5a 6b 290 - 3/16" 1a 170 - 3. II 5/16" 2b 290 - remainder not given C. 22 hrs. 150° - 200°F. D. Cracking after first pass. Grinding after 1st, 4th, 6th, 8th, 12th, and 16th passes.	A. 70°F B. None	1 2	1086 1223	1/4" L X		7 1/2" D 6" U	Imp Imp	III II III V	6 1/2" 1 1/8" 6" 1/8" 14 1/2"	Passed radiograph
A. AD-312 B. 3/9/43 C. 35 D. Republic Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R --- C. --- D. Face 278 Back 285 E. --- F. ---	A. A-I (.12C,2.00 Mn,.50Si, 18.7-28.5 Cr,9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. DC REV	A. 75°DV B. 1/8" C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 1a 120 - 35 5/32" 1a 130 - 35 2. I 5/32" 1a 120 - 35 5/32" 2a 130 - 35 3/16" 2a 140 - 35 5/32" 1a 120 - 35 3. I 3/16" 1a 140 - 35 3/16" 1a 150 - 35 C. 22 hrs. 150° - 200°F. D. Cracking after fourth pass. Grinding after 1st, 4th, 5th, and 8th passes. Two more passes in crossbar	A. 70°F B. None	1 2	1096 1199	1" L X		7" D 7" U	Imp Imp	II II III V	1" 2 1/2" 7 1/8" 3" 7 1/8" 20 1/2"	Passed radiograph

**Bass Wire

SPECIFICATION A. Weld Metal Spec. No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Brh E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Including Cuble, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amps V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	N	BALLISTIC RESULTS Vel. F/S	Location of N L.L.	R.L.	O.L.	CRACKING Loc.	Type	Amt.	REMARKS ON CRACKED RADIOGRAPHIC RESULTS, ETC.
A. AD-54 B. 10/13/42 C. MQH-40 D. Republic Steel Corp. E. Reid-Avery F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-V (.93Mn,.27Si, 1.05Cr,.95Ni, .95Mo) C. .25 D. Face 250 Back 250 E. Basic-Elec. F. ---	A. A-I (.10C,4.0 Mn,.50Si, 20.Cr 9.0Ni)* B. --- C. Mineral D. DC REV	A. 45°DV B. 3/8" C. ---	A. Copper B. 1. II 1/4" 2a 250 - 28 2. I 5/16" 2a 325 - 30 3/8" 2a 385 - 31 3. I 3/8" 2a 385 - 31 C. 8 hrs --- D. Some grinding in first and fifth passes. Time 45 min	A.75-100°F B.None	1 2 3	1110 1106	 1/2" R	1" R 6 1/2" U	7" D Imp Imp	Imp O Imp	II III III V	11 3/4" 3 1/2" 3/4" 8" 1 1/4" 25 1/2"	Failed radiograph Crack near left weld junction Incomplete fusion along lower right leg and right weld junction
A. AD-76 B. 10/20/42 C. MQH-42 D. Republic Steel Corp. E. Lincoln F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-V (.93Mn,.27Si, 1.05Cr,.95Ni, .95Mo) C. .25 D. Face 250 Back 250 E. Basic-Elec. F. ---	A. A-I (.10C,3.90 Mn,.60Si, 20.Cr, 9.0Ni)* B. Armorweld C. Lime D. DC	A. 45°DV B. 3/8" C. Flame Cutting Flame Softening Grinding	A. Copper B. 1. II 1/4" 2a 250 - 30 2. I 5/16" 2a 330 - 28 3/8" 2a 385 - 31 3. I I 1/4" 6b 250 - 30 C. 6-[illegible]2 hrs. --- D. Very little chipping in the first two passes. Time 30 min.	A.75°-100°F B.None	1 2 3	1100 1141 1304	 X 	1/2" L 8 1/2" U 1/2" L 4" U	6" D Imp Imp O Imp	Imp Imp III I III	III III I III	1/2" 5 1/2" 1/2" 10" 10 1/2" 27"	Passed radiograph
A. AD-129 B. 11/30/42 C. MQH-43 D. Carnegie-Illinois E. Reid-Avery, Hollup & Champion F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-I (.95Mn,.27Si, .39Cr,.92Ni, .36Mo) C. .27 D. Face 250 Back 250 E. B.O.H. F. ---	A. A --- B. Reid-Avery 18-8B, Sureweld, Champion (308) C. --- D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting	A. Copper B. 1. II 1/4" 1a 250 - 30 3/16" 1a 180 - 27 2. I 3/16" 1a 330 - 29 3/8" 2a 390 - 31 5/16" 1a 330 - 29 3. III 5/16" 6b 330 - 29 C. 6 hrs 200 - 510°F D. Very little chipping in all passes. Time 30 mins.	A.75°-100°F B.None	1 2 3	1095 1190 1199	 1/4" R 	1/4" R 6" D	4 1/4" U 9" D Imp	Imp Imp Imp	III II III V I II	3" 3 1/4" 14 3/4" 3 1/2" 24" 10" 57 1/2"	Passed radiograph
A. AD-129 B. 11/30/42 C. Carnegie-Illinois D. MQH-44 E. Hollup and McKay F. Pullman Standard Car Mfg.Co.	A. 1-1/2" B. R-I (.95Mn,.27Si, .39Cr,.92Ni, .36Mo) C. .27 D. Face 250 Back 250 E. B.O.H. F. ---	A. A --- B. Sureweld & Armorloy C. Mineral D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting	A. Copper backing B. 1. II 3/16" 1a 170 - 27 1/4" 1a 230 - 29 2. I 1/4" 1a 230 - 29 3/8" 7a 380 - 32 3. III 5/16" 6b 320 - 30 C. 6 hrs 200° - 510°F D. Very little chipping in all passes. Time 30 mins.	A.75°-100°F B.None	1 2 3	1091 1204 1243	 1/4" R 	X X	7 1/4" D 4 3/4" U 4" U	Imp O Imp Imp	III III II III I	6 3/4" 1 1/2" 12 1/2" 2" 28" 50 1/2"	Passed radiograph

*Weld Metal

IDENTIFICATION A. Weld record no. B. Date of test C. Plate no. D. Armor manufacturer E. Electrode spec. F. Armor fabricator	ARMOR DATA A. Plate thickness B. Type C. Carbon content D. Brh E. Process F. Heat treatment temp time quench	ELECTRODE DATA A. Type B. Trade name C. Coating D. Current & polarity	JOINT DESIGN A. Groove, included angle, root face B. Root gap C. Plate preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. 1. Root type 2. Body type 3. Crown type C. Total welding time & inter pass temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. f/s	Location of N L.L.	R.L.	S.B.	Cracking Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHS RESULTS, ETC.
A. AD-110 B. 12/9/42 C. MQH-45 D. Carnegie-Illinois E. Metal & Thermit Corp F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. h-T (.95Mn,.27Si, .39Cr,.93Ni, .36Mo) C. .27 D. Face 269 Back 269 E. B.O.H. F. ---	A. A --- B. Murex C. Mineral D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding	A. Corner backing strip B. 1. II 1/4" 1a 230 - 28 5/16" 1a 380 - 30 2. I 1/4" 1a 230 - 28 5/16" 2a 380 - 36 3/8" 3a 400 - 36 3. III 5/16" 3b 380 - 30 3/16" 1b 210 - 27 1/4" 2b 240 - 28 5/16" 1b 395 - 30 C. 8 hrs 200° - 410°F D. Back step welded. Chipping in third And fourth passes.	A.75°-100°F B.None	1 2 3	1094 1115 1177	 1/2" R 	2 1/2" R 1 1/2" L	8 1/2" D 5 1/2" U 5 1/2" U	 Imp O	 III III	 2" 6" 8"	Passed radiograph
A. AD-110 B. 12/9/42 C. MQH-47 D. Carnegie-Illinois E. Champion Rivet F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-T (.95Mn,.27Si, .39Cr,.92Ni, .36Mo) C. .27 D. Face 269 Back 269 E. B.O.H. F. ---	A. A --- B. Champion (308) C. Mineral D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding	A. Copper backing strip B. 1. II 1/4" 1a 200 - 26 1/4" 1a 350 - 28 2. I 1/4" 1a 230 - 28 1/4" 1a 250 - 28 3/8" 4a 410 - 36 3. III 1/4" 6b 240 - 28 C. 9 hrs 300° - 430°F D. Chipping in first, second, fifth and seventh passes. Back step welded.	A.75°-100°F B.None	1 2 3	1095 1207 1293	 1/2" R 	1/2" L 1 1/2" L	8 1/2" D 5 1/2" U 5 3/8" U	 Imp O Imp	 III III I II III	 10 1/4" 2 1/2" 2 1/2" 1" 7 1/4" 23 1/2"	Passed radiograph
A. AD-186 B. 1/14/43 C. MQH- 50 D. Republic Steel Corp. E. Champion F. Pullman Standard Car Mfg. Co	A. 1-1/2" B. R-V (.93Mn,.27Si, 1.05Cr,.95Ni, .95Mo) C. .25 D. Face 250 Back 250 E. B.Kleo. F. ---	A. A-II (.12C,3.75 Mn,19.0Cr 10.0Ni)* B. 388 C. Mineral D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding Buttering-root of crossbar	A. Copper backing strip B. 1. II 1/4" 1a 190 - 1/4" 1a 290 - 2. I 1/4" 1a 300 - 1/4" 1a 290 - 1/4" 1a 280 - 1/4" 1a 260 - 3/8" 1a 390 - 3. III 1/4" 3b 270 - 1/4" 3b 265 - C. 12 hrs. 75° - 530°F. D. Side of plate edges disturbed by grinding. Much repair work necessary due to uncontrolled ARC BLOW. Cracking after 1st, 4th, 5th and 6th passes. 1st pass root crack ocurred after 2nd and 3rd passes laid in. Chipping and grinding after 1st, 4th, 5th and 6th passes.	A.75°-100°F. B.None	1 2 3 4	1096 1194 1198 1239	 X X	1" R 1 3/4" L 	5 1/2" U 6" D 5 1/2" D 6 1/2" U	Imp Imp Imp Imp	V III V V III V	1" 7" 7 1/2" 5" 10 3/4" 4 1/2" 35 3/4"	Passed radiograph
		*Weld Metal												

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	C.L.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. FIRM RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS PASSES									
A. AD-215 B. 1/27/43 C. MQH-46 D. Republic Steel Corp. E. McKay Company F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-V (.93Mn,.27Si, 1.05Cr,.95Ni .95Mo) C. .25 D. Face 250 Back 250 E. Basic-Elec. F. ---	A. A --- B. Armorloy A C. Mineral D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting Grinding Buttering at root of crossbar	A. Copper backing strip B. 1. II 1/4" 1a 220 - 26 1/4" 1a 310 - 30 2. I 1/4" 1a 280 - 29 3/8" 1a 440 - 36 3/8" 1a 420 - 35 3/8" 2a 400 - 33 3. III 1/4" 6b 290 - 29 C. 8 hrs. 260 - 410°F. D. Seven more passes in crossbar.	A. 75°-100°F. B. None	1 2 3	1092 1179 1090	1 1/8" R X	 3/4" R	4 3/4" U 6 3/4" D 7 1/2" D	 Imp O Imp	 I II III	2" 17" 3 1/2" 33"	Passed radiograph
A. AD-215 B. 1/27/43 C. MQH-53 D. Carnegie Illinois Steel Corp. E. Crucible Steel Corp. F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-I (.95Mn,.27Si, .39Cr,.92Ni, .36Mo) C. .27 D. Face 250 Back 250 E. B.C.H. F. ---	A. A --- B. Armorize C. --- D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting Grinding Buttering at root of crossbar	A. Copper backing B. 1. II 1/4" 1a 220 - 30 5/16" 1a 360 - 33 2. I 5/16" 8a 360 - 32 3. III 5/16" 6b 360 - 32 C. 7 hrs. 210° - 330°F. D. Very little chipping in all passes. Two angles disturbed at root by grinding	A. 75°-100°F. B. None	1	1103	1" R		5 1/4" D	Imp	I II V III	2 1/4" 15 3/4" 1 1/4" 7" 26 1/4"	Passed radiograph
A. AD-215 B. 1/27/43 C. MQH-54 D. Republic Steel Corp. E. Crucible Steel Corp. F. Pullman Standard Car Mfg.Co	A. 1-1/2" B. R-V (.93Mn,.27Si, 1.05Cr,.95Ni .95Mo) C. .25 D. Face 250 Back 250 E. Basic-Elec. F. ---	A. A --- B. Armorize C. --- D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting Grinding Buttering at root of crossbar	A. Copper backing B. 1. II 1/4" 1a 220 - 30 5/16" 1a 360 - 33 2. I 5/16" 9a 360 - 33 3. III 5/16" 6b 360 - 33 C. 6:30 hrs. 330° - 360°F. D. Chipping and grinding after first and 15th passes. Very little chipping after all other passes. Two angles disturbed at root by grinding.	A. 75°-100°F. B. None	1 2 3	1108 1142 1174	3/4" R X	3/4" R	5 1/4" U 8 1/8" D 7" D	Imp Imp Imp O	II I II III I II V II	1 1/2" 6" 2 1/4" 3 3/4" 3 1/4" 6 1/4" 1" 2 3/4" 27 3/4"	Passed radiograph

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS					CRACKING			REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. PRESS RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. FIRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	LOCATION OF N R.L.	OB.	LOC.	TYPE	AMT.	
A. AD-336 B. 3/23/43 C. 1 D. Henry Disston & Sons E. Alloy Rods Co F. York Safe & Lock Co.	A. 1-1/2" B. R-V (.51Mn,.20Si, .10Cr,4.77Ni, .34Mo,.10V) C. .21 D. Face 269 Back 262 E. O.H. F. 1425°F. 2 hrs. Water	A. A-II (.10C,4.00 Mn,.35Si, 19.5Cr, 10.00Ni)* B. Armorarc C. Titania D. DC REV	A. 90°DV B. 1/8" C. ---	A. None B. 1. I 1/8" 1a 200 - 30 2. I 3/16" 2a 300 - 35 1/4" 6a 375 - 35 3. I 1/4" 2a 375 - 35 C. 9:30 hrs. 80° - 230°F. D.	A. None B. None	1	1082		1" R	6 3/8" U	Imp	III	6 3/4"	Passed radiograph
						2	1188	X		1 1/8" D	Imp	III	9" 15 3/4"	

*Weld Metal

APPLICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON GROUPING RADIOGRAPHIC RESULTS, ETC.
						N	VEL.	LOCATION OF H			CRACKING		
							F/S	L.L.	R.L.	G.S.	LOC.	TYPE	AMT.	
A. Plate Rejected On B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabricator	A. Plate Thickness B. Type C. Carbon Content D. BHN E. Process F. Heat Treatment Temp Time Quench	A. Type B. Trade Name C. Coating D. Current & Polarity	A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing B. Deposition Size El. Passes No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	A. Pre B. Post									
A. AD-53 B. 10/8/42 C. 295 D. Republic Steel Corp. E. Linde Air Products F. American Locomotive Company	A. 1-1/2" B. R-V (.47Mn,.228i, .22Cr,4.05Ni, .39Mo) C. .28 D. Face 252 Back 245 E. --- F. ---	A. A-I (.20C,3.01 Mn,.608i, 17.42Cr, 11.50Ni, .37Mo)* B. Oxweld #41 C. 12X200 20 Melt (Flux) D. AC	A. 45°DV B. --- C. Flame Cutting Grindir	A. Spacer strip 25-20 B. Special Unionmelt Two passes 1/4" 2UM 850 - 1100 - 35 - 36 C. 40.68 mins. 145° - 155°F D. Crater on end tab	A.150° F. B.None	1	1104		1" R	6" D	Imp	I II III V	10 8½ 3 1½	Failed radiograph 2" weld crack in upper left leg 1-1/2" deep seated weld crack in crossbar Large blowholes in lower right leg Lower half of legs are 23" long

*Weld Metal

IDENTIFICATION A. FIRM'S RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. DIN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-100 B. 10/21/42 C. U-19 D. Great Lakes Steel Corp. E. McKay Company Linde Air Products F. Fisher Tank Division	A. 1-1/2" B. R-IV (.71Mn, .79Si, .56Cr, .16Mo, .08Zr) C. .42 D. Face 369 Back 369 E. Basic F. 1600°F. 2 hrs. Spray 1150°F. 4 hrs. Draw	A. A --- B. Armorloy Oxweld #42 C. --- D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 2a 185 - 22 2. V 3/16" 2a 185 - 22 1/4" 1UM 980 - 35 1/4" 1UM 1200 - 35 C. 2.08 hrs. 190° - 400°F. D. Grinding after 4th pass.	A. None B. None	1	1105	1/2" R		8 1/2" D	Imp	I II	36" 4 3/8" 40 3/8"	Failed radiograph Deep seated weld cracks along crossbar and lower legs
A. AD-100 B. 10/21/42 C. U-20 D. Great Lakes Steel Corp. E. McKay Company Linde Air Products F. Fisher Tank Division	A. 1-1/2" B. R-IV (.92Mn, .79Si, .63Cr, .17Mo. .09Zr) C .30 D. Face 369 Back 369 E. Basic F. 1600°F. 2 hrs. Spray 1150°F. 4 hrs. Draw	A. A --- B. Armorloy Oxweld #42 C. Titania D. AC	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 2a 185 - 22 2. V 3/16" 2a 185 - 22 1/4" 1UM 900 - 36 1/4" 1UM 1200 - 36 C. 2.08 hrs. 200° - 340°F. D. Grinding after last pass.	A. None B. None	1 2	1100 1096	3/4" R	X	12 1/2" D 6 1/2" U	Imp Imp	I I II	18 1/2" 18 1/2" 2 39"	Failed radiograph Lower right leg and crossbar are entirely cracked up in the weld
A. AD-118 B. 12/12/42 C. U-21 D. Great Lakes Steel Corp. E. Lincoln Linde Air Products F. Fisher Tank Division	A. 1-1/2" B. R-IV (.94Mn, .67Si, .59Cr, .18Mo, .09Zr) C. .29 D. --- E. Basic F. ---	A. A --- B. Armorweld Oxweld #42 C. Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. I 3/16" 1a 185 - 22 2. V 3/16" 2a 185 - 22 1/4" 1UM 840 - 35 1/4" 1UM 1000 - 35 C. 1.52 hrs. 280° - 340°F. D.	A. None B. None	1	1098	X		3 1/2" U	Imp O	I II I II	27 1/2" 6" 10 3/4" 5 1/4" 49 1/2"	Passed radiograph 1-1/2" crater crack in crossbar weld

IDENTIFICATION A. FIRM RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. PASSES TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-194 B. 1/13/43 C. 8 D. Dominion Foundries & Steel Ltd. E. Harnischfeger Corp. Linde Air Products F. General Motors Div. of Canada	A. 1-1/2" B. R-V (.69Mn,.398i, 2.45Cr,.71Ni, .30Mo) C. .26 D. --- E. --- F. 1650°F. 10 hrs. Air 1650°F. 6 hrs. Water 1150°F. 5 hrs. Air	A. A --- B. AW 3-A Oxweld # 41 C. --- D. ---	A. DV B. 3/8" C. Flame Cutting	A. Copper back up bar B. 1. II 1/4" 3a 230 - 16 2. IV 3/16" 2UM 1000 - 35 C. 2.15 hrs. 110° - 130°F. D. Chipping after all passes. Cracking after first two passes. Hand and automatic welding	A. 135° F. B. None	1	1099	1/4" L		6 1/4" U	Imp	I II	36 1/4" 5 1/4" 31 1/4"	Failed radiograph Crossbar is entirely cracked 2" crack at end of weld
A. AD-214 B. 1/27/43 C. 9 D. Dominion Foundries & Steel Ltd. E. Lincoln Elec. Linde Air Products F. General Motors Div. of Canada	A. 1-1/2" B. R-V (.57Mn,.348i, 2.25Cr,.72Ni, .28Mo) C. .28 D. --- E. Elec. F. 1650°F. 10 hrs. Air 1650°F. 6 hrs. Water 1150°F. 5 hrs. Air	A. A --- B. Armorweld ARW-1 Oxweld #41 C. --- D. AC	A. DV B. 1/4" C. Flame Cutting Grinding	A. Copper back up bar B. 1. II 5/32" 2a 150 - 16 2. V 1/4" 2a 240 - 16 1/4" 1UM 900 - 35 1/4" 1UM 1050 - 35 C. 2.15 hrs. 125° - 270°F. D. Cracking after first pass. Chipping after all passes. Hand and automatic welding.	A. Yes B. None	1 2	1105 1103	7/8" R	X	6 1/4" D 6 1/4" U	Imp O Imp	I II III V I III I II V	13" 2 3/4" 1" 3/4" 16 3/4" 1" 11 3/4" 5 1/4" 6 1/4" 57 3/4"	Failed radiograph Excessive crossbar cracks 3/4" crack originates from blowhole in crossbar
A. AD-283 B. 2/26/43 C. 10 D. Dominion Foundries & Steel Ltd. E. Harnischfeger Corp. Linde Air Products F. General Motors Div. of Canada	A. 1-1/2" B. R-V (.57Mn,.348i, 2.25Cr,.72Ni, .28Mo) C. .28 D. --- E. Elec. F. 1650°F. 10 hrs. Air 1650°F. 6 hrs. Water 1150°F. 5 hrs. Air	A. A --- B. AW 3-A Oxweld #41 C. --- D. AC	A. DV B. 1/4" C. Flame Cutting Grinding	A. Copper back up bar B. 1. II 3/16" 1a 170 - 10 3/16" 1a 170 - 16 2. V 1/4" 2a 210 - 16 1/4" 1UM 950 - 35 1/4" 1UM 1000 - 35 C. 2.45 hrs. 120° - 300°F. D. Cracking after first pass. Chipping after all passes. Hand and automatic welding.	A. None B. None	1	1098		3/4" R	6" U	Imp	I	36"	Failed radiograph Cracks at intersection of legs & crossbars. 3/4" crack at right junction. Crater crack at left junction.

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE (Wire) A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF H L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ET
A. AD-287 B. 2/16/43 C. I.H.C. 57 D. Great Lakes Steel Corp. E. Crucible Steel Linde Air Products F. International Harvester Co.	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08Zr) C. .42 D. Face 269 Back 286 E. B.O.H. F. 1600°F. 2 hrs. Water 1240°F. 2 hrs. Air	A. A-II (.06C,2.10 Mn,19.16 Cr,9.21Ni, 1.61Mo, .20V)* (.25C,3.90 Mn,.50Si, 7.5Cr ?, 9.00Ni, .25Mo)* B. Armorize Oxweld #42 C. --- D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 2a 150 - 2. V 3/16" 2a 180 - 3/16" 2UM 780 - 32 C. 215 mins. 140° - 250°F. D. Grinding after first four passes. Time 85 mins. Hand and automatic welding	A.150° F. B.None	1	1113		X	6 1/2" D	Imp	I V	36" 1/2" 36 1/2"	Failed radiograph 5" cracking along crossbar 1-1/2" crack in lower right leg 1-1/2" crack in lower left leg
A. AD-287 B. 2/16/43 C. I.H.C. 59 D. Great Lakes Steel Corp. E. Crucible Steel Linde Air Products F. International Harvester Co.	A. 1-1/2" B. R-IV (.94Mn,.67Si, .59Cr,.18Mo, .09Zr) C. .26 D. Face 269 Back 300 E. B.O.H. F. 1650°F. 2 hrs. Water 1150°F. 2 hrs. Air	A. A-II (.06C,2.10 Mn,19.16 Cr,9.21Ni, 1.61Mo, .20V)* (.25C,3.90 Mn,.50Si, 7.5Cr ?, 9.00Ni, .25Mo)* B. Armorize Oxweld #42 C. --- D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 140 - 5/32" 1a 145 - 2. V 3/16" 1a 175 - 5/32" 1a 160 - 3/16" 1a 180 - 3/16" 2UM 760 - 32 C. 232 mins 150° - 300°F. D. Grinding after first and fourth passes. Time 70 mins. Hand and automatic welding.	A.150° F. B.None	1 2	1093 1171	1 1/8" R	1" L	7 1/2" D 5 1/2" U	Imp O Imp	I II III V III V I II V	6 3/4" 1 3/4" 2 1/4" 3" 1 1/4" 3/4" 14 1/2" 3" 2" 35 1/2"	Passed radiograph
A. AD-287 B. 2/16/43 C. I.H.C. 60 D. Great Lakes Steel Corp. E. Crucible Steel Linde Air Products F. International Harvester Co.	A. 1-1/2" B. R-IV (.92Mn,.79Si, .63Cr,.17Mo, .09Zr) C. .30 D. Face 269 Back 300 E. B.O.H. F. 1625°F. 2 hrs. Water 1200°F. 2 hrs. Air	A. A-II (.06C,2.10 Mn,19.16 Cr,9.21Ni, 1.61Mo, .20V)* (.25C,3.90 Mn,.50Si, 7.5 ?, 9.00Ni, .25Mo)* B. Armorize Oxweld #42 C. --- D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 2a 145 - 2. V 3/16" 2a 180 - 3/16" 1b 170 - 3/16" 3b 175 - 5/32" 1a 140 - 3/16" 2UM 760 - 31 C. 4.33 hrs. 170° - 290°F. D. Grinding after first and fifth passes. Time 1.84 hrs. Hand and automatic welding.	A.150° F. B.None	1	1100		X	6 1/2" D	Imp	I	36"	Passed radiograph 1" crater crack in right junction
		*Weld Metal												

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC TESTS					REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. Plate Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Supp. F. Armor Fabricator	A. Plate Thickness B. Type C. Carbon Content D. Side E. Process F. Heat Treatment Temp Time Quench	A. Type B. Trade Name C. Coating D. Current & Polarity	A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing B. Deposition Sequence Sketch Passes No. Type Amps V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time Inter Pass Temperature D. Remarks	A. Pre B. Post	N	Vel. F/S	Location of N L.L.	R.L.	G.B.	Cracking Loc.	Type	Amt.	
A. AD-287 B. 2/16/43 C. I.H.C. 62 D. Great Lakes Steel Corp. E. Crucible Steel Linde Air Products F. International Harvester Co.	A. 1-1/2" B. R-IV (.71Mn,.79Si, .56Cr,.16Mo, .08Zr) C. .42 D. Face 269 Back 286 E. B.O.H. F. 1600°F. 2 hrs. Water 1240°F. 2 hrs. Air	A. A-II (.06C,2.10 Mn,19.16 Cr,9.2Ni, 1.61Mo, .20V)* (.25C,3.90 Mn,.50Si, 7.5Cr 7. 9.10Ni, .25Mo)* B. Armorize Oxweld #4 C. Titanium D. DC REV	A. 45°DV B. 3/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 145 - 3/16" 1a 175 - 2. V 3/16" 2a 2b 180 - 3/16" 2b 175 - 3/16" 2UM 760 - 31 C. 240 mins. 145° - 300°F. D. Grinding after first pass. Time 90 mins. Hand and automatic welding.	A. 175° F. B. None	1	1102	X		7½" D	Imp	III	36"	Passed radiograph 1/2" crack at left junction

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS								REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ET
A. PLATE SERIAL NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT	
A. AD-126 B. 10/20/42 C. NYAB-10 D. Republic Steel Corp. E. Alloy Rods Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-V (.47Mn,.22Si, .22Cr,4.05Ni, .39Mo) C. .28 D. --- E. B.Elec. F. ---	A. A --- B. Armoraro Oxweld #42 C. --- D. AC	A. 45°DV B. --- C. Flame Cutting	A. Not given B. 1. II 3/16" 2a 160 - 25 2. IV 1UM 900 - 32 1UM 1050 - 32 C. 40 mins. 200°F. D. Plate 40"X36"X1-1/2" used. Also 4"X4"X1-1/2" tabs used at start of weld. Extra 4" of plate and tabs cut off after welding.	A.200° F. B.None	1 2 3 4	1110 1151 1202 1229	 3/8" L 1/2" L 	1 1/2" R X	5" D 5 1/2" U 7 1/2" D 1" U	O O Imp	III III I II I II III	1 3/4" 1 1/2" 1 1/2" 6 1/4" 13 3/4"	Failed radiograph Cracks running through blowholes in crossbar. Several large gas pockets in lower right leg
A. AD-126 B. 10/29/42 C. NYAB-11 D. Republic Steel Corp. E. Alloy Rods Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-V (.47Mn,.22Si, .22Cr,4.05Ni, .39Mo) C. .28 D. --- E. B.Elec. F. ---	A. A --- B. Armoraro Oxweld #42 C. --- D. AC	A. 45°DV B. --- C. Flame Cutting	A. Not given B. 1. II 3/16" 2a 160 - 28 2. IV 2UM 850 - 32 C. 40 mins. 150°F. D. Plate 40"X36"X1-1/2" used. Extra 4" of plate cut off after welding.	A.150° F. B.None	1 2 3	1111 1145 1215	1/2" R 1/2" R	 1/2" L 	7" D 4" U 4 1/2" U	Imp Imp O Imp	II III II II II III	6" 6 3/4" 3" 11" 5 1/4" 30 1/2"	Failed radiograph Large amount of incomplete fusion. Large blowholes from which cracks originate.
A. AD-140 B. 12/5/42 C. NYAB-13 D. Jones & Laughlin E. Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.23Si, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A --- B. Oxweld #42 C. --- D. AC	A. 45°DV B. 1/4" C. Flame Cutting	A. None B. Special Unionmelt 1/4" 1UM 900 - 32 1/4" 1UM 1050 - 32 C. --- D. ---	A.None B.None	1	1096	 	1 1/2" R	5" D	Imp	I	36"	Failed radiograph 2-1/2" weld and plate crack and 1" plate cracks near right weld junction. Transverse cracks in left weld junction. 1-1/2" deep seated crack. Incomplete fusion in crossbar
A. AD-140 B. 12/5/42 C. NYAB-14 D. Jones & Laughlin E. McKay Company Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.23Si, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A --- B. Armorley Oxweld #42 C. Lime D. AC	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 180 - 27 2. V 1/4" 2a 260 - 27 1/4" 2UM 850 - 32 C. --- D. First four passes hand welded, unionmelt was automatic	A.None B.None	1	1102	 	1 1/2" R	6" U	Imp	I	36"	Passed radiograph

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES NO. TYPE AMP. V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS H	VEL. F/S	LOCATION OF H L.L.	R.L.	C.G.	CRACKING LOC.	TYPE	Amt	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-135 B. 12/11/42 C. 18 D. Jones & Laughlin E. Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2381, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A --- B. Oxweld #42 C. --- D. ---	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. None B. 1. I 3/16" 1a 180 - 25 2. IV 1/4" 2UM 900 - 33 1000 - 32 C. --- 70° - 90°F D. First pass hand welded. Root bead hand welded but electrode not given.	A. None B. None	1	1140	X		2 3/4" D	Imp	I III	41" 1/2" 41 1/2"	Failed radiograph 1-1/2" crack at left weld junction 3/4" weld crack in crossbar Another crack at right weld junction Weld reinforcement is excessive Undercut in lower right leg 6" left leg crack 1" right leg crack both in fusion zone before testing 12" right leg crack in fusion zone in the front
A. AD-135 B. 12/11/42 C. 21 D. Jones & Laughlin E. McKay Company Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2381, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A --- B. Armorloy Oxweld #42 C. None D. AC	A. DV B. --- C. ---	A. Not given B. 1. II 3/16" 2a 170 - 25 2. IV 1/4" 1UM 900 - 33 1/4" 1UM 1050 - 33 C. --- 70° - 150°F. D.	A. None B. None	1	1078		X	1 1/4" U	Imp	I	43"	Failed radiograph Right crossbar junction is badly cracked 3-3/4" left leg crack in the fusion zone in the front
A. AD-135 B. 12/11/42 C. 22 D. Jones & Laughlin E. McKay Company Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2381, .41Mo) C. .25 D. --- E. B.O.H. F. ---	A. A --- B. Armorloy Oxweld #42 C. None D. ---	A. DV B. --- C. Flame Cutting Grinding	A. Not given B. 1. I 3/16" 1a 200 - 25 2. IV 1/4" 1UM 900 - 33 1/4" 1UM 1000 - 33 C. 6 hrs. 70° - 100°F. D.	A. None B. None	1	1086		1 1/2" R	6" D	Imp	I V	7 1/2" 1 1/2"	Passed radiograph
						2	1160	2 1/2" L		6 1/2" U	Imp	I	36" 45"	

IDENTIFICATION A. FIRING RECORD NO B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	H	BALLISTIC RESULTS VEL. F/S	LOCATION OF H L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-159 B. 12/28/42 C. 27 D. Jones & Laughlin E. McKay Company Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.23Si, .41Mo) C. .25 D. Face 286 Back 283 E. B.O.H. F. 1625°F 2½ hrs. Water 1080°F. 2¾ hrs. Air	A. A --- B. Armorloy Oxweld #42 C. --- D. AC	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 200 - 25 2. V 1/4" 2a 330 - 28 1/4" 2UM 950 - 33 C. 12 hrs. 100° - 350°F. D. First four passes were hand welded, last two are automatic	A. None B. None	1	1090		6" L	5½" D				Passed radiograph
						2	1094		1½" R	4¾" U	Imp	I	36"	
A. AD-159 B. 12/28/42 C. 29 D. Jones & Laughlin E. McKay Company Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.23Si, .41Mo) C. .25 D. Face 286 Back 275 E. B.O.H. F. 1625°F. 2½ hrs. Water 1080°F. 2¾ hrs. Air	A. A --- B. Armorloy Oxweld #42 C. --- D. AC	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. Not given B. 1. II 3/16" 2a 200 - 25 2. V 1/4" 2a 330 - 28 1/4" 2UM 950 - 33 C. 12 hrs. 100° - 350°F. D. First four passes were hand welded, other two are automatic	A. None B. None	1	1099	½" R		6⅜" D	0 Imp	II I III II	10½" 15" 3" 29½"	Passed radiograph
A. AD-245 B. 2/9/43 C. 30-J-1 D. Jones & Laughlin E. Lincoln Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.23Si, .41Mo) C. .25 D. Face 302 Back 300 E. B.O.H. F. 1625°F. 2½ hrs. Water 1080°F. 2¾ hrs. Air 1080°F. 3 hrs.	A. A --- B. Armorweld Oxweld #42 C. --- D. AC	A. 90°DV B. 1/4" C. ---	A. Copper backing B. 1. II 3/16" 1a 175 - 25 3/16" 1a 180 - 26 2. V 3/16" 2a 180 - 26 3/16" 2UM 720 - 32 C. --- 150° - 200°F. D. 2" long dams hand welded at ends to start and stop Unionmelt on. Hand welds were surface ground before the Unionmelt was applied. Plate was allowed to cool down between Unionmelt passes. Plate was ground after copper backing strip was removed to smooth up bottom.	A. 150°F. Hand 200°F. Auto- B. None	1	1101		X	6" D	Imp	I II	28¾" 7¼" 36"	Passed radiograph 5/8" & 3/8" cracks in crossbar Crossbar only 9-1/2" long

IDENTIFICATION A. Panel Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabrication	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Brin E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Modified Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. F/S	Location of N L.L.	R.L.	C.S.	Cracking Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-245 B. 2/9/43 C. 31-J-2 D. Jones & Laughlin E. Lincoln Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2381, .4lMo) C. .25 D. Face 302 Back 300 E. B.O.H. F. 1625°F. 2½ hrs. Water 1080°F. 2½ hrs. Air 1080°F. 3 hrs.	A. A B. Armorweld Oxweld #42 C. --- D. AC	A. 90°DV B. 1/4" C. ---	A. Copper backing B. 1. II 3/16" 1a 175 - 25 3/16" 1a 180 - 26 2. V 3/16" 2a 180 - 26 3/16" 2UM 720 - 32 C. --- 150° - 300°F. D. 2" long dams hand welded at ends to start and stop Unionmelt on. Hand welds were surface ground before the Unionmelt was applied. Plate was allowed to cool down between Unionmelt passes. Plate was ground after copper backing strip was removed to smooth up bottom.	A.150°F.Hand 300°F. Auto-B.None	1 2	1092 1191	1½" R	7/8" R	4½" D 5½" U	Imp	I II V	13½" 2½" 3½" 19½"	Passed radiograph Leg welds only 16-1/2" long Crossbar 10-1/2" long
A. AD-279 B. 2/25/43 C. 32 D. Jones & Laughlin E. Lincoln Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2331, .41Mo) C. .25 D. Face 290 Back 284 E. B.O.H. F. 1625°F. 2½ hrs. Water 1080°F. 2½ hrs. Air 1080°F. 5 hrs.	A. A --- B. Armorweld Oxweld #42 C. --- D. AC DC REV	A. 45°DV B. 1/4" C. ---	A. Not given B. 1. II 3/16" 2a 170 - 26 2. V 1/4" 2a 275 - 26 1/4" 2UM 680 - 29 C. 20 hrs. 300°F. D. First pass ground on under side. Applied 2" dams to start and stop Unionmelt on. Cross section of (H) ground out into side welds.	A.300°F. at start B.None	1 2	1111 1104	½" R	1 3/8" R	6½" U 4½" D	Imp Imp	I II I	15½" 2½" 36" 53½"	Passed radiograph
A. AD-279 B. 2/25/43 C. 33 D. Jones & Laughlin E. Lincoln Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-III (1.50Mn,.2381, .41Mo) C. .25 D. Face 287 Back 284 E. B.O.H. F. 1625°F. 2½ hrs. Water 1080°F. 2½ hrs. Air 1080°F. 3 hrs.	A. A- --- B. Armorweld Oxweld #42 C. --- D. AC DC REV	A. 45°DV B. 1/4" C. ---	A. Not given B. 1. II 3/16" 2a 170 - 26 2. V 1/4" 2a 275 - 26 1/4" 2UM 680 - 29 C. 20 hrs. 300°F. D. First pass ground on under side. Applied 2" dams to start and stop Unionmelt on. Cross section of (H) ground out into side welds.	A.300°F. at start B.None	1	1098	X		6" U	Imp	I II	5½" 30½" 36"	Passed radiograph Lower legs are 14" Upper legs are 22"

IDENTIFICATION A. Purdue Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Supplier F. Armor Fabricator	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. BHN E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELD Data PROCEDURE A. Backing B. Deposition Size El. Passes No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. F/S	Location of N L.L.	R.L.	O.B.	CRACKING Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-340 B. 3/26/43 C. 35 D. Carnegie-Illinois Steel Corp. E. Lincoln Elec. Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-I (.98Mn,.47Si, .58Cr,.99Ni, .34Mo) C. .30 D. Face 228 Back 228 E. B.O.H. F. 1544°F. 1½ hrs. Water 1050°F. 2½ hrs. Water	A. A --- B. Armor-weld Oxweld #42 C. --- D. AC DC	A. 45°DV B. 1/4" C. ---	A. Not given B. 1. II 5/32" 2a 150 - 28 2. V 5/32" 2a 150 - 28 3/16" 2UM 720 - 32 C. --- 200° - 225°F. D. Grinding after second pass. 4" end tabs used on start and 8" end tabs used on finish in order to provide 100% length of Unionmelt weld. Temperatures as stated were closely held.	A. 200° F. B. None	1 2	1106 IIII	2 1/8" L	⅛" R	5" U 6" D	O Imp	II I	2" 36"/38"	Passed radiograph 2" of intermittent incomplete fusion in upper left leg
A. AD-340 B. 3/26/43 C. 36 D. Republic Steel Corp. E. Lincoln Elec. Linde Air Products F. New York Air Brake Company	A. 1-1/2" B. R-I (.71Mn,*.26Si, .69Cr,1.23Ni, .47Mo) C. .24 D. --- E. R.Elec. F. 1600°F. 2½ hrs. Water 1160°F. 3½ hrs.	A. A --- B. Armor-weld Oxweld #42 C. --- D. AC DC	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 2a 150 - 28 2. V 5/32" 2a 150 - 28 3/16" 2UM 720 - 32 C. --- 200° - 375°F. D. Grinding after second pass. 4" end tabs used on start and 8" end tabs used on finish in order to provide 100% length of Unionmelt weld.	A. 200° F. B. None	1 2	1093 1107	X	1⅜" R	5⅛" U 6" D	Imp Imp	I II V I II V	1⅜" 7/16" 4⅜" 15" 9/16" 3⅜"	Passed radiograph

*Questionable

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC.
A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION: SIZE EL. NO. TYPE AMP V. PASSES 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF H L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT.	
A. AD-83 B. 10/22/42 C. CP-40 D. American Cast Continental " E. A. O. Smith F. Chryseler Plymouth	A. 1-1/2" B. C-II Amer. (1.55Mn,.46Si, .33Cr,.10Mo) C-I Cont. (.92Mn,.40Si, .50Cr,.51Ni, .52Mo) C. A .265 C .32 D. A-Face 225 Back 225 C-Face 248 Back 248 E. B.O.H. Acid O.H. F. --- ---	A. A-I (.08C,3.5Mn .35Si,19.0Cr,10.0Ni, 1.0Mo)* B. Smithway C. Lime D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 240 - 30 2. III 1/4" 5a 2b 300 - 30 3. III 3/16" 4b 240 - 30 1/4" 2b 300 - 30 C. 6.5 hrs. 200 - 350° D. Upper center section and right section are American lower center section and left section are Continental.	A. None B. None	1	1057		2" L	6½" D				Passed radiograph
						2	1047	1¼" R		7¼" U				
						3	1108	⅛" R		6½" D	Imp	II	7⅛"	
											O	II	3⅛"	
						4	1155		X	7" U	Imp	I	1"	
												II	4⅛"	
						5	1206		2 1/8" R	4" D	Imp O	III II	2⅛" ⅛"	
						6	1204		4¼" L	⅜" D	Imp O	II I III	4⅛" ⅛" ⅛"	
													36¼"	
A. AD-83 B. 10/22/42 C. CP-41 D. American Cast Continental " E. A. O. Smith F. Chryseler Plymouth	A. 1-1/2" B. C-IV Amer. (.93Mn,.41Si, 2.75Cr,.41Mo) C-I Cont. (.85Mn,.38Si, .48Cr,.52Ni, .39Mo) C. A .274 C .32 D. A-Face 226 Back 226 C-Face 248 Back 262 E. B.O.H. Acid O.H. F. --- ---	A. A-I (.08C,3.5Mn .35Si,19.0Cr,10.Ni, 1.0Mo)* B. Smithway C. Lime D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 185 - 25 2. III 3/16" 2a 6b 185 - 25 1/4" 3a 220 - 25 3. III 3/16" 4b 185 - 25 1/4" 2b 220 - 25 C. 7 hrs. 140 - 360° D. Upper center section and left section are American, lower center section and right section are Continental.	A. None B. None	1	1112	⅜" R		6½" D	Imp	V	35½"	Passed radiograph
						2	1053		X	7¼" U	Imp	V	27½"	
													63"	
		*Weld Metal												

IDENTIFICATION A. Weld Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Fabricator	BASE MTL. A. Plate Thickness B. Type C. Carbon Content D. Hdn E. Process F. Heat Treatment Temp Time Quench	PREHEAT MTL. A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT PREP. A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	TEST CONDITIONS A. Backing B. Deposition Sequence Sk. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	TEST A. Pre B. Post	RADIOGRAPHIC RESULTS H	Vel. F/M	Location of H L.L.	R.L.	G.S.	Cracking Loc.	Type	Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-83 B. 10/20/42 C. CP-42 D. American Cast Continental " E. McKay F. Chrysler Plymouth	A. 1-1/2" B. C-IV Amer. (.97Mn,.45Si, 2.88Cr,.41Mo) C-I Cont. (.80Mn,.33Si, .42Cr,.60Ni, .45Mo) C. A .245 C .34 D. A-Face 224 Back 224 C-Face 255 Back 255 E. S.O.H. Acid O.H. F. ---	A. A-II (.077C,4.04 Mn,.62Si, 19.06Cr, 9.06Ni)* (.10C,3.85 Mn,.55Si, 20.00Cr, 9.90Ni)* B. Armorloy C. Lime Titaniun D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. I 1/4" 1a 240 - 28 2. I 1/4" 2a 240 - 28 5/16" 2a 320 - 30 3/8" 2a 470 - 35 3. I 1/2" 2a 600 - 35 C. 6 hrs. 150° - 350° D. Upper center section and left section are Continental, lower center section and right section are American	A. None B. None	1 2 3.	1062 1150 1185	1/2" R	3/4" R 3/4" R	6" D 1 1/2" U 4" U	Imp O Imp	I II III V III V II III V	2" 9 1/2" 5 1/2" 1 3/4" 1/2" 1 1/2" 9 1/2" 3" 7" 40"	Passed radiograph
A. AD-83 B. 10/22/42 C. CP-43 D. Continental E. McKay Rods F. Chrysler Plymouth	A. 1-1/2" B. C-I (.80Mn,.33Si, .42Cr,.60Ni, .45Mo) C. .34 D. Face 255 Back 255 E. Acid O.H. F. ---	A. A-II (.077C,4.04 Mn,.62Si, 19.06Cr, 9.06Ni)* (.10C,3.85 Mn,.55Si, 20.0Cr, 9.90Ni)* B. Armorloy C. Lime Titaniun	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 1/4" 2a 300 - 30 2. I 5/16" 2a 360 - 30 3/8" 2a 470 - 35 3. I 1/2" 2a 660 - 35 C. 6 hrs. 160° - 365° D.	A. None B. None	1 2	1056 1062	1 1/4" R	3/4" R	7" D 7 1/2" U	Imp Imp	I I III V V	3" 1 1/2" 3/4" 13" 31" 39"	Passed radiograph
A. AD-83 B. 10/22/42 C. CP-45 D. American Cast Continental " E. Alloy Rods F. Chrysler Plymouth	A. 1-1/2" B. C-IV Amer (.97Mn,.44Si, 3.15Cr,.41Mo) C-I Cont (.87Mn,.34Si, .46Cr,.71Ni, .52Mo) C. A .380 C .32 D. Face 326 Back 326 Face 241 Back 263 E. B.O.H. Acid O.H. F. ---	A. A-II (.14C,3.50 Mn,.75Si, 18.Cr, 8.25Ni)* (.06C,.170 Mn,.016Si, 21.30Cr, 10.22Ni)* B. Armorarc C. Titamiun D. DC REV	A. 22-1/2°DV on one side, straight edge on other B. 3/8" C. Flame Cutting	A. Copper B. 1. II 1/4" 2a 240 - 27 2. I 1/4" 1a 240 - 27 5/16" 7a 320 - 27 3. III 1/4" 4b 240 - 27 5/16" 2b 320 - 27 C. 8 hrs. 140° - 345° D. Upper center section and right section are Continental, lower center section and left section are American	A. None B. None	1 2 3	1057 1058 1062	2 1/8" L X	X	9" U 7 1/4" D 3" D	Imp Imp O	I II III III	18 1/2" 6 3/4" 1 3/4" 27 1/4"	Passed radiograph
		*Weld Metal															

IDENTIFICATION A. Press Release No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Manf. F. Armor Fabricator	ARMOR PLATE A. Plate Thickness B. Type C. Carbon Content D. Ni% E. Process F. Heat Treatment Temp Time Quench	ELECTRODE (Ref) A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Joint V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT TREAT A. Pre B. Post	BALLISTIC RESULTS N	V50 f/s	Location of N L.L.	B.L.	S.L.	Cracking Loc.	Type	Amt.	REMARKS OR TESTS Radiographic Results, etc.
A. AD-79 B. 10/29/42 C. 23 D. Ordnance Steel Foundry E. Harnischfeger Corp. F. Federal Machine & Welder Co.	A. 1-1/2" B. C-III (1.72Mn,.458i, .45Mo) C. .31 D. Face 269 Back 355 E. B.O.H. F. 1750°F 2-1/2 hrs. Air 1575°F 1-1/4 hrs. Water 1150°F 4 hrs. Air	A. A-I (.13C,1.72 Mn,.578i, 20.5Cr, 10.4Ni, 1.88Mo)* A-I (.10C,1.38 Mn,.618i, 20.4Cr, 10.9Ni, 2.20Mo)* A-I (.13C,1.64 Mn,.558i, 19.3Cr, 10.4Ni 2.00Mo)* B. Smooth Arc AW-3 C. Lime D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 5/32" 1a 130 - 20 2. III 3/16" 2b 185 - 22 5/32" 1a 2b 140 - 20 3/16" 12b 175 - 22 3. III 3/16" 4b 185 - 22 1/4" 2b 225 - 24 C. 9 hrs. 70° to 212°F D. In the crossbar a 5/32" electrode was used in the first six passes.	A. None B. None	1 2 3	1111 1172 1107	1/2" L 1 1/2" L 1 1/2" L		5 1/2" U 6" D 4" U	Imp O O Imp	III III V III III	4" 1 1/2" 2 1/2" 1 1/2" 1 1/2" 9 1/2"	Passed radiograph
A. AD-79 B. 10/29/42 C. 24 D. General Steel Casting Corp. E. McKay Co F. Federal Machine & Welder Co.	A. 1-1/2" B. C-III (1.56Mn,.408i, .11Cr,.46Mo) C. .29 D. Face 270 Back 281 E. --- F. 1975°F 10 hrs. Air 1250°F 4 hrs. Air 1575°F 4 hrs. Water	A. A-II (.10-.12C 3.80-4.00 Mn,.50-.60 Si,19.75-20.75Cr, 9.00-10.20 Ni)* B. Armorloy C. Lime-Mn D. AC	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 5/32" 1a 90 - 20 2. III 5/32" 1a 4b 110 - 20 3/16" 8b 135 - 22 3. I 1/4" 2a 190 - 24 C. 9.42 hrs. 70° to 212° D. 12 passes in crossbar	A. None B. None	1 2 3	1103 1142 1205	2" L 1 1/2" L	X	7 1/2" D 5 1/2" U 5 1/2" U	Imp Imp	III V I III I V	1" 5 1/2" 2 1/2" 2" 1" 6 1/2" 18 1/2"	Passed radiograph 1-1/2" incomplete fusion in crossbar Large amount of shrinkage tears or piping in cast plate
A. AD-127 B. 11/23/42 C. 26 D. American Radiator & Standard Sanitery Corp. E. McKay Company F. Federal Machine & Welder Co.	A. 1-1/2" B. C-II (1.56Mn,.458i, .49Cr,.33Mo) C. .29 D. Face 240 Back 275 E. B. Elec. F. 1200°F 2 hrs. Air 1850°F 7 hrs. Air 1650°F 5 hrs. Water	A. A-II (.105C,3.95 Mn,.558i, 20.10Cr, 10.20Ni)* B. Armorloy A-5 C. --- D. AC	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 5/32" 1a 150 - 22 2. I 3/16" 1a 190 - 22 3/16" 1a 200 - 24 1/4" 4a 275 - 26 3. III 1/4" 1a 1b 250 - 26 1/4" 3b 225 - 26 C. 9.26 hrs. 70° - 230°F D. Grinding in all but first pass. Time 55 mins. Three more passes in crossbar. 2 layers at root of crossbar.	A. None B. None	1 2 3 4	1111 1131 1191 1254	5/8" R 1 1/4" R	1 1/4" R 1" R	5 1/2" U 6 1/2" D 8" D 5" U	Imp Imp	II III V	1" 1" 1" 8 1/2" 10 1/2"	Passed radiograph Piping is present in cast plate adjacent to welde

*Weld Metal

SPECIFICATIONS A. PLATE ORDER NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE DESIG. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. PASSES REQ. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS M	VEL. F/S	LOCATION OF M L.L.	R.L.	G.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC.
A. AD-127 B. 11/23/42 C. 28 D. Symington Gould Corp. E. McKay Company F. Federal Machine & Welder Company	A. 1-1/2" B. C-II (1.38Mn,.35Si, .37Cr,.40Mo) C. .26 D. Face 255 Back 258 E. B. Elec. F. 1850°F. 7 hrs. Air 1650°F. 5 hrs. Water 1150°-1180°F. 6 hrs. Water	A. A-II (.10C,3.95 Mn,.55Si, 20.10Cr, 10.20Ni)* B. Armorloy C. Lime-Mn D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 3/16" 1a 160 - 22 2. III 3/16" 3a 160 - 22 1/4" 6b 195 - 24 3. III 3/16" 4b 160 - 22 1/4" 2b 195 - 24 C. 12.02 hrs. 70° - 195°F. D. Grinding after all but first adn last passes. Time 2.25 hrs. Ons more pass in crossbar	A. None B. None	1	950		3/4" R	4" U	Imp	I II V	3 1/4" 5 7/8" 3 1/4"	Passed radiograph Large amount of piping and porosity present in cast plate
							2	996	1/4" R		4 1/8" D	Imp	I III V	10" 2 3/4" 5 1/8" 30"	
A. AD-120 B. 12/12/42 C. 30 D. Buckeye Steel Castings Co. E. McKay Company F. Federal Machine & Welder Company	A. 1-1/2" B. C-III (1.58Mn,.44Si, .42Mo) C. .27 D. Face 212 Back 228 E. --- F. 1825°F. 8 hrs. Air 1625°F. 3 hrs. Water 1200°F. 6 hrs. Water	A. A-II (.11C,3.90 Mn,.55Si, 20.00Cr, 10.00Ni)* B. Armorloy C. Lime-Mn D. AC	A. 60°DV B. 1/4" C. Flame Cutting Grinding Buttering	A. None B. 1. I 3/16" 1a 150 - 22 2. II 3/16" 1b 150 - 22 3/16" 1b 165 - 22 3/16" 1b 180 - 22 3/16" 1b 200 - 22 1/4" 1b 180 - 24 1/4" 1b 210 - 24 1/4" 1b 220 - 24 1/4" 9b 225 - 24 3. III 3/16" 4b 185 - 22 1/4" 2b 250 - 24 C. 22.21 hrs. 70° - 212°F. D. Grinding after all but first two and last two passes. Time 2.05 hrs. Five less passes in crossbar.	A. 70°F. B. None	1	1072	1 1/4" R		1 1/4" U	Imp	II	4 1/2"	Passed radiograph
							2	1084		X	7 1/8" D	Imp	V	6"	
							3	1169		3/4" L	5 3/4" U	Imp	II V	3" 4 1/4" 16 3/4"	
A. AD-129 B. 12/12/42 C. 32 D. Continental Roll & Steel Foundry E. McKay Company F. Federal Machine & Welder Company	A. 1-1/2" B. C-I (.79Mn,.38Si, .49Cr,.53Ni, .44Mo) C. .35 D. Face 255 Back 235 E. ACID-O.H. F. 1650°F. Air 1550°F. 8 hrs. Water 1180°F. 10 hrs. Water	A. A-II (.11C,3.90 Mn,.55Si, 20.00Cr, 10.00Ni)* B. Armorloy A-5 C. Lime-Mn D. AC	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 3/16" 1a 180 - 22 2. I 3/16" 1a 190 - 22 1/4" 1a 360 - 25 1/4" 1a 370 - 26 1/4" 2a 380 - 28 3. I 1/4" 1a 385 - 28 1/4" 1a 350 - 25 C. 6 hrs. 70° - 212°F. D. Chipping in fourth pase. Time 2.15 hrs.	A. 70°F B. None	1	1040	2 1 1/8" R		7" U	Imp	I II V	1 1/4" 6 1/4" 10 1/2"	Passed radiograph
							2	1038		1 7/8" R	8" D	Imp	I II V	4" 2" 16" 40 1/2"	
		*Weld Metal													

IDENTIFICATION A. PIPING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. DHN E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	BASE METAL DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	GROOVE WELDING A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	H	VEL. P/H	LOCATION OF H L.L.	LOCATION OF H R.L.	LOCATION OF H C.S.	CRACKING LOC.	CRACKING TYPE	CRACKING AMT.	RADIOGRAPHIC RESULTS, ETC.
A. AD-120 B. 12/12/42 C. 33 D. Pratt & Letchworth Company E. McKay Company F. Federal Machine & Welder Company	A. 1-1/2" B. C-III (1.34Mn,.41Si, .32Mo) C. .25 D. Face 269 Back 269 E. B.O.H. F. 1725°F. 3 hrs. Air 1625°F. 2 hrs. Water 1050°F. 4 hrs. Air	A. A-II (.11C,3.90 Mn,.55Si, 20.00Cr, 10.00Ni)* B. Armorloy A-5 C. Lime-MN D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 3/16" 1a 190 - 24 2. III 5/32" 1a 145 - 20 3/16" 1a 190 - 24 1/4" 1a 230 - 26 1/4" 1a 3b 235 - 26 1/4" 1a 240 - 26 3. II 1/4" 2a 365 - 26 C. 10.06 hrs. 70° - 212°F. D. Chipping in 3rd, 8th, 9th, 11th, and 12th passes. Time 2.25 hrs. Two less passes in crossbar	A. 70°F. B. None	1 2 3	1066 1106 1158	 X 1/8" L	1" R 	3 1/2" U 7 1/2" D 4" U	 Imp	 III	 3 1/2" V 25 1/2" 29"	Passed radiograph
A. AD-120 B. 12/12/42 C. 35 D. Pratt & Letchworth Company E. Alloy Rods Co. F. Federal Machine & Welder Company	A. 1-1/2" B. C-III (1.36Mn,.37Si, .3Mo) C. .27 D. Face 277 Back 286 E. B.O.H. F. 1725°F. 3 hrs. Air 1625°F. 2 hrs. Water 1050°F. 4 hrs. Air	A. A-II (.11C,4.00 Mn,.50Si, 20.00Cr, 9.00Ni)* B. Armoraro B C. Titanium D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. II 3/16" 1a 155 - 22 5/32" 1a 145 - 20 2. I 3/16" 1a 175 - 24 1/4" 6a 235 - 26 1/4" 1a 240 - 26 3. III 3/16" 4b 170 - 22 1/4" 2b 240 - 24 C. 13.55 hrs. 70° - 212°F. D. Three less passes in crossbar	A. 70°F. B. None	1 2 3	1064 1127 1091	1 1/4" L 	 3" R 3/8" R	5" U 7 1/2" D 9" U	 Imp 	 V 	 13" 	Passed radiograph
A. AD-246 B. 2/6/43 C. 34 D. Pratt & Letchworth Company E. Harnischfeger Corp. F. Federal Machine & Welder Company	A. 1-1/2" B. C-III (1.34Mn,.42Si, .36Mo) C. .27 D. Face 248 Back 245 E. B.O.H. F. 1725°F. 3 hrs. Air 1625°F. 2 hrs. Water 1050°F. 4 hrs. Air	A. A-I (.11C,1.68 Mn,.65Si, 18.8Cr, 10.3Ni, 1.92Mo)* B. AW-3 C. Lime-Mo-Mn D. AC	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. II 3/16" 1a 170 - 24 3/16" 1a 180 - 24 2. I 1/4" 2a 265 - 26 1/4" 2a 240 - 24 3. III 3/16" 4b 160 - 22 1/4" 2b 250 - 24 C. 12.10 hrs. 70° - 212°F. D. Three more passes in crossbar. Chipping after first pass.	A. 70°F. B. None	1	1153	 	X 	7 1/2" U 	Imp 	V 	51" 	Passed radiograph 1/2" crack in crossbar weld
		*Weld Metal													

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. PASSES 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	N	VEL. F/S	LOCATION OF N L.L.	R.L.	O.B.	CRACKING LOC.	TYPE	AMT.	
A. AD-246 B. 2/2/43 C. 36 D. Symington Gould Corp. Pratt & Letchworth Company E. Harnischfeger Corp. F. Federal Machine & Welder Company	A. 1-1/2" B. C-II S.G.Co. (1.47Mn,.32Si, .43Cr,.35Mo) C. .30 D. Face 258 Back 255 E. B.Elec. F. 1850°F. 7 hrs. Air 1650°F. 5 hrs. Water 1180°F. 6 hrs. Water B. C-III P&L.Co. (1.42Mn,.34Si, .31Mo) C. .27 D. Face 255 Back 255 E. B.O.H. F. 1725°F. 3 hrs. Air 1625°F. 2 hrs. Water 1050°F. 4 hrs. Air	A. A-I (.13C,1.58 Mn,.64Si, 19.00Cr, 9.7Ni, 1.98Mo)* B. Smoothard AW-3 C. Lima-MN-MO D. DC REV *Weld Metal	A. 60°DV B. 5/16" C. Flame Cutting Grinding	A. Not given B. 1. I 5/32" 1a 116 - 18 2. I 5/32" 1a 116 - 18 5/32" 3a 120 - 20 3/16" 2a 170 - 24 3. I 3/16" 2a 170 - 24 C. 13.10 hrs. 75° - 125°F. D. Upper and lower center sections are Pratt & Letchworth; left and right sections are Symington Gould Corp. Chipping in all passes.	A. 70°F. B. None	1 2	1055 1065	3/4" L	1" R	5" U 4 1/2" D	Imp Imp	I V I V	1 1/2" 18 1/2" 5 3/4" 14 1/2" 40"	Passed radiograph

SPECIFICATIONS A. PLATE NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT THICK TIME CARBON	WELDING DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DISPOSITION SIZE EL. AM. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PWHT B. POST	BALLISTIC RESULTS N	V50 F/S	LOCATION OF N L.L.	R.L.	O.A.	CRACKING LOC.	TYPE	AMT.	REMARKS OR CRACKING DESCRIPTION, RESULTS, ETC.
A. AD-246 B. 2/2/43 C. 37 D. Pratt & Letchworth Co. Symington Gould Corp. E. Harnischfeger Corp. F. Federal Machine & Welder Co.	A. 1-1/2" B. C-III P&L.Co (1.42Mn,.448i, .31Mo) C. .27 D. Face 255 Back 255 E. B.O.H. F. 1725°F 3 hrs. Air 1625°F 2 hrs. Water 1050°F 4 hrs. Air B. C-II S.G.Co. (1.47Mn,.328i, .43Cr,.35Mo) C. .30 D. Face 358 Back 255 E. B.Elec. F. 1850°F 7 hrs. Air 1650°F 5 hrs. Water 1180°F 6 hrs. Water	A. A-I (.11C,1.68 Mn,.658i, 18.8Cr, 10.3Ni, 1.92Mo)* B. Smooth Arc AW-3 C. Lime-Mn-Mo D. DC REV	A. 60°DV B. 3/8" C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 3b 150 - 18 2. II 5/32" 4b 150 - 18 3/16" 38b 185 - 32 3. III 3/16" 18b 185 - 32 C. 33.35 hrs. 70° - 140°F D. Fear hrs. chipping after 7th rass. Twelve more passes in crossbar Upper and lower center sections are Symington Gould Corp.; left and right section are Pratt & Letchworth	A.70°F B.None	1 2 3	1065 1060 1059	 4" R 3" R	1¼" L	4½" D 6¾" U 5¾" D	Imp Imp Imp	II V V I II V	1" 9¾" 16" 7½" 6⅜" 13½" 53½"	Passed radiograph
A. AD-263 B. 2/16/43 C. 41 D. Continental Roll & Steel Foundry Co. E. McKay Co/ F. Federal Machine & Welder Co.	A. 1-1/2" B. C-I (.79Mn,.388i, .49Cr,.53Ni, .44Mo) C. .35C D. Face 229 Back 269 E. Acid O.H. F. 1650°F Air 1575°F Water 1210°F Furnace	A. A-II (.12C,4.10 Mn,.498i, 19.45Cr, 10.0Ni)* B. Armorloy A-5 C. Lime D. AC	A. 60°DV B. 1/4" C. Flame Cutting Grinding Buttering	A. None B. 1. I 3/16" 1a 160 - 22 2. III 3/16" 1a 160 - 22 1/4" 1a 8b 350 - 26 1/4" 1b 355 - 26 1/4" 2b 350 - 26 3. I 1/4" 1b 360 - 28 3. III 1/4" 6b 350 - 26 C. 29.05 hrs. 70° - 213°F D. Chipping in all passes except first two and last	A.70°F B.None	1	1114		X	7" D	Imp	I II V	9¾" 11½" 8½" 29½"	Passed radiograph Crater crack, 1/2" long
		*Weld Metal															

SPECIFICATION A. Weld Record No. B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Supp. F. Armor Preparation	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Brn E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Including Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Sequence 1. Root Type 2. Body Type 3. Groove Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	N	VEL. F/S	BALLISTIC RESULTS LOCATION OF N L.L.	R.L.	S.B.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-184 B. 1/13/43 C. 30 D. Utility Elec. Corp. E. Page Steel & Wire Division F. Firestone Tire & Rubber Co.	A. 1-1/2" B. C-I (1.07Mn,.53Si, .60Cr,.63Ni, .21Mo) C. .27 D. Face 239 Back 369 E. ACID ELEC. F. 1850°F 6 hrs. Air 1250°F 5 hrs. Air 1650°F 1/3 hrs. Water 1250°F 6 hrs. Air	A. A-II (.15C,3.50 Mn,.26Si, 19.25Cr, 11.40Ni)* B. Alleghney C. Titanium Base D. DC REV	A. B. C. Flame Cutting	A. None B. 1. I 5/32" 1a 110 - 24 2. I 1/8" 1a 110 - 24 5/32" 2a 130 - 24 3/16" 1a 155 - 24 5/32" 1a 150 - 24 3/16" 1a 165 - 23 1/4" 1a 220 - 23 1/4" 1a 240 - 23 1/4" 1a 210 - 23 3. III 1/4" 4b 210 - 23 3/16" 2b 155 - 24 C. 5.99 hrs. 96° - 100°F D. Some chipping after second fourth and ninth passes	A. 100°F B. None	1 2 3 4	1080 1121 1207 1148	3/4" R X	1/4" L X	6 1/2" D 5 1/2" U 4 1/2" U 6 1/2" D	Imp Imp Imp	V II III	1 1/8" 2 1/2" 6 3/4" 9"	Passed radiograph

*Weld Metal

IDENTIFICATION A. PLATE NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	VEL. FPS	LOCATION OF D L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC SENSITIVITY, ETC.
A. AD-99 B. 10/30/42 C. 74 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.52Mn,.47Si, .35Cr,.13Mo) C. .29 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C,3.60 Mn,.019Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.12 hrs 250° - 420°F D. Grinding after fifth pass	A. 150°F B. None	1 2 3	1111 1171 1194	3/8" R X	1 1/4" R	5 1/2" U 6 1/2" D 6" D	Imp Imp	II III V I II III	1" 1 1/4" 3 1/2" 6 1/4" 1" 1 1/2" 1 1/4" 16 1/2"	Passed radiograph
A. AD-224 B. 11/10/42 C. 75 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.53Mn,.48Si, .36Cr,.16Mo) C. .26 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.14 hrs 180° - 420°F D.	A. 150°F B. None	1 2 3 4 5	1101 1100 1175 1214 1256	2 1/2" R 1" R 2" R 1/4" L 1 1/8" R	1" R	6" U 5 1/2" D 4 1/4" D 5" U 10 1/8" D	Imp Imp	II V	2 3/4" 1" 3 3/4"	Passed radiograph
A. AD-224 B. 11/10/42 C. 76 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.52Mn,.47Si, .35Cr,.16Mo) C. .29 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C,3.60 Mn,.019Si 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.07 hrs 300° - 460°F D.	A. 150°F B. None	1 2 3 4	1112 1159 1181 1271	1" R 1 1/4" R	1" L 1/8" R	6 1/8" D 5" U 3 1/2" U 5 1/2" D	Imp Imp	II III V V I III V	4" 2" 4 1/4" 1/8" 3" 2 1/2" 11 1/8" 27 3/4"	Failed radiograph 1-5/8" crack near right weld junction
A. AD-224 B. 11/16/42 C. 77 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.52Mn,.48Si, .36Cr,.16Mo) C. .26 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C,3.60 Mn,.03Si, 19.3Cr, 10.2Ni, .012Mo)* B. Armorarc C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.05 hrs 190° - 460°F D.	A. 150°F B. None	1 2 3 4	1070 1121 1204 1200	1 1/4" R 1 1/4" R	1/8" R 1 1/4" R	9" D 5 1/2" U 6" U 8" D	Imp Imp	I II III V I II III V	14" 1 3/4" 2 1/4" 1" 4" 1 1/4" 2" 4 1/8" 31 1/4"	Passed radiograph

*Weld Metal

INFORMATION A. TEST NUMBER OR ID. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	BASE MAT'L A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT THICK THICK CONDITION	ELECTRODE MAT'L A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SEQ. EL. NO. TYPE JOINT V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT TREAT A. PRE B. POST	BALLISTIC RESULTS No.	V50 F/S	LOCATION OF HIT LL	RL	SL	CRACKING Len	Type	Amt	REMARKS OR DEFECTS EXPLANATIONS, REMARKS, ETC.
A. AD-224 B. 11/10/42 C. 78 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.53Mn, .488i, .36Cr, .16Mo) C. .26 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C, 3.60 Mn, .038i, 19.3Cr, 10.2Ni, .012Mo)* B. Armoraro C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.10 hrs 200° - 520°F D.	A. 150° F B. None	1	1115		1" R	4½" D	0	III	10½"	Passed radiograph 1-1/8" crack in crossbar
A. AD-224 B. 11/7/42 C. 79 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.53Mn, .488i, .36Cr, .16Mo) C. .26 D. Face 197 Back 197 E. --- F. ---	A. A-II (.08C, 3.60 Mn, .038i, 19.3Cr, 10.2Ni, .012Mo)* B. Armoraro C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper bar B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 4a 360 - 40 3. I 5/16" 2a 360 - 40 C. 2.01 hrs 190° - 520°F D.	A. 150° F B. None	1 2 3 4	1063 1083 1305 1257	3/4" L 1" R	1½" R 1½" R	8" U 6½" D 8½" D 5½" U	0 Imp	III I II III V	3½" 3" 3½" 5½" 9½" 35"	Passed radiograph
A. AD-216 B. 1/27/43 C. 85 D. American Steel Foundries E. Alloy Rods Co. F. Fisher Tank Division	A. 1-1/2" B. C-II (1.35Mn, .27Cr, .016Mo)* C. .32 D. --- E. --- F. ---	A. A-II (.13C, 3.06 Mn, .032Si, 18.99Cr, 8.29Ni, .109Mo)* B. Armoraro C. Titania D. AC DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 3/16" 1a 185 - 22 1/4" 1a 250 - 40 2. I 1/4" 1a 250 - 40 5/16" 1a 360 - 40 3/8" 2a 440 - 40 3. I 1/2" 2a 635 - 40 C. 1.50 hrs. 260° - 560°F. D.	A. None B. None	1 2	1065 1194	7/8" R 1" R	6½" U 6½" D	0 Imp Imp 0	I I II V I	10½" 14" 9" 7½" 41½"	Passed radiograph
		*Weld Metal															

A. AD-228 B. 11/16/42 C. W-22 D. Ford Motor Co. E. Crucible Steel Co. F. Ford Motor Co.	A. 1-1/2" B. C-IV (1.27Mn,.53Si .50Cr,.35Mo) C. .27 D. Face 341 E. B.Elec. F. 1800°F 5 hrs Air 1700°F 3 hrs Water 1100°F 6 hrs Water	A. A-I (.07C,1.37 Mn,.26Si, 17.8Cr, 10.6Ni, 1.9Mo)* B. Reristal C. Titania D. AC DC	A. 45°DV B. 3/16" C. Flame Cutting	A. B. 1. II 3/16" 2a 150 - 2. I 1/4" 2a 230 - 3/8" 1a 360 - 3/8" 1a 485 - 3/8" 1a 440 - 3. I 3/8" 1a 385 - 3/8" 1a 440 - C. 8 hrs --- D. Chipping after each pass. Time 1 hr. Grinding after passes 3rd, 5th, 15th & 16th.	A.None B.None	1	1148		1/4" L	5" U	O Imp	III II III V	11 1/4" 1" 2 1/4" 2" 16 3/4"	Passed radiograph
A. AD-228 B. 11/16/42 C. W-26 D. Ford Motor Co. E. Reid-Avery Co. F. Ford Motor Co.	A. 1-1/2" B. C-IV (1.11Mn,.35Si .54Cr,.41Mo) C. .29 D. --- E. B.Elec. F. 1800°F 5 hrs Air 1700°F 3 hrs Water 1100°F 6 hrs Water	A. A-I (.06C,1.60 Mn,.23Si, 16.8Cr, 9.9Ni,1.7 Mo)* B. Raco C. Titania D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. B. 1. II 1/4" 2a 230 - 2. I 5/16" 1a 350 - 5/16" 2a 340 - 3/8" 2a 380 - 3. I 3/8" 2a 380 - C. 8 hrs Less than 150°F D. Chipping after each pass Time 1 hr. Grinding after passes 2nd, 3rd, 10th and 14th. One more pass in crossbar.	A.None B.None	1 2	1156 1179	1/4" L	2" R	8" D 4 1/2" U	Imp Imp	III II III V	4" 12" 6 1/2" 3 1/2" 1" 26 3/4"	Passed radiograph
A. AD-228 B. 11/16/42 C. W-27 D. Ford Motor Co. E. Arcos Corp. F. Ford Motor Co.	A. 1-1/2" B. C-IV (1.30Mn,.60Si .60Cr,.37Mo) C. .29 D. Face 248 E. B.Elec. F. 1800°F 5 hrs Air 1700°F 3 hrs Water 1100°F 6 hrs Water	A. A --- B. Chromang C. --- D. DC REV	A. 45°DV B. 1/8" C. Flame Cutting	A. None B. 1. II 3/16" 2a 200 - 25 2. III 3/16" 2a 13b 200 - 25 3. III 3/16" 5b 200 - 25 C. 8 hrs --- D. Chipping and grinding after first pass.	A.None B.None	1 2	1111 1149	3/4" L	2" R	4 3/4" U 8" D	Imp Imp	III II III	4" 5" 6 1/2" 15 1/2"	Passed radiograph
		*Weld Metal											

IDENTIFICATION A. PLATE THICKNESS OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR PREPARATION	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SEQUENCE NO. TYPE AMPS V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT TREAT A. PWHT B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.L.	CRACKING LOC.	TYPE	AMT.	REMARKS OR CRACKED RADIOGRAPHIC RESULTS, ETC.
A. AD-275 B. 2/17/43 C. W-106 D. Ford Motor Co. E. Crucible Steel Corp. F. Ford Motor Co.	A. 1-1/2" B. C- --- C. --- D. --- E. Basic-Elec. F. 1800° 5 hrs. Air 1700° 3 hrs. Water 1100° 8 hrs. Water	A. A --- B. --- C. --- D. AC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper strip B. 1. II 1/4" 2a 250 - 2. I 5/16" 6a 330 - 3. I 5/16" 2a 330 - C. 8 hrs. --- D. Chipping in all passes	A. None B. None	1 2	1114 1330	 1/4" L	1" R 6 1/4" U	6 1/4" D Imp	Imp I III V I II V	I III V I II V	1 1/4" 2 1/4" 5 3/4" 11" 4 1/4" 18 1/2" 43"	Passed radiograph
A. AD-275 B. 2/17/43 C. W-107 D. Ford Motor Co. E. Crucible Steel Corp. F. Ford Motor Co.	A. 1-1/2" B. C --- C. --- D. --- E. Basic-Elec. F. 1800° 5 hrs. Air 1700° 3 hrs. Water 1100° 8 hrs. Water	A. A --- B. --- C. --- D. AC DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper strip B. 1. II 1/4" 2a 350 - 2. I 5/16" 6a 320 - 3. I 5/16" 2a 330 - C. 8 hrs. --- D. Chipping after all passes	A. None B. None	1	1091	 	1" L 	5 1/2" D 	Imp 	I II V 	12 3/4" 3" 15 1/2" 30 1/4"	Passed radiograph
A. AD-275 B. 2/17/43 C. W-114 D. Ford Motor Co. E. Crucible Steel Corp. F. Ford Motor Co.	A. 1-1/2" B. C --- C. --- D. --- E. Basic-Elec. F. 1800° 5 hrs. Air 1700° 3 hrs. Water 1100° 8 hrs. Water	A. A --- B. --- C. --- D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper Strip B. 1. II 1/4" 2a 350 - 2. I 1/4" 2a 350 - 5/16" 6a 320 - 3. I 5/16" 2a 330 - C. 8 hrs. Below 120°F D. Chipring after all passes	A. None B. None	1 2	1139 1363	1 7/8" L 	 X 	5 1/2" U 5 1/2" D 	 Imp 	 I II V	 13 1/2" 7" 14 3/4" 35 1/4"	Passed radiograph

SPECIFICATION A. PLATE NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, JOINT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING CONDITIONS A. BACKING B. DEPOSITION SEQUENCE NO. PASSES 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	PASSES NO. TYPE ROD V.	PWHT A. PRE B. POST	BALLISTIC RESULTS N	V/S	LOCATION OF N C.L.	R.L.	S.L.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-131 B. 12/3/42 C. H-C-16 D. Wehr Steel Co. E. A. O. Smith Corp. F. The Neil Co.	A. 1-1/2" B. S-I (.86Mn,.468i, .84Cr,.055Ni .45Mo) C. .33 D. Face 255 Back 255 E. --- F. ---	A. A-I (.08C,3.5 Mn,.358i, 19.Cr,10. Ni,1.Mo)* B. S.W. 164 C. Lime D. DC REV	A. 60°DV B. 3/16" C. Machining	A. Not given B. 1. I 3/16" 1a 145 - 25 2. III 3/16" 1a 155 - 25 3/16" 4a 175 - 30 1/4" 2a 220 - 30 1/4" 6b 175 - 30 3. III 1/4" 4b 175 - 30 1/4" 2b 220 - 30 C. 21 hrs --- D. *		A. 120°F B. None	1 2 3	1039 1040 1046	1½" R	2½" R X	3⅛" D 4⅜" U 4⅜" U	Imp Imp	II III V I III V	7" 2" 9" 11" 3" 11" 41⅛"	Passed radiograph

*Weld Metal

A. AD-269 B. 2/15/43 C. I.H.C. 45 D. Ord. Steel Fdry. E. McKay Company F. International Harvester Co.	A. 1-1/2" B. C-III (1.55Mn,.44Si, .42Mo) C. .28 D. Face --- Back 367 E. B.O.H. F. 1750°F. 2½ hrs. Air 1575°F. 1½ hrs. Water 1125°F. 4 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy AC-5 C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up bar B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 3a 4b 260 - 1/4" 4b 350 - 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 3.50 hrs. 140° - 330°F. D. Cracking in first pass, ground out	A.100°F B.None	1 2 3	1104 1142 1214	3/4" R	5/8" L 1" R	6½" U 6" D 5½" U	Imp Imp	II I II III V	2" 6½" 3" 12¾"	Passed radiograph
A. AD-269 B. 2/15/43 C. I.H.C. 46 D. Ord. Steel E. McKay Company F. International Harvester Co.	A. 1-1/2" B. C-III (1.55Mn,.44Si, .42Mo) C. .28 D. Face 368 Back 359 E. B.O.H. F. 1750°F. 2½ hrs. Air 1575°F. 1½ hrs. Water 1125°F. 4 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up bar B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 3a 4b 260 - 1/4" 4b 350 - 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 3.53 hrs. 150° - 330°F. D.	A.100°F B.None	1 2 3	1144 1236 1333	3/4" L	1" R 5/8" L	4½" U 7½" D 7" D	Imp Imp O	III I II V I	1" 3½" 5½" 2½" ½" 13"	Passed radiograph
A. AD-269 B. 2/15/43 C. I.H.C. 50 D. Ord. Steel E. McKay Company F. International Harvester Co.	A. 1-1/2" B. C-III (1.55Mn,.44Si .42Mo) C. .28 D. Face 368 Back 375 E. B.O.H. F. 1750°F. 2½ hrs. Air 1575°F. 1½ hrs. Water 1125°F. 4 hrs. Air	A. A-II (.12C,4.0 Mn,.80Si, 20.0Cr, 9.7Ni)* B. Armorloy AC-5 C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up bar B. 1. II 5/32" 1a 140 - 3/16" 1a 180 - 2. III 1/4" 3a 4b 260 - 1/4" 4b 250-- 3. III 5/32" 4b 140 - 1/4" 2b 260 - C. 3.49 hrs. 140° - 330°F. D. Grinding after first pass	A.100°F B.None	1 2	1132 1168	3/4" R	7/8" R	6½" D 5½" U	Imp Imp	II V I II V	2" 1½" 4½" 1½" 36" 45½"	Passed radiograph
		*Weld Metal													

IDENTIFICATION A. FIRM NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SEQ EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PWHT B. POST	N	BALLISTIC RESULTS VEL. f/s	LOCATION OF N LL	LOCATION OF N RL	LOCATION OF N S.E.	CRACKING LOC.	CRACKING TYPE	CRACKING AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-269 B. 2/15/43 C. I.H.C. 54 D. Ordnance Steel E. Metal & Thermit F. International Harvester Co.	A. 1-1/2" B. C-III (1.45Mn,.3981 .40Mo) C. .27 D. Face 321 Back 321 E. B.O.H. F. 1750°F. 2½ hrs. Air 1600°F. 1½ hrs. Water 1150°F. 4 hrs. Air	A. A-I (.08C,1.45 Mn,.4781, 19.33Cr, 9.61Ni, 2.00Mo) B. Murex C. --- D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 130 - 3/16" 1a 185 - 2. III 1/4" 1a 255 - 1/4" 1a 2b 260 - 1/4" 4b 245 - 1/4" 1b 160 - 1/4" 1b 265 - 3. III 5/32" 2b 135 - 5/32" 2b 140 - 1/4" 2b 250 - C. 4.33 hrs. 150° - 280°F. D. Grinding after first pase.	A.100° F B.None	1 2 3 4	1160 1220 1281 1289	5/8" R 1½" L	½" L 2" L	5½" D 6½" U 7" U 9" D	Imp Imp Imp	II II I II III V	1½" 1" 4½" 2½" 6½" 4" 19½"	Passed radiograph
A. AD-269 B. 2/15/43 C. I.H.C. 65 D. Ordnance Steel E. McKay Company F. International Harvester Co.	A. 1-1/2" B. C-III (1.55 Mn,.44 Si,.42Mo) C. .38 D. Face 268 Back 275 E. B.O.H. F. 1750°F. 2½ hrs. Air 1575°F. 1½ hrs. Water 1125°F. 4 hrs. Air	A. A-II (.12C,4.0Mn, .80Si, 20.0Cr, 9.7Ni) B. Armorloy C. Lime D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper back up B. 1. II 5/32" 1a 140 - 3/16" 1a 185 - 2. III 1/4" 1a 255 - 1/4" 1a 3b 260 - 1/4" 4b 245 - 1/4" 2b 270 - 3. III 5/32" 4b 140 - 1/4" 2b 255 - C. 5.40 hrs. 160° - 320°F. D. Grinding after first two passes	A.100° f B.None	1	1111	1" R		6" D	Imp O	II I	¾" 11½"	Passed radiograph
		*Weld Metal															

SPECIMEN A. Plate Number or Identification B. Date of Test C. Plate No. D. Armor Manufacturer E. Electrode Spec. F. Armor Preparation	ARMOR DATA A. Plate Thickness B. Type C. Carbon Content D. Hrn E. Process F. Heat Treatment Temp Time Quench	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing Passes B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. f/s	Location of N L.L.	R.L.	S.E.	Cracking Loc	Type	Amt	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-142 B. 12/23/42 C. 31-KB-5 D. Utility Steel E. McKay Company F. Kay Brunner Steel Products	A. 1-1/2" B. C-I (1.07Mn,.53Si, .60Cr,.63Ni, .21Mo) C. .27 D. --- E. Elec. F. 1850°F 6 hrs Air 1250°F 5 hrs Air 1650°F 1/3 hr Water	A. A-II (.11C,3.90 Mn,.60Si, 19.82Cr, 10.45Ni)* B. Armorloy C. Lime D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting Grinding	A. B. 1. II 5/32" 2a 130 - 24 2. III 3/16" 2a 175 - 25 1/4" 2a 4b 200 - 27 3. III 3/16" 4b 175 - 25 1/4" 2b 200 - 27 C. 13.15 hrs 100° - 130°F D. Cracking in first pass, ground out	A. None B. None	1	1106	1" R		4¾" D	Imp	I II III V	2½" 3½" 1½" 9¾" 28"	Passed radiograph
						2	1144		¾" R	2½" U	Imp	I II III V	2" 6" 1" 1¾"	
A. AD-319 B. 3/12/43 C. KB-7 D. Utility Steel E. McKay Company F. Kay-Brunner Steel Products	A. 1-1/2" B. C-I (1.07Mn,.38Si, .47Cr,.74Ni, .31Mo) C. .35 D. --- E. Elec, F. 1850°F. 6 hrs. Furnace 1250°F. 6 hrs. Furnace 1600°F. 2 hrs. Water 1200°F. 6 hrs. Air	A. A-II (.09-.10C, 4.31-4.41 Mn,.40-64 Si,19.90-20.21Cr, 8.95-10.15Ni)* B. Armorloy C. Lime D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 2a 125 - 24 2. III 3/16" 2a 175 - 24 1/4" 2a 4b 210 - 24 3. III 3/16" 2b 160 - 24 3/16" 2b 175 - 24 1/4" 2b 210 - 24 C. 8:30 hrs. 100° - 195°F. D. Grinding after first and third passes. Time 2 hrs.	A. Yes B. None	1	1024	¾" R		6¼" U	Imp	I II V	4½" 2½" 8"	Failed radiograph 4" crack in cross-bar 1/2" crack at
						2	1161		¾" R	5¾" D	Imp	I II V	3" 2" 18½" 38⅛"	right weld junction

*Weld Metal

IDENTIFICATION A. FIELD RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V (PASSES) 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	R	VEL. F/S	LOCATION OF H L.I.	H.L.	O.B.	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-262 B. 2/16/43 C. 6-5501-2-1 D. Pittsburgh Steel Fdry. Corp. E. Lincoln Elec. Co. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. C-I (1.03Mn, .40Si, .53Cr, .50Ni, .48Mo) C. .30 D. Face 269 Back 277 E. B.O.H. F. 1850°F. 6 hrs. Air 1200°F. 6 hrs. Furnace 1600°F. 6 hrs. Water 1150°F. 8 hrs in Furnace to 700°F. in air	A. A- --- B. Armorweld C. --- D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" backing strip Sae 1015 B. 1. II 5/32" 2a 170 - 30 2. II 5/32" 4b 170 - 30 3/16" 4b 230 - 30 1/4" 4b 270 - 30 3. III 5/16" 6b 300 - 30 C. 9 hrs. 70° - 190°F. D. Backing removed after first bead.	A. None B. None	1	1055		¾" L	7½" D	Imp	I II	2½" 20½" 23"	Passed radiograph Excessive piping in plates adjacent to welds
A. AD-262 B. 2/16/43 C. 7-5501-3-1 D. Pittsburgh Steel Fdry. Corp. E. Arcos Corp. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. C-I (1.03Mn, .40Si, .53Cr, .50Ni, .48Mo) C. .30 D. Face 269 Back 277 E. B.O.H. F. 1850°F. 6 hrs. Air 1200°F. 6 hrs. Furnace 1600°F. 6 hrs. Water 1150°F. 8 hrs. Furnace to 700°F Air	A. A-I (.10C, 3.27 Mn, .32Si, 18.50Cr, 10.25Ni, .97Mo)* B. Chromang C. Lime D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild Steel SAE 1015 B. 1. II 5/32" 1a 170 - 30 5/32" 1a 175 - 30 2. II 5/32" 4b 170 - 30 3/16" 8b 200 - 30 3. III 1/4" 6b 260 - 30 C. 9 hrs. 70° - 170°F. D. Backing removed after first pass.	A. None B. None	1 2	1091 1219	 ¼" L	¾" L	5" D 7½" U	Imp Imp	I II III I II V	3" 7" 4" 18½" 17¼" 8¼" 57¾"	Passed radiograph Lg. amount of shrinkage in plates
		*Weld Metal												

A. [illegible] B. [illegible] C. PLATE: NO. D. [illegible] E. [illegible] F. [illegible]	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. [illegible] E. PROCESS F. HEAT TREATMENT TEMP TIME COOLING	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDER PROCEDURE A. BACKING B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	N	WELDER QUALIFIED VEL. F/M	LOCATION OF B L.L.	R.L.	U.L.	GRADING LOC	TYPE	AMT.	REMARKS OR STANDARD RADIOGRAPH REPORT NO. ETC.
A. AD-327 B. 3/15/43 C. 8-5501-2-1 D. Pittsburgh Steel Fdry. Corp. E. Lincoln Elec. Co. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. C-I (1.03Mn,.40Si, .53Cr,.50Ni, .48Mo) C. .30 D. Face 269 Back 277 E. B.O.H. F. 1850°F. 6 hrs. Air 1200°F. 6 hrs. Furnace 1600°F. 6 hrs. Water 1150°F. 8 hrs. Furnace to 700°F.Air	A. A --- B. Armorweld C. Lime D. DC REV	A. 60°DV B. 1/4" C. Machining	A. 3/8" Backing strip SAE 1015 B. 1. II 5/32" 2b 160 - 30 5/32" 2b 175 - 30 2. II 5/32" 2b 175 - 30 3/16" 4b 210 - 30 1/4" 5b 250 - 30 5/16" 4b 290 - 30 3. II 5/16" 4b 290 - 30 C. 9 hrs. 70° - 210°F. D.	A. None B. None	1	1043	1¼" R		7½" D	Imp	I II	3½" 6½"	Passed radiograph Lg. amount of shrinkage in plates
						2	1101		1½" R	7½" U	O Imp	II I II III V	1½" 5" 4" 5½" 5½" 31½"				

A. AD-160 B. 1/1/43 C. 10 D. Pacific Car & Fdry. Co. E. McKay Company F. Pacific Car & Fdry. Co.	A. 1-1/2" B. C-III (1.06Mn,.64Si, .42Mo) C. .21 D. Face 207 Back 212 E. Basic Elec. F. 1850°F. 6 hrs. Air 1625°F. 3 hrs. Water 1200°F. 4 hrs. Air	A. A-I (.10C,4.50 Mn,18.5Cr, 8.9Ni, .40Mo)* B. Armorloy A-5 C. Lime D. DC REV	A. 30°DV B. 3/16" C. Machining	A. None B. 1. II 5/32" 1a 130 - 18 5/32" 1a 145 - 22 2. I 3/16" 6a 180 - 28 3. III 5/32" 4b 145 - 22 3/16" 2b 180 - 28 C. 9:10 hrs. 200° - 300°F. D.	A.None B.None	1	1091		X	6¾" D				Failed radiograph 20" incomplete fusion in left leg 14" incomplete fusion in right leg
						2	1113	1" L		4" U	Imp	II III V	6¼" 3" 47" 54¼"			
A. AD-160 B. 1/1/43 C. 12 D. Pacific Car & Fdry. Co. E. McKay Company F. Pacific Car & Fdry. Co.	A. 1-1/2" B. C-III (1.10Mn,.66Si .47Mo) C. .21 D. Face 197 Back 201 E. Basic Elec. F. 1850°F. 6 hrs. Air 1625°F. 3 hrs. Water 1200°F. 4 hrs. Air	A. A-I (.10C,4.50 Mn,18.5Cr, 8.9Ni, .40)* B. Armorloy A-5 C. Lime D. DC REV	A. 30°DV B. 3/16" C. Machining	A. None B. 1. II 5/32" 1a 130 - 18 5/32" 1a 145 - 22 2. I 3/16" 6a 180 - 28 3. III 5/32" 4b 145 - 22 3/16" 2b 180 - 28 C. 9:40 hrs. 200° - 300°F. D.	A.None B.None	1	1034	1¼" R		8" D	Imp	I II V	3¼" 3¼" 40" 47"			Failed radiograph 24" incomplete fusion in left leg 3" incomplete fusion in right leg Some piping in cast plate

*Weld Metal

IDENTIFICATION A. PLATE NUMBER OR B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR PREPARATION	BASE METAL DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION SIZE EL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	VEL. F/S	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	DEPTH	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-236 B. 2/11/43 C. MQ-29 D. Union Steel Casting Co. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. C-III (1.46Mn,.42Si, .55Mo) C. .30 D. Face 265 Back 265 E. --- F. ---	A. A (.12C,2.00 Mn,.50Si, 18.7-28.5 Cr,9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. AC STR	A. DV B. --- C. ---	A. Not given B. 1. II 3/16" 1a 170 - 3/16" 1a 290 - 2. III 5/16" 5a 3b 290 - 5/16" 1a 3b 300 - 3. II 5/16" 4b 290 - remainder not given C. 22 hrs. 150° - 200°F. D. Grinding after 1st, 2nd, 6th, 9th and 15th passes One less pass in right leg	A. 70°F. B. None	1 2 3	1049 1052 1048	 1 3/4" R 1 1/2" L	2 1/2" L	4 3/4" U 6" D 4 1/2" U	0 Imp Imp	V III V II	7" 3 1/2" 10" 8" 22 1/2"	Passed radiograph Large amount of shrinkage around right weld junction
A. AD-271 B. 2/19/43 C. MQ-32 D. Union Steel Casting Co. E. Crucible Steel F. Pressed Steel Car Company	A. 1-1/2" B. C-III (1.59Mn,.34 Si,.55Mo) C. .28 D. Face 257 Back 257 E. --- F. ---	A. A (.12C,.75 Si,1.60-2.0Mn, 20.5-22.5 Cr,9.5-11.0Ni)** B. Rezistol C. Slag D. DC REV	A. DV B. --- C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 2a 160 - 25 2. II 5/32" 4b 160 - 25 3/16" 10b 190 - 25 remainder not given 3. II --- C. 28 hrs. 150° - 200°F. D. Cracking after first pass Grinding after first, fourth and eight passes Three more passes in right leg and five more in crossbar	A. 70°F. B. None	1	1113		3/4" L	7" D	Imp	I II III V	7 1/2" 1 1/2" 9" 21" 38 1/2"	Failed radiograph Two 1/2" weld cracks, one 1-1/2" weld crack Shrinkage cracks in upper left leg plate
A. AD-271 B. 2/19/43 C. MQ-34 D. Union Steel Casting Co. E. Crucible Steel F. Pressed Steel Car Company	A. 1-1/2" B. C-III 1057-A (1.52Mn,.38Si, .53Mo) C-III 93-B (1.60Mn,.36Si, .54Mo) C-III 1066-A (1.55Mn,.35Si, .55Mo) C. .30 .27 .31 D. Face 285 Back 285 Face 327 Back 320 Face 285 Back 285 E. --- F. ---	A. A (.12C,.75Si 1.60-2.0Mn 20.5-22.5 Cr,9.5-11.0Ni)** B. Rezistol C. Slag D. DC REV	A. DV B. --- C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 1a 120 - 25 5/32" 1a 130 - 25 2. I 5/32" 2a 120 - 25 5/32" 2a 130 - 25 3/16" 2a 150 - 25 5/32" 1a 130 - 25 3. I 3/16" 2a 150 - 25 C. 22 hrs. 150° - 200°F. D. Grinding after 1st, 4th, 5th, and nineth passes. Three less passes in crossbar. Left leg of 1057-A, right leg of 93-B, upper center section and lower center section of 1066-A	A. 70°F. B. None	1 2	1101 1104	1 1/4" L	1/2" L	8" D 7 1/4" U	Imp Imp	I II V I II V	2" 7" 12 1/2" 2 3/4" 2 3/4" 41 1/2" 68"	Welds acceptable Plate is unsound Shrinkage cracks, gas pockets and inclusions in plates adjacent to weld deposits

**Base Wire

SPECIFICATION A. PLATE CASTING NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	ARMOR DATA A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. DATA E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE SPEC. A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	ARMOR PREPARATION A. GROOVE, BEVELED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DISPOSITION SEE SL. NO. TYPE SEE V 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALANCED SECTION SL	VOL. PER	LOCATION OF SL C.L.	E.L.	S.L.	CRACKING LOC	TYPE	AMT	RESULTS OF CRACKING RADIOGRAPH AND MAGNETIC INSP.
A. AD-312 B. 3/9/43 C. MQ-36 D. Union Steel Casting Co. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. C-III 1090 (1.36Mn,.378i, .53Mo) C-III 81-B (1.36Mn,.418i, .53Mo) C-III 1066-A (1.55Mn,.348i, .55Mo) C. .27 .29 .31 D. Face 285 Back 285 Face 268 Back 268 Face 285 Back 285 E. --- F. ---	A. A (.12C,2.00 Mn,.50Si, 18.?-28.5 Cr,9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. DC REV	A. 75°DV B. 1/8" C. Flame Cutting Grinding	A. Not given B. 1. II 5/32" 1a 120 - 25 5/32" 1a 130 - 25 2. I 5/32" 2a 120 - 25 5/32" 4a 130 - 25 3/16" 1a 150 - 25 3. I 3/16" 2a 150 - 25 C. 22 hrs. 150° - 200°F. D. Cracking after first pass. Grinding after 1st, 4th, and 7th passes. Three more passes in crossbar. Left leg is of 1066-A, right leg of 81-B, upper center and lower center sections are of 1090.	A. 70°F B. None	1	1095		X	4½" U	Imp	II 3" III 7" V 16½" V 3½"	Passed radiograph Large amount of shrinkage in right plate
							2	1087	X		6¾" D	O Imp	II 1½" III 1½" I ¾" II 4" III 1½" V 18" 57½"	
A. AD-312 B. 3/9/43 C. MQ-37 D. Union Steel Castings Co. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. C-III 68-B (1.79Mn,.428i, .57Mo) C-III 84-3 (1.74Mn,.358i, .53Mo) C-III 109-C (1.49Mn,.408i, .56Mo) C. .30 .28 .29 D. Face 270 Back 262 Face 260 Back 252 Face 255 Back 255 E. --- F. ---	A. A (.12C,2.00 Mn,.50Si, 18.7-28.5 Cr,9.5-10.7Ni, 1.5-2.25 Mo)** B. A-6 C. Slag D. DC REV	A. 75°DV B. 5/32" C. —	A. Not given B. 1. II 5/32" 1a 130 - 25 3/16" 1a 150 - 25 2. II 5/32" &b 130 - 25 3/16" 10b 150 - 25 remainder not given 3. II --- C. 24 hrs. 150° - 200°F. D. Grinding after 1st, 8th, 10th, 13th and 14th passes. One less pass in right leg and three more in crossbar. Left leg is of 68-B, right leg of 109-C, upper center and lower center sections are of 84-3	A. 70°F B. None	1	1100		X	5¾" D	Imp	II V	2¾" 46½" 49¼"	Passed radiograph Large amount of shrinkage in left leg plate
		**Base Wire												

IDENTIFICATION A. Welder Symbol No. B. Date of Test C. Plate No. D. Welder Identification E. Electrode Spec. F. Welder Foreman	BASE METAL A. Plate Thickness B. Type C. Carbon Content D. Size E. Process F. Heat Treatment Temp Time Cooling	ELECTRODE DATA A. Type B. Trade Name C. Coating D. Current & Polarity	JOINT DESIGN A. Groove, Included Angle, Root Face B. Root Gap C. Plate Preparation	WELDING PROCEDURE A. Backing B. Deposition Size El. No. Type Amp V. 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Inter Pass Temperature D. Remarks	HEAT A. Pre B. Post	BALLISTIC RESULTS N	Vel. F/S	Location of N L.L.	Location of N R.L.	Location of N S.E.	Cracking Loc.	Cracking Type	Cracking Amt.	REMARKS ON COMBINED RADIOGRAPHIC RESULTS, ETC.
A. AD-244 B. 2/11/43 C. MQH-57 D. Sivyer Steel Casting Co. E. Metal & Thermit Corp. F. Pullman Standard Car Mfg. Co	A. 1-1/2" B. C-I (.86Mn,.43Si, .44Cr,.46Ni, .46Mo) C. .30 D. Face 335 Back 235 E. Acid-Elec. F. ---	A. A- --- B. Murex C. --- D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding	A. Copper backing B. 1. II 1/4" 1a 250 - 28 5/16" 1a 280 - 32 2. I 5/16" 8a 280 - 32 3. III 5/16" 6b 280 - 32 C. 8 hrs. 225° - 320°F. D. Cracking after second pass. Chipping after all passes.	A. None B. None	1	1107		X	3¾" D	Imp	II III	1" ¼"	Passed radiograph
						2	1161	1½" R		6" U	Imp	II V	2" 2½" 5½"	

RESTRICTED

TITLE: Welding of Armor

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ABSTRACT:

Some 172 firing record data for 1 1/2 in. homogeneous armor "H" plates, welded with austenitic electrodes, are tabulated, and a comparison is made of the ballistic shock performance of plates manufactured with various materials and welding procedures. Within the range of chemical composition of commercial rolled homogeneous armor, steel quality was indicated as having more effect on ballistic performance of hand welded plates than variations in chemical analysis. Of 26 Uniomelt welded plates, only two were comparable in ballistic performance to satisfactory hand-welded plates. Cast assemblies showed a higher proportion of cracking in the unaffected plate than in the weld, fusion, and heat-affected zones. It was found that the ratio of plate to weld cracking decreases with increase in hardenability and with improvement in radiographic soundness of cast armor.

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