WATERTOWN ARSENAL LABORATORY

EXPERIMENTAL REPORT

NO WAL 640/113

WELDING OF ARMOR

Summary of Ballistic Tests of Welded Armor Plate
1-1/2 inch Homogeneous Armor "H" Plates Welded [illegible]
Watervliet Arsenal and Tested at Aberdeen Proving Ground
during the Period 1 April 1942 to [illegible] August 1943

BY

S. A. Herres,
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DATE 10 August 1944

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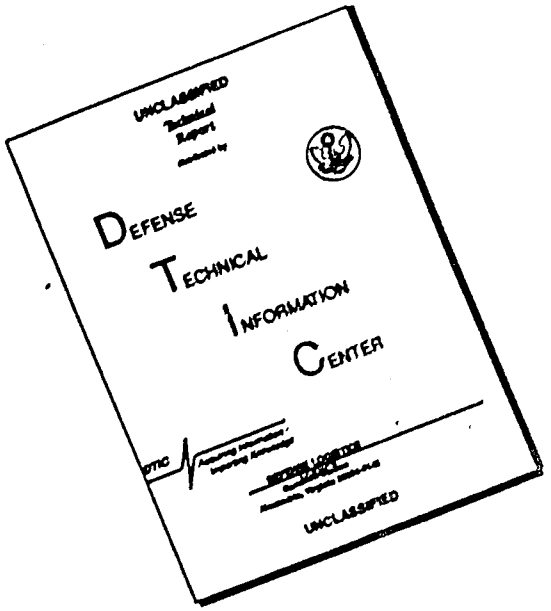

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Watertown Arsenal Laboratory (unclassified)
Report Number WAL 640/113
Problem No. D-3.4

10 April 1944

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 1 April 1943 through 30 September 1943

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 117 Aberdeen Proving Ground firing records have been tabulated on accompanying charts and tables.

2. The relative performance of hand welded rolled armor "H" plates was much better than that of Unionmelt welded rolled armor "H" plates or hand welded cast armor "H" plates even though the ballistic test requirements for the latter group are considerably less severe.

3. Steel quality (cleanliness and directional properties) of rolled armor hand welded "H" plates was indicated as having more influence on ballistic performance than any other variable considered for this group. Chemical compositions of either armor plate or weld metal, within the ranges reported for this group of "H" plates, did not appear to have a large effect on ballistic performance. The use of a combination of weaves and beads in the body of the weld and of a multiple bead crown appeared more desirable than a straight weaving technique throughout.

4. Insufficient hardenability, of rolled armor in Unionmelt welded plates, to produce adequate impact resistance in the slowly cooled weld heat-affected zone appeared to be the principal deficiency of the plates in this group. Accordingly, use of high alloy armor plate or alternately a high proportion of hand to Unionmelt weld passes effected some improvement.

5. Inadequate heat treatment of cast armor resulted in a high proportion of ballistic cracking in plate beyond the zone affected by the heat of welding and prevented a fair comparison of welding variables.

6. No correlation between radiographic soundness and ballistic performance was evident.

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(unclassified)

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INTRODUCTION

This is the fifth of a series of reports intended to make available to persons concerned with the welding of armor structures information as to ballistic performance of "H" plates welded with various materials and procedures by commercial fabricators. The following reports of this series have been distributed to date:

WAL 640/73 - 1 and 1-1/2 Inch Homogeneous Armor Welded with Ferritic Electrodes and Tested at A.P.G. prior tc 25 February 1943.

WAL 640/84 - 1-1/2 Inch Homogeneous Armor Welded with Austenitic Electrodes and Tested at A.P.G. 1 October 1942 through 31 March 1943.

WAL 640/89 - 1 and 3/4 Inch Homogeneous Armor Welded with Austenitic Electrodes and Tested at A.P.G. 1 October 1942 through 31 March 1943.

WAL 640/90 - 1/2, 3/8, and 1/4 Inch Homogeneous Armor Welded with Austenitic Electrodes and Tested at A.P.G. 1 October 1942 through 31 March 1943.

On the charts of Appendix A are tabulated data taken from 117 firing records for qualification and development tests of welded ballistic test plates of rolled or cast homogeneous armor. The tabulation includes all firing records received by this arsenal for 1-1/2 inch thick "H" plates welded with austenitic electrodes and fired at Aberdeen Proving Ground during the period from 1 April 1943 through 31 September 1943. An index to the fabricators, armor manufacturers and electrode manufacturers is given in Table I. The tabulation has been divided into four parts: (1) Plates assembled from rolled armor by hand welding; (2) Plates assembled from rolled armor by Unionmelt welding; (3) Plates assembled from cast armor by hand welding; and (4) Plates assembled from cast armor by Unionmelt welding. A summary of current ballistic shock test specification requirements for "H" plates welded with austenitic electrodes and a key to tabulation methods and symbols used in this report are included in Appendix A.

GENERAL COMMENTS

Firing record data show cracking as located in weld metal, fusion zone, heat-affected zone, or plate based upon surface appearance. However, 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 this report, all cracking within one-eighth inch of edge of weld is included as weld cracking and the remainder as plate cracking.

Ballistic performance of "H" plates can be evaluated in terms of the amount of cracking produced by each round provided that proper allowances are made for variations in velocity and location of impact and effect of prior impacts on each plate. The average plate and weld cracking have

been tabulated in terms of severity of ballistic test in Table II. Although no exact evaluation of the effect of ballistic variations is possible from this table, the corrections used previously in comparing austenitic welded 1-1/2 inch "H" plates (see Table III) seem to provide reasonable comparisons and were used in calculating average weld metal cracking throughout this report.

The 75 mm. test projectile seldom produces weld cracking when fired at specified velocity if the impact does not touch or overlap the weld. Rounds striking at a distance (center of weld to center of impact) greater than 1-1/2 inches were therefore not included in the averages.

Armor of satisfactory quality should not crack to any large extent in areas beyond the zone affected by the heat of welding under conditions of testing specified for welded plates. When plate cracking is excessive the weld itself does not receive a fair test. Hence it is necessary to consider amount of plate cracking when comparing welded plates.

In Tables IV through XVI changes in the more important variables introduced by welding materials and procedures are compared on the basis of average cracking per round after correcting, as indicated above, for ballistic severity. For the limited number of test results available, this method serves principally to indicate trends and the tables in this report are intended only to encourage further observation and analysis.

Specification requirements were changed 25 June 1943 by amendment to Specification AXS-497, Rev. 3. Table XVII gives the number of plates which met or failed to meet both new and old specification requirements. Plates were judged as "no test" when there were no impacts within specified areas at required velocities.

HAND WELDED, ROLLED ARMOR, H PLATES

Of a total of 69 plates in this group, 22% may be considered as failing the ballistic requirements in effect prior to 25 June 1943 and 30% as failing the present specification requirements.

Fabricators - Table IV

The performance of plates welded by various fabricators is dependent upon the quality of the electrodes and armor used as well as the welding procedure and inspection control.

Armor Data - Table V

All of the rolled armor compositions contain sufficient alloy to produce a completely hardened structure during quenching. They have been drawn to hardness levels within the relatively narrow range of 255 to 321 Brinell in order to meet the ballistic requirements for shock and penetration resistance of unwelded armor. The carbon range is only from .22% to .30%. Within these limits of carbon content and Brinell hardness, and for

fully quenched-out steel, no specific influences of carbon content, hardness, or type and amounts of any of the alloying elements appears to influence average weld cracking. It is interesting to note that the Disston composition has been changed from .50 Mn, .10 Cr, 4.7 Ni, .30 Mo, .10 V to .80 Mn, .90 Cr, .95 Ni, .30 Mo, .15 Cu with some slight improvement in the amount of weld cracking of the new over the earlier analysis. These Disston plates were the best in ballistic performance of all armor plates in this group - one plate being impacted with seven rounds at velocities up to 1349 ft./sec. without excessive cracking. Steel quality (cleanliness and directional properties) appears to be reflected in ballistic performance more than any other difference among the various armors.

Electrodes - Table VI

The number of plates tested for any one electrode was too small to make general comparisons. Chemical compositions reported in the firing records were often questionable, and no correlation was evident between electrode compositions and average weld cracking. There was little difference between Mn and Mo modified electrodes.

Joint Design - Table VII

All plates in the group were prepared with double V bevels. A slight trend toward improved performance with included angles greater than 45° was apparent. Root gap does not appear to be an important factor. Any effect of plate edge preparation is apparently masked by other variables.

Welding Procedure - Table VIII

No correlation is apparent between total number of passes and ballistic cracking. The use of a combination of beading and weaving in the body of the weld appears to resist ballistic shock better than either a straight beading or full weaving technique. A multiple pass crown (annealing bead technique) appears more desirable than a single weave crown. Preheating above 110° F. was used on only four plates and no benefit therefrom was apparent for these plates.

Radiographic Examination - Table IX

The average cracking for plates failing to meet the radiographic soundness standards was less than for those passing radiographic examination. This circumstance is probably explained by the following considerations: (1) The area most susceptible to radiographic defects is the crossbar of the "H" plate and impacts are placed on the leg welds at an average distance of six inches from the crossbar; (2) The present radiographic standards are quite severe and reject plates for defects which do not have a large influence in ballistic performance.

UNIONMELT WELDED, ROLLED ARMOR, H PLATES

Of a total of 22 plates in this group, 74% may be considered as failing the ballistic requirements in effect prior to 25 June 1943, and 95% as failing to meet the present specification requirements.

Tables X through XV show comparison of these plates on the basis of average cracking for various fabricators, armors, electrodes, joint design, welding procedures, and radiographic results.

The principal shortcoming of the Unionmelt process for current composition of armor plate is that the large heat input of the welding process raises the plate metal adjacent to the weld to a high temperature from which it cools slowly. This produces a "slack-quenched" heat-affected zone which tends to develop extensive cracking in that zone under a properly placed ballistic impact.

In general, use of an alloy armor composition of relatively high hardenability improves this condition. One such plate (Republic 4.74% Ni) was included in this group. Performance of this plate was best of all plates welded with two or more Unionmelt passes, and failure was entirely in weld metal and fusion zone.

Influence of variations in joint design is masked by other variables. The use of all Unionmelt passes or of Unionmelt passes on both sides of plate appears to give consistently higher average cracking values than the use of a large proportion of hand welding and one Unionmelt pass on one side of the plate only. Radiographic examination indicated the majority of Unionmelt plates to be unacceptable under present standards, but there is no correlation between radiographic soundness and ballistic performance of these welds.

HAND WELDED, CAST ARMOR, H PLATES

Of a total of 22 plates in this group, 27% may be considered as failing the ballistic requirements in effect prior to 25 June 1943, and 50% as failing the present specification requirements.

Welded cast armor H plates ballistically tested during the period of 1 October 1942 through 31 March 1943 performed erratically and in a majority of tests, there was more cracking in the unaffected plate than in the vicinity of the welds. It was concluded that the welded H plate incorporating notches and high residual stresses provided a very severe test of inadequately heat-treated cast armor compositions, and that the considerable plate cracking invalidated any comparison of welding variables.

The present group of plates indicates the same general conclusions. Reference to Table II shows both weld and plate cracking, but especially plate cracking, to be greater for cast than for rolled plates, although the cast plates were tested at a velocity of impact averaging 50 ft./sec.

less than the rolled plates. Table XVI shows comparisons between the various cast armor compositions tested but, without complete knowledge of the efficiency of the heat treatment and soundness, no conclusions regarding the suitability of various compositions seem possible. So long as there is such a large proportion of ballistic cracking in the unaffected plate, no attempt at tabular comparison of welding variables appears justifiable.

UNIONMELT WELDED, CAST ARMOR, H PLATES

The two plates of this group were each welded with four hand and two Unionmelt passes. Both plates withstood one round to meet specification requirements but were borderline on subsequent fair rounds and, therefore, judged inconsistent and "no test" by Aberdeen Proving Ground.

TABLE I

Index to Plates

Hand Welded, Rolled Armor, H Plates

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
1 - 2	5	Baldwin Locomotive Works	Disston	McKay Alloy Rods Harnischfeger
3	1	Briggs Mfg.	Carnegie-Illinois	Crucible
4	1	Chicago Vitreous Enamel Products	Jones & Laughlin Great Lakes	Crucible
5	2	Federal Machine & Welder	Republic	Lincoln Alloy Rods
6 - 7	2	Fisher Tank	Youngstown	McKay Maurath Alloy Rods Reid-Avery
8	3	Fitzgibbons Boiler	Republic Jones & Laughlin Carnegie-Illinois	Alloy Rods Metal & Thermit
9	1	Florence Stove	Jones & Laughlin Great Lakes	Crucible
10 - 11	4	Ford Motor	Ford Motor	Alloy Rods Page Harnischfeger Crucible
12 - 13	3	General American Trans.	Republic	Alloy Rods Harnischfeger
14	1	General Spring & Bumper	Great Lakes Jones & Laughlin	Crucible
15	1	Holland Furnace	Great Lakes	Crucible
16 - 19	6	Ilco Ordnance	Republic Carnegie-Illinois	Crucible Alloy Rods Harnischfeger A. O. Smith Metal & Thermit Page
20	1	Kalamazoo Stove	Great Lakes	Crucible
21 - 24	10	Lima Locomotive	Youngstown Jones & Laughlin	Arcos Alloy Rods Lincoln Electric

TABLE I (Cont.)

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
25 - 30	14	Midland Steel	Carnegie-Illinois	Crucible Reid-Avery
31	2	New York Air Brake	Jones & Laughlin	Page Metal & Thermit
32 - 35	9	Pressed Steel Car	Carnegie-Illinois Republic Great Lakes Youngstown	Crucible Reid-Avery Hollup McKay
36	2	Pullman Standard Car	Carnegie-Illinois	Metal & Thermit A. O. Smith
37	1	Standard Steel Spring	Jones & Laughlin	Crucible
		Unionmelt Welded, Rolled Armor, H Plates		
38 - 39	4	Briggs Mfg.	Carnegie-Illinois	Linde Air Products
40	1	Fisher Tank	Great Lakes	McKay Linde Air Products
41	1	Ford Motor	Ford Motor	Metal & Thermit Linde Air Products
42 - 43	4	Midland Steel Products	Carnegie-Illinois	McKay Crucible Linde Air Products
44 - 46	8	New York Air Brake	Jones & Laughlin Republic Carnegie-Illinois	McKay Lincoln Electric Linde Air Products
47	1	Pressed Steel Car	Carnegie-Illinois	Crucible Linde Air Products
48 - 49	3	Pullman Standard Car	Carnegie-Illinois Republic	Metal & Thermit A. O. Smith Linde Air Products
		Hand Welded, Cast Armor, H Plates		
50	2	Chrysler-Plymouth	Continental American	Alloy Rods McKay
51 - 55	5	Fisher Tank	Pittsburgh American Radiator Standard Sanitary Symington Gould Continental National Roll Sivyer Castings	McKay Maurath Alloy Rods Reid-Avery Harnischfeger

TABLE I (Cont.)

Chart No.	No. of Plates	Fabricator	Armor Mfgr.	Electrode Mfgr.
56	3	Ilco Ordnance	Sivyer	Alloy Rods Crucible
57	3	Lima Locomotive	Continental Pittsburgh	Alloy Rods
58 - 62	10	Pressed Steel Car	Union Continental General	Crucible Hollup
63	1	Pullman Standard Car	Symington-Gould Sivyer	McKay Hollup
		Unionmelt Welded, Cast Armor, H Plates		
64 - 65	2	Pressed Steel Car	Symington-Gould Union Continental General	Crucible Linde Air Products

TABLE II

Severity of Ballistic Test

Vel. f/s	1st Round A	1st Round B	1st Round C	2nd Round A	2nd Round B	2nd Round C	3rd Round A	3rd Round B	3rd Round C	4th Round A	4th Round B	4th Round C	5th Round A	5th Round B	5th Round C	6th Round A	6th Round B
Rolled H Plates																	
1176-1300	7	0	9.28	37	.81	10.07	35	.22	12.15	16	1.54	10.45	2	.50	5.00	1	0
1126-1175	2	0	1.38	8	0	6.44	2	3.50	7.63	2	.75	12.75					
1075-1125	55	.06	4.09	20	.38	7.34	6	.33	7.00	1	0	0				1*	4.00*
1025-1074	6	.28	4.91	2	0	12.50	2	0	12.63								
950-1024																	
Unionmelt Rolled H Plates																	
1176-1300				6	0	17.79	5	.45	16.80	1	0	22.00	1	0	0	1	0
1126-1175	1	0	36.00	1	3.00	14.00											
1075-1125	20	.55	15.23	8	0	14.59	4	0	27.00	1	0	0					
1025-1074				1	0	25.25											
950-1024																	
Cast H Plates																	
1126-1200				3	3.08	7.33	2	1.00	8.25	2	3.75	9.00	1	2.50	7.00	1	0
1076-1125	6	7.04	8.00	7	5.95	8.21	6	2.54	6.95	1	0	6.50					
1025-1075	18	1.51	6.34	10	4.95	9.85	6	2.75	13.13	2	1.50	12.50					
975-1024				3	.66	11.75											
900- 974																	

NOTES: A = Number of Rounds B = Average Plate Cracking C = Average Weld Cracking
* = 7th Round

TABLE III

Weld Cracking Corrections for Ballistic Severity

(Center of impact no further than 2 inches distant from center of weld)

Vel. f/s	1st Round	2nd Round	3rd Round	4th Round
		Rolled H Plates		
1176-1300+	-1.0	-3.0	-5.0	-7.0
1126-1175	- .5	-2.5	-4.5	-6.5
1075-1125	0	-2.0	-4.0	-6.0
1025-1074	+ .5	-1.5	-3.5	-5.5
950-1024	+1.0	-1.0	-3.0	-5.0
		Cast H Plates		
1126-1200	-1.0	-3.0	-5.0	-7.0
1076-1125	- .5	-2.5	-4.5	-6.5
1025-1075	0	-2.0	-4.0	-6.0
975-1024	+ .5	-1.5	-3.5	-5.5
900- 974	+1.0	-1.0	-3.0	-5.0

TABLE IV

Fabricators of Hand Welded, Rolled H Plates

Armor Fabricator	No. of Plates	No. of Rounds	Av: Weld Cracking per Round (Corrected)(inches)
Baldwin Locomotive	5	16	2.59
Briggs	1	2	8.25
Chicago Vitreous	1	4	5.50
Federal Machine	2	5	2.80
Fisher Tank	2	5	5.40
Fitzgibbons	3	8	6.81
Florence	1	3	3.75
Ford Motor	4	9	11.38
General American Trans.	3	7	9.42
General Spring Bumper Div.	1	2	3.75
Holland Furnace	1	2	11.00
Ilco Ordnance	6	17	4.51
Kalamazoo Stove & Furnace	1	2	5.88
Lima Locomotive	10	21	9.02
Midland Steel	14	47	6.00
New York Air Brake	2	4	9.50
Pressed Steel Car	9	30	3.05
Pullman Standard Car	2	7	1.35
Standard Steel Spring	1	3	11.75

TABLE V

Armor Data for Hand Welded Rolled H Plates

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Hold(hrs.)	Quench	Brinell Hardness	No.of Plates	No.of Rounds	Av. Cracking per Round (Corrected) (inches) Weld	Plate
Carnegie-Illinois	I Mn-Cr-Ni-Mo	.26 - .28 C .95 - 1.33 Mn .19 - .26 Si .40 - .67 Cr .50 - 1.13 Ni .17 .51 Mo	850-1562 1040-1058 545-1022	3/4 1-3/4 1-1/4	Water Water Water	269-321	21	68	5.6	.45
Henry Disston & Sons	I Mn-Cr-Ni-Mo	.22 - .23 C .69 - .92 Mn .02 - .30 Si .79 - .98 Cr .89 - .98 Ni .32 - .35 Mo .15 - .16 Cu	1575 1125	2 2	Water Air	275-285	5	16	2.5	.81
Ford Motor	II Mn-Cr-Mo	.27 - .28 C 1.26 - 1.38 Mn .23 - .26 Si .50 - .56 Cr .40 - .45 Mo	1650 1100	3-1/2 5-1/4	Spray Air	269-293	4	9	11.4	0
Great Lakes	IV Mn-Cr-Mo-Si	.29 C .89 Mn .68 Si .61 Cr .16 Mo .08 Zr	1650 1040	3-3/4 4	Water Air	269-269	1	2	11.0	0

TABLE V (Cont.)

Manufacturer	Armor Type	Chemical Composition	Heat Treatment °F.	Hold(hrs.)	Quench	Brinell Hardness	No. of Plates	No. of Rounds	Av. Cracking per Round (Corrected) (inches) Weld	Plate
Jones & Laughlin	III Mn-Mo	.25 - .28 C 1.58 - 1.68 Mn .19 - .24 Si .34 - .52 Mo	1625 1080-1200	3/4 - 3½ 1½ - 3½	Water Air	269-302	6	16	7.8	.11
Republic Steel	I Mn-Cr-Ni-Mo	.26 C .87 Mn .27 Si .67 Cr .89 Ni .52 Mo	1300 1600 1200	1 3/4 1-1/2	Air Spray Air	255-255	5	12	6.7	.04
Republic	V High Alloy	.28 C .47 Mn .22 Si .22 Cr 4.05 Ni .39 Mo	Not given				1	3	6.1	0
Youngstown	III Mn-Mo	.23 - .30 C 1.62 - 1.87 Mn .19 - .20 Si .28 - .52 Mo	1650 1130-1175	2 3	Water Air or Water	269-285	10	21	8.2	1.03

TABLE VIa

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 B-S-W Armorarc B Armorarc	.07 - .17 C 1.50 - 4.75 Mn .05 - .80 Si 8.00 - 20.50 Cr 9.0 - 10.7 Ni 1.10 - 2.25 Mo	Mineral Titania Lime	8	24	5.13
	Armorarc B	.08 - .14 C 3.50 - 4.50 Mn .08 - .70 Si 19.0 - 21.00 Cr 8.50 - 10.50 Ni	Titania Lime	3	8	11.78
A. O. Smith	SW-164	.08 - .11 C 3.20 - 3.90 Mn .35 - .50 Si 18.0 - 19.5 Cr 9.0 - 10.0 Ni .98 - 1.15 Mo	Lime	2	8	2.12
Crucible Steel Corp.	Armorize Rezistal	.07 - .14 C 1.62 - 2.60 Mn .19 - 1.17 Si 16.76 - 20.18 Cr 8.0 - 10.28 Ni .71 - 2.40 Mo	Titania	23	70	5.82
	Armorize Mn	.09 - .11 C 3.91 - 4.11 Mn .18 - .33 Si 20.06 - 20.18 Cr 9.94 - 10.00 Ni .88 - .98 Mo		2	5	10.05

TABLE VIa (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Crucible Steel Corp. (Cont.)	Armorize	1.79 Mn .02 C .49 Si 20.5 Cr 10.85 Ni		1	3	10.33
Hollup Corp.	Armorod	.14 C 4.26 Mn .51 Si 19.78 Cr 9.72 Ni .74 Mo	Lime	1	4	1.00
Harnischfeger Corp.	AW-3-C	.12 - .17 C 4.75 Mn .80 Si 19.0 - 20.5 Cr 10.0 - 10.7 Ni 1.10 Mo	Lime	2	5	11.65
	AW-3-A	.11 - .13 C 1.64 - 1.80 Mn .55 - .59 Si 18.1 - 19.7 Cr 9.8 - 10.7 Ni 1.23 - 2.00 Mo	Titania	3	7	8.92
Lincoln Electric	Armorweld	.08 - .14 C 3.50 - 4.25 Mn .30 - .80 Si 17.71 - 20.5 Cr 8.57 - 10.0 Ni	Lime	3	6	8.21

TABLE VIa (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Metal & Thermit Corp.	Murex	.07 - .17 C 3.3 - 4.75 Mn .30 - .80 Si 18.0 - 20.82 Cr 8.5 - 10.7 Ni .55 - 1.10 Mo	Lime	4	9	8.33
McKay Co.	A-5	.10 - .14 C 3.08 - 4.20 Mn .61 - .67 Si 18.58 - 20.30 Cr 8.72 - 10.85 Ni 1.0 Mo	Lime	4	14	1.76
	Armorloy A-6	.12 C 2.25 Mn .41 Si 17.07 Cr 9.48 Ni 2.22 Mo	Titania	1	2	4.25
Page Steel & Wire	Page Allegheny	.13 C 3.95 Mn .33 Si 21.88 Cr 9.76 Ni .58 Mo	Titania & Lime	1	2	9.63
	Page Allegheny	.08 - .17 C 1.83 - 2.41 Mn .24 - .30 Si 18.46 - 20.70 Cr 9.45 - 10.90 Ni 1.48 - 1.89 Mo	Titania	1	4	5.88

TABLE VIa (Cont.)

Electrode Mfgr.	Brand	Weld Metal Composition	Coating	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Page Steel & Wire (Cont.)	Page Allegheny	.12 C 4.2 Mn .35 Si 19.31 Cr 11.15 Ni	Titania	1	3	6.66
Reid Avery		--- C 6.45 Mn .39 Si 18.82 Cr 10.20 Ni .81 Mo	---	1	4	2.18
		.07 - .17 C 3.30 - 4.75 Mn .80 Si 18.50 - 20.50 Cr 9.0 - 10.7 Ni 1.10 Mo	Manganese	1	3	7.33
Arcos Corp.	Chromang	.10 C 2.27 - 3.27 Mn .32 Si 18.50 Cr 10.25 Ni .97 Mo	Lime	4	7	7.67

TABLE VIb

(Rolled Homogeneous)

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	41	119	6.13
Mn Mod. 18/8	At least 1% Mn below .2% Mo	4	11	4.86
Mo Mod. 18/8	At least .3% Mo and less than 1% Mn	16	45	4.59

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	31	85	6.72
54° DV	4	14	3.91
60° DV	20	50	5.88
70° DV	1	4	7.68
75° DV	10	34	2.91

Root Gap (inches)	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
1/8	1	3	9.50
5/32	3	9	4.27
3/16	24	64	5.04
1/4	17	51	6.53
5/16	17	48	5.54
3/8	4	12	3.16
1/2	2	5	6.10

Plate Preparation	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Flame Cutting	23	72	5.85
Flame Cutting and Grinding	27	78	4.57
Flame Cutting and Machining	13	30	7.01
Flame Cutting, Grinding and Buttering	3	7	5.50

TABLE VIII

Welding Procedure Data for Hand Welded Rolled H Plates

No. of Passes	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
8	8	21	9.33
9	1	4	- .75
10	2	6	8.62
12	1	1	6.50
13	3	7	9.08
14	10	30	3.90
16	9	30	3.22
17	2	5	7.80
18	8	26	3.98
19	2	7	3.92
20	3	7	11.7
21	4	10	7.45
22	6	13	8.34
24	2	5	8.10
25	1	3	3.75
26	1	2	3.75
27	1	3	1.75
28	1	3	10.75
29	1	2	- 4.25
48	1	3	5.33
58	1	3	5.66

Backing	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Copper	38	109	5.62
Mild Steel	11	24	9.20
None	20	61	4.59

TABLE VIII (Cont.)

Root Deposition Type		No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
I	Single bead at root	5	13	6.13
II	Two beads at root	61	172	6.02
III	More than two beads	3	9	0
Body Deposition Type				
I	Layers only	26	64	6.27
II	Beads only	14	34	7.94
III	Layers and beads	31	94	4.62
Crown Deposition Type				
I	Single crown	13	37	7.34
II and III	Multiple crown	56	157	5.36

Preheat °F.	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
70 - 110	65	183	5.72
150	2	7	4.75
200	1	2	11.00
610	1	2	5.88

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	61	168	5.90
Failing	8	26	4.75

TABLE X

Fabricators of Unionmelt Welded Rolled Armor H Plates

Fabricator	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Briggs Mfg. Co.	4	9	13.88
Fisher Tank Division	1	3	14.58
Ford Motor Co.	1	2	11.25
Midland Steel	4	7	22.82
New York Air Brake	8	19	14.59
Pressed Steel Car Co.	1	3	16.83
Pullman Standard Car Mfg. Co.	3	4	16.94

TABLE XI

Armor Data for Unionmelt Welded Rolled Armor 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. Cracking per Round (inches) Weld (Corrected)	Av. Cracking per Round (inches) Plate
Carnegie-Illinois	I Mn-Cr-Ni-Mo	.25 - .28 C .95 - 1.21 Mn .15 - .26 Si .40 - .87 Cr .74 - 1.02 Ni .19 - .46 Mo	1550-1650 1150-945	3/4-1½-3½ 1-1/4	Water ---	277-302	16	32	16.36	.34
Ford Motor	II Mn-Cr-Mo	.27 C 1.36 Mn .27 Si .55 Cr .40 Mo	1650 1125	2 4	Spray Air	286-286	1	2	11.25	1.50
Great Lakes	II	.37 C .80 Mn .55 Cr .36 Mo	--	--	---	285-285	1	3	14.58	0
Jones & Laughlin	III Mn-Mo	.25 C 1.58 Mn .23 Si .41 Mo	1625 1060-1080	2½-3½ 2-3/4	Water Air	302-300	3	7	14.42	.32
Republic Steel	V High Alloy	.29 C .46 Mn .20 Si .04 Cr 4.74 Ni .36 Mo	1550 1150	3-1/2	Water Air	---	1	3	13.33	0

TABLE XII

Electrode Data for Unionmelt Welded Rolled Armor 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 #42	.21 - .27 C 3.43 - 4.00 Mn .49 - .86 Si 7.68 - 11.43 Cr 8.58 - 10.16 Ni .33 - .44 Mo	3	4	25.25
Linde Air Products and Lincoln Electric	Armorweld	.10 C 4.0 Mn .45 - .60 Si 19.5 - 20.00 Cr 9.0 - 9.5 Ni	7	18	13.40
	Oxweld	Not Given			
Linde Air Products and McKay Co.	Oxweld #42	.21 - .23 C 4.00 - 4.54 Mn .49 - .52 Si 7.48 - 7.68 Cr 8.18 - 8.58 Ni .24 Mo	2	4	20.81
	McKay	Not Given			
Linde Air Products and A. O. Smith	A.O.Smith 307	.08 - .09 C 3.84 - 3.90 Mn .48 - .50 Si 19.3 - 19.5 Cr 9.2 - 9.7 Ni .98 - 1.10 Mo	1	2	4.38
	Oxweld #42	.25 C 2.24 Mn 8.2 Ni 7.8 Cr			

TABLE XII (Cont.)

Electrode Manufacturer	Brand	Weld Metal Composition	No. of Plates	No of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Linde Air Products and Crucible Steel	Armorize	.08 - .09 C 1.77 - 1.78 Mn .19 - .30 Si 19.17 - 19.38 Cr 10.60 - 10.81 Ni 2.09 - 2.14 Mo	1	4	3.00
	Oxweld #42	.27 C 3.43 Mn .86 Si 11.43 Cr 10.16 Ni .33 Mo			
Linde Air Products and Crucible Steel	Oxweld #42	.21 C 4.00 Mn .49 Si 7.68 Cr 8.58 Ni .24 Mo	1	1	36.00
	Crucible	Not Given			
Linde Air Products and Crucible Steel	Oxweld	.10 C .13 Mn .55 Si 13.69 Cr 11.26 Ni .48 Mo	1	3	16.83
	Crucible	Not Given			

TABLE XII (Cont.)

Electrode Manufacturer	Brand	Weld Metal Composition	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Linde Air Products and Metal & Thermit Corp.	Murex	.07 C 1.04 Mn .50 Si 18.3 Cr 10.3 Ni 2.00 Mo	1	2	11.25
	Oxweld	.12 C 6.24 Mn 13.45 Cr 11.8 Ni .13 Mo			
Linde Air Products and Metal & Thermit Corp.	Murex	.10 C 3.32 - 3.67 Mn .36 - .64 Si 19.44 - 19.61 Cr 9.57 - 9.85 Ni .78 - .91 Mo	2	2	29.50
	Oxweld #42	.25 C 2.25 Mn .50 Si 8.00 Cr 8.5 Ni			
Crucible Steel, McKay and Linde Air Products	Oxweld #42	.21 C 4.84 Mn .72 Si 10.16 Cr 11.98 Ni .05 Mo	1	2	20.25
	McKay	Not Given			

TABLE XII (Cont.)

Electrode Manufacturer	Brand	Weld Metal Composition	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
McKay and Linde Air Products	McKay	.08 - .12 C 3.92 - 4.00 Mn .53 - .60 Si 19.8 - 20.00 Cr 9.5 - 9.7 Ni	2	4	19.93
	Oxweld	Not Given			

TABLE XIII

Joint Design Data for Unionmelt Welded Rolled Armor H Plates

Angle of Bevel	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
45° DV	21	43	15.50
90° one side 58° other	1	3	14.58

Root Gap (inches)	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
1/8	1	3	14.58
3/16	6	10	21.03
1/4	8	15	16.58
5/16	6	16	12.40
3/8	1	2	4.38

Plate Preparation	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Flame Cutting	9	17	15.95
Flame Cutting and Grinding or Machining	13	29	15.15

TABLE XIV

Welding Procedure Data for Unionmelt Welded Rolled Armor H Plates

No. of Passes	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
4 UM	4	5	27.30
4 hand beads and 2 UM	13	29	13.88
5 hand beads and 2 UM	1	3	16.88
6 hand beads and 1 UM	1	3	14.58
8 hand beads and 1 UM	1	2	20.25
9 hand beads and 1 UM	1	2	7.1
17 hand beads and 1 UM	1	2	11.25

Root Type Deposition		No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
II	Two hand beads at root	17	41	14.00
Special	All Unionmelt	4	5	27.30

TABLE XV

Radiographic Data for Unionmelt Welded Rolled Armor H Plates

Radiographic Results	No. of Plates	No. of Rounds	Av. Weld Cracking per Round (Corrected) (inches)
Passing	9	17	15.00
Failing	13	29	15.67

TABLE XVI

Armor Data for Hand Welded Cast Armor 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	.25 C 1.65 Mn .62 Si .35 Cr .50 Mo	Not Given			240-245	1	3	.33	2.16
Continental Roll & Steel Fdry.	I Mn-Cr-Ni-Mo	.30 - .32 C .75 - 1.22 Mn .36 - .42 Si .50 - .58 Cr .50 - .62 Ni .43 - .72 Mo	1650 1150-1550	— —	Air Water	220-269	3	7	13.42	2.64
National Roll & Fdry.	III Mn-Mo	.30 C 1.32 Mn .40 Si .66 Mo	Not Given			270-275	1	3	11.91	2.41
Sivyer Steel Castings	I Mn-Ni-Cr-Mo	.22 - .30 C .86 - .94 Mn .42 - .57 Si .46 - .48 Ni .37 - .46 Mo .42 - .44 Cr	1900 1600 1150	4 4 4	Air Water Furnace	255-295	4	11	1.21	4.71
Symington-Gould	III Mn-Mo	.29 C 1.58 Mn .51 Si .51 Mo	Not Given			230-240	1	2	14.33	1.63

TABLE XVI (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.)(ins.)	Av. Plate Cracking per Round (inches)
Pittsburgh Steel Foundry	III Mn-Mo	.28 C 1.82 Mn .80 Si .44 Mo	Not Given			297-297	1	4	2.88	4.66
	I Mn-Cr-Ni-Mo	.30 C 1.03 Mn .40 Si .55 Cr .50 Ni .42 Mo	1650 1200 1600 1150 700	6 6 6 8 -	Air Furnace Water Furnace Air	269-277	1	3	4.75	.50
Union Steel Castings	III Mn-Mo	.27 - .30 C 1.46 - 1.59 Mn .34 - .39 Si .53 - .55 Mo	1700 1225-1650 1750	8 4 4	Water Water Air	247-267	2	5	1.95	9.50

TABLE XVII

Comparative Specification Performance of Rolled and Cast Armors

	Specification in Force*	Number Passed	Number Failed	No Test
Hand Welded Rolled Armor	Prior to 25 June 1943	53	15	1
	Present	30	21	18
Hand Welded Cast Armor	Prior to 25 June 1943	17	6	1
	Present	12	11	1
Unionmelt Welded Rolled Armor	Prior to 25 June 1943	7	15	0
	Present	1	21	0
Unionmelt Welded Cast Armor	Prior to 25 June 1943	2**	0	0
	Present	2**	0	0

* See Appendix A

** One round only. Judged "no test" because of inconsistent performance on subsequent rounds.

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 for 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

Figure 1 shows the construction and intended aiming points for the ballistic shock test plate. Prior to 25 June 1943 the following requirements were in effect:

Plate Thickness	Type Armor	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. TP T21	1100±25	2	15	8
1-1/2"	C.H.	75 mm. TP T21	1050±6 f/s per .01"	2	15	8

*NOTES:

1 - Cracks in the armor parallel to the weld and within 1/8 inch of the edge of the weld shall be considered 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 inches as measured from the center of impression. Any other plate crack shall not exceed a total of 8 inches.

Effective 25 June 1943, the following requirements were in effect (as abstracted from Specification AXS-497, Rev. 5, 15 December 1943):

F-3. Ballistic Tests. Test plates required by paragraph F-2a(1)a shall be supported solidly on each of the two sides parallel to the longest welds and with these welds upright. The plate shall be tested for compliance with the requirements of Table II.

Table II

Plate Thickness (inches)	Type Armor	Projectile	Striking Velocity f/s	Allowable Weld Cracking
1-1/2	R.H.	75 mm. T21	1200	15
1-1/2	C.H.	75 mm. T21	1050	10

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

All impact velocities specified.

F-3a. Cracks in the armor parallel to the weld and within 1/8 inch of the edge of the weld shall be considered in the total weld cracking.

F-3b. All impact velocities specified for cast homogeneous armor are subject to variation depending on the actual armor thickness. This variation shall be based on the velocities specified for testing primary armor and results in velocity of 6 f/s for each increase of .01 inches in armor thickness.

F-3c. Cracking of the plate outside a circle of 6 inches radius, the center of which is the center of impact, or plate cracks greater than 6 inches in length not passing through the point of impact shall be considered cause for reporting "no test." Other types of armor cracking which indicate that the test of the welding procedure is insufficient may also be cause for reporting "no test." The phrase "no test" is defined as that condition existing when the results of the ballistic test are such that it is impossible to arrive at a decision as to the acceptability of the welding procedure.

F-3d. The impact of the 75 mm. proof projectile T21 shall touch the edge of the weld to be considered as conforming to the requirements of the test.

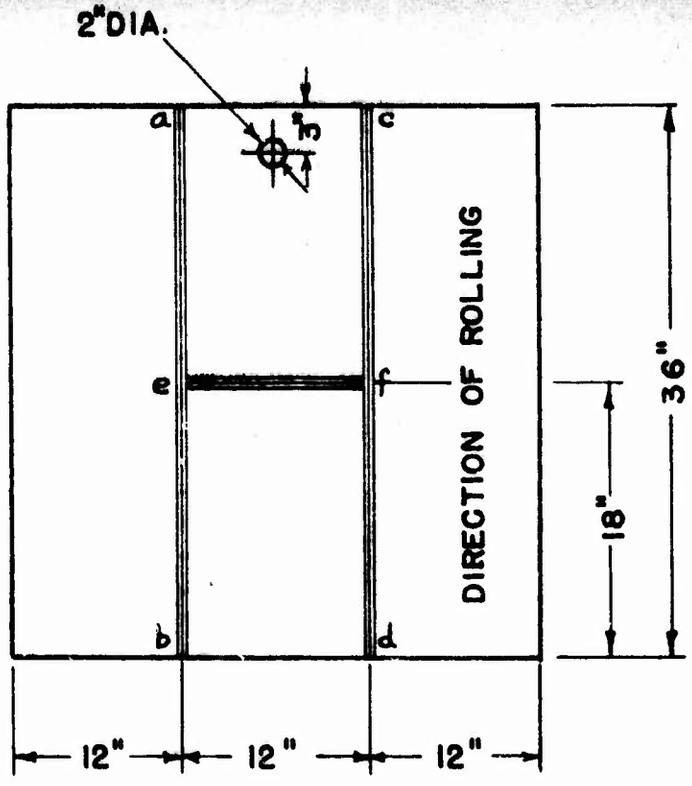
F-3f. Impacts, the edges of which are more than 2 inches from the edge of the crossbar weld, which cause cracking in the crossbar either on the front or back of the plate, which is not an extension of cracking in a leg weld, shall be cause for rejection of the welding procedure.

F-3g. Any inconsistency in the quality of the welding procedure revealed by impact on a ballistic test plate may be considered cause for reporting "no test" at the discretion of the proof officer.

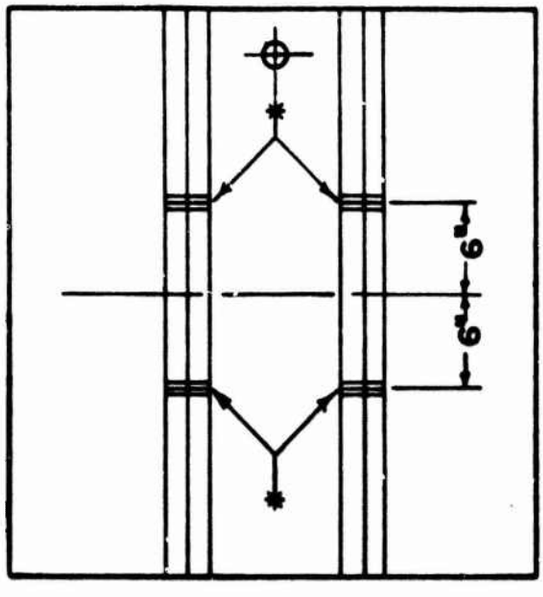
F-3h. Any length of weld cracking revealed as a result of an impact outside the acceptable limits for impacts shall be cause for rejection of the welding procedure.

F-3i. Impacts less than 6 inches from the top or bottom edge of the plate, which cause excessive weld cracking, shall be considered as not conforming to the requirements of the test. If, however, the cracking is not excessive and the requirements referred to in paragraph F-3d are met, the impact will be considered acceptable.

WELD SEQUENCE:
ab, cd, fe.



QUALIFICATION SHOCK TEST PLATE



* INTENDED AIMING POINTS

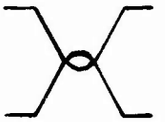
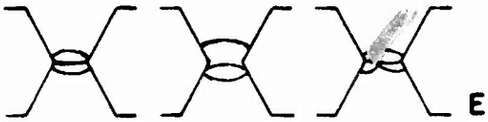
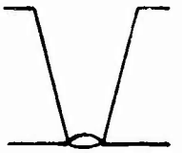
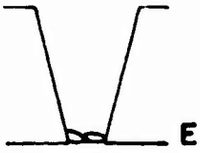
FIG. 1

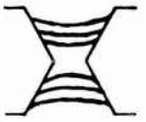
A. PLATE NUMBER B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE SPEC. F. ARMOR FABRICATOR	A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	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 D. POST	H	BALLISTIC RESULTS VEL. F/S	LOCATION OF H L.L.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT.	RADIOGRAPHIC RESULTS, ETC.
---- 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 oren 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	KEY TO SYMBOLS a - layer b - bead SB - seal 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 Left Leg, Crossbar, Right Leg							

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. Armored 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" 3a 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	1058	½" R	4" U	Imp	I	5½" D	Passed radiograph Area of incomplete fusion; repair weld in casting				
						2	1100	X	5½" D	Imp	II III V	4" 5" 2" 14"	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

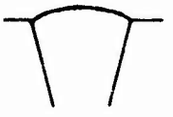
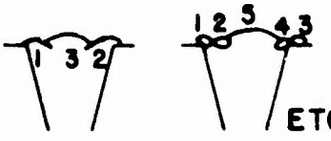
CROWN TYPES	TYPE I	TYPE II	TYPE III
DOUBLE V & SINGLE V BEVEL	 SINGLE CROWN SINGLE PASS BRIDGES GAP	 MULTIPLE CROWN LAST BEAD TOUCHES PARENT METAL	 MULTIPLE CROWN LAST BEAD DOES NOT TOUCH PARENT METAL

FIG. 3 WELD METAL DEPOSITION TYPES

IDENTIFICATION A FRAME 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 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	PROCEDURE PASSES	HEAT A PRE B POST	W	VEL F/S	BALLISTIC RESULTS LOCATION OF R	CB	CRACKING LOC TYPE	REMARKS ON BACK NO RADIOGRAPHIC RESULTS, ETC
A. AL-45 B. 8/1/43 C. 54 D. Henry Disston Company E. McKay Company F. Baldwin Locomotive Works	A. 1-1/2" B. RHA (.64Mn,.20 Si, .34Cr,.4Ni, .35Mo,..50W) C. --- D. Face 285 Back 375 E. Basic F. ---	A. A-I (.10C,4.20 Mn,.65Si, .03P, .03S, 12.2Ni, 1.20 Cr) B. Armaloy C. Mineral D. 90 AcV	A. 60°CV B. 1/16" C. Flame Cutting Grinding	A. None B. 1. I 5/8" 1A 1 E - 3C 1. II 5/16" 1A 1 E - 3C 3/16" 1A 2I - 3J 1/4" 2I 3HO - 3G 2. I 1/4" 2I 3G - 3G 2. II 1/4" 2I 3G - 3G C. 13-1/2 hrs. 100° - 330°F. D. Surface cracks after first pass, ground out. Second side was ground 24" to 3/4 in metal before applying the third bead. Ground reading to 1/4" at thoroughly.	A.None B.None	1 1088	1-1/8"					Passed radiograph Two 1/4" slag in lower left ins, and one 1/4" crack in 3 weld start (ap ox.)
								2 1103	1/4"							
								3 1144	1/4"			Imm II III IV	1/4" 1/4" 1/4" 3/8" 3/8"			
A. AL-715 B. 8/1/43 C. 58 D. Henry Disston Company E. McKay Company F. Baldwin Locomotive Works	A. 1-1/2" B. RHA (.40Mn,.75Si, .74Cr,.48Ni, .20Mo,1.68W) C. .23 D. Face 285 Back 285 E. S.S.A. F. 1575°F. 2 hrs. Water 1135°F. 2 hrs. Air	A. A-I (1.22C,..85 Mn,.41Si, 17.07Cr, 9.48Ni, ..28Mo,* B. Armaloy C. Lime D. 90 AcV	A. 60°CV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. II 1/16" 3E 1E - 3E 1/4" 1A 3HS - 3H 1. III 3/16" 1A 3HS - 3H 1/4" 4S 1E - 3H 2. I raw 200 - 215°F. 2. Passed one, two and three per bank omitted. Passed one and two were buttered	A.None B.None	1 1067	1"					Passed radiograph Scattered porosity throughout
								2 1100	5/8"							
								3 1106	1/4"			Imm II III IV	3/4" 3/8"			
								4 1096	1/4"							
								5 1098	1/4"			Imm II	1"			
								6 1095	5/8"							
								7 1144				Imm II III IV	1/4" 1/4" 1/4" 3/8" 3/8"			

*Weld Metal

IDENTIFICATION A. FINISH 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	N	VEL. F/M	BALLISTIC RESULTS LOCATION OF H L.L.	E.L.	O.D.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-770 B. 7/31/43 C. 53 D. Henry Disston & Sons E. Alloy Rods Co. F. Baldwin Locomotive Works	A. 1-1/3" B. R-I (.92Mn,.26Si, .79Cr,.90Ni, .32Mo,.16Cu) C. .33 D. Face 385 Back 275 E. Basic F. 1575°F. Water 1135°F. Draw	A. A-I (.14C, 3.66Mn, .37Si, 18.36Cr, 9.37Ni, 2.10Mo)* B. Armoarc Type B-S-W C. Mineral D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting	A. None B. 1. II 3/16" 1a 150 - 28 1/4" 1a 250 - 30 2. III 1/4" 3a 250 - 30 5/16" 3a 4b 425 - 37 3. III 3/16" 4b 175 - 26 5/16" 2b 425 - 33 C. 13 hours 100° - 300°F. D. Back chipped after first pass. Plate is 40" in length.	A.None B.None	1 2 3 4	1203 1206 1205 1200	4" R 1" R 2" R 4" R	16½" U 13¾" D 15½" U 15¼" D	Imp Imp O I	I II II II	12" 3½" 3⅜" 7⅝" 8" 27"	Failed radiograph Two 3/4" cracks in crossbar
A. AD-785 B. 8/13/43 C. 59 D. Henry Disston & Sons E. Harnischfeger Corp. F. Baldwin Locomotive Works	A. 1-1/2" B. R-I (.69Mn,.30Si, .89Cr,.98Ni, .35Mo,.15Cu) C. .32 D. --- E. --- F. 1575°F. Water 1135°F. Draw	A. A-I (.12C,4.75 Mn,.80Si, 19.0Cr, 10.0Ni, 1.1Mo)* B. AW-3-S C. Lime D. ---	A. DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 5/32" 2a 185 - 40 2. III 5/32" 4a 12b 185 - 40 3. II 5/32" 10b 185 - 40 C. 30 hrs. 87° - 120°F. D. 10-1/2" ground out after first pass, time 20 mins.	A.None B.None	1 2 3	1086 1105 1185	1" R X ¾" L	4½" U 5½" D 7½" D	Imp Imp Imp	II II I	9" 10½" 2½" 20" 41½"	Passed radiograph Small amount of slag and porosity scattered throughout the welds Plate has 16" legs below crossbar
A. AD-873 B. 9/7/43 C. 52 D. Henry Disston & Sons E. Alloy Rods Co. F. Baldwin Locomotive Works	A. 1-1/2" B. R-I (.69Mn,.30Si, .89Cr,.98Ni, .35Mo) C. .22 D. Face 385 Back 275 E. Basic F. 1575°F. Water 1135°F. Draw	A. A-I (.14C, 3.66Mn, .37Si, 18.36Cr, 9.37Ni, 2.10Mo)* B. Armoarc Type B-S-W C. Mineral D. DC REV	A. 60°DV B. 1/4" C. Flame Cutting	A. None B. 1. II 3/16" 3b 140 - 26 5/16" 1a 400 - 38 2. III 5/16" 2a 7b 400 - 38 3. III 3/16" 4b 190 - 28 5/16" 2b 400 - 38 C. 13 hrs. 100° - 300°F. D. Passes one, two and three were back chipped.	A.None B.None	1 2 3 4	1192 1205 1208 1313	⅜" R ⅜" R 1" L ⅜" R	13⅜" D 17⅜" D 14" U 14" D	Imp Imp	II V I II	14" 6½" 6" 6" 32"	Failed radiograph Excessive cracking in crossbar

*Weld Metal

IDENTIFICATION A. Plate 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. Side E. Process F. Heat treatment Type test section	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 per el. pg. type, size, V. 1. Root type 2. Body type 3. Groove type C. Total welding time & interpass temperature D. Remarks	HEAT A. Pre B. Post	N	WEL. PAS	BALLISTIC RESULTS LOCATION OF H L.L.	R.L.	S.S.	CRACKING Loc.	Type	Amt	REMARKS OR COMMENTS RADIOGRAPHIC RESULTS, ETC.
A. AD-418 B. 5/13/43 C. 41 D. Carnegie Illinois Steel Corp. E. Crucible Steel Corp. F. Briggs Mfg. Co.	A. 1-1/2" B. R-I (1.33Mn,.31Si, .80Cr,.90Ni, .17Mo) C. .37 D. Face 269 Back 269 E. S.O.H. F. 1562°F. 3/4 hr. Water 1058°F. 1-3/4 hrs. Water	A. A-1 (.075-.13C 1.62-1.87 Mn,.27-.51Si, 18.96-20.12Cr, 10.05-10.28Ni, 1.92-2.34 Mo)* B. Armorize C. Titania D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 1/4" 2a 300 - 30 2. I 5/16" 2a 360 - 30 3/8" 2a 460 - 32 3. I 3/8" 2a 460 - 32 C. 6 hrs. 126° - 170°F. D. Copper removed after first pass.	A. None B. None	1	1049		$\frac{1}{4}$" L	$6\frac{1}{2}$" U				Passed radiograph
						2	1113	$\frac{1}{4}$" R		$7\frac{1}{4}$" D	Imp	I II	$6\frac{1}{4}$ $11\frac{1}{4}$ 18^{3}	
		*Weld Metal												3

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. DESIGNATION SIZE EL. NO. TYPE AMP. V. C. ROOT TYPE E. BODY TYPE F. CROWN TYPE G. TOTAL WELDING TIME & INTER PASS TEMPERATURE H. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS NO.	VEL. F/S	LOCATION OF H L.L.	N.L.	C.G.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-464 B. 6/10/43 C. 1 D. Jones & Laughlin Steel Corp. Great Lakes Steel Corp. E. Crucible Steel Company F. Chicago Vitreous Enamel Product Co.	A. 1-1/2" B. R-III J&L (1.63Mn,.19Si, .28Mo) R-IV (.84Mn,.78Si, .60Cr,.19Mo, .11Zr) C. .26 .29 D. Face 262 Back 262 Face 255 Back 255 E. B.O.H. F. 1650°F. 1 hr. Water 1100°F. 3 hrs. Air	A. A-I (.10C,1.92 Mn,.32Si, 19.84Cr, 10.56Ni, 2.21Mo)* B. Armoriza C. Titanium Base D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 140 - 22 1/4" 1a 220 - 30 2. III 1/4" 1a Bb 220 - 30 3. III 5/32" 4b 140 - 22 1/4" 2b 240 - 30 C. 6-2/3 hrs. 110° - 190°F. D. Chipping after all passes, time 3-1/2 hours.	A. 140°F. B. None	1 2 3 4	1099 1084 1075 1170	2" R 3/4" L 1½" R	2" L 3½" D 6" U 6½" D	8½" U Imp Imp	I III I II	10½" 3" 13" 8½" 34½"	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 N	VEL F/S	LOCATION OF N T.L.	A.L.	C.R.	CRACKING LOC	TYPE	INT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-368 B. 4/17/43 C. 44 D. Republic Steel Corp. E. Lincoln Electric Co. F. Federal Machine & Welder Company	A. 1-1/2" B. R-I (.02%n,.17Si, .67Cr,.69Ni, .58Mo) C. .36 D. Face 455 Back 235 E. H. Elec. F. 1300°F. 1 hr. Anneal 1600°F. 3/4 hr. Spray 1300°F. 1-1/2 hrs.	A. A-II (.08-.12C, 3.25-4.25 Mn,.45-.80Si, 13.0-20.5 Cr,8.5-10.0Ni)* B. Armor-weld C. Lime D. DC REV	A. 60°CV B. 1/4" C. Flame Cutting Grinding	A. Copper B. 1. I 5/16" 1a 180 - 2 5/16" 1b 170 - 2 1/4" 1a 170 - 2 1/4" 1b 170 - 4 1/4" 1a 240 - 4 1/4" 1b 240 - 4 1/4" 1a 250 - 4 2. III 3/16" 1b 170 - 2 1/4" 1b 235 - 4 C. 1:54 hrs. 70° - 130°F. D. One less pass in cross-bar.	A. 70°F. B. None	1	1075 1 1058	X	1/4"	3/4"	1- 1-			
A. AD-41 B. 4/24/43 C. 43 D. Republic Steel Corp. E. Alloy Rods Co. F. Federal Machine & Welder Company	A. 1-1/2" B. R-I (.02Mn,.17Si, .67Cr, .58Mo) C. .36 D. Face 451 Back 250 E. H. Elec. F. 1300°F. 1 hr. Anneal 1400°F. 3/4 hr. Spray 1300°F. 1-1/2 hrs.	A. A-I (.07-.17C, 3.30-4.75 Mn,.80Si, 14.50-20.50Cr, 9.00-11.7 Ni,1.10 Mo)* B. Armorarc Type B C. Titanium D. DC REV	A. 60°CV B. 1/4" C. Flame Cutting Grinding	A. Copper B. 1. I 5/32" 1a 12 - 20 5/16" 1b 12 - 20 3/16" 1b 12 - 20 2. III 3/16" 1a 120 - 20 3/16" 1b 120 - 20 3. III 3/16" 1a 12 - 20 3/16" 1b 120 - 20 C. 25:15 hrs. 80° - 150°F. D. Six less passes in crossbar.	A. 70°F. B. None	1	1100 1 1060	1/2"	1/2"	3/4"	1- 1-			
		*Weld Metal															

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IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING	PROCEDURE	HEAT	BALLISTIC RESULTS	REMARKS (OR CRACKING PATTERN THIS 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 POST GAP C PLATE PREPARATION	A MACHINE B DEPOSITION RATE C ROOT TYPE D BODY TYPE E CROWN TYPE F TOTAL WELDING TIME G REMARKS	PASSES NO TYPE AMP V G INTER PASS TEMPERATURE	A PRE B POST	P V EL P A CRACKING LOC TYPE IN	

Axial Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS				CRACKING			REMARKS ON CRACKING
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 PASSES D 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	H	VEL F/S	LOCATION OF H L.L.	EL.	O.D.	LOC.	TYPE	Amt	RADIOGRAPHIC RESULTS, ETC
A. AD-448 B. 5/29/43 C. H-69 D. Youngstown Sheet & Tube Company E. Harnischfeger Corp. McKay Rods Co. Wurath Alloy Rods Co. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. R-III (1.83Mn,.20Si, .44Mo) C. .28 D. Face 279 Back 277 E. Basic F. ---	A. A-I H (.09C,3.8 Mn,.80Si, 18.78Cr, 10.01Ni, 1.82Mo)* A-II WeK (.08C,4.61 Mn,.33Si, 20.91Cr, 9.65Ni, .51Mo)* A-I W (.13C,4.57 Mn,.23Si, 19.56Cr, 9.7Ni, .44Mo)* A-I A (.13C,3.69 Mn,.45Si, 18.3Cr, 9.45Ni, .64Mo)* A-II R A (.08C,1.50 Mn,.65Si, 18.31Cr, 9.74Ni, .04Mo)* B. Smallhausen Armerly --- Armeraro Rods C. Lime Lime Titania Titania Titania D. DC REV	A. 45°DV B. 5/16" C. ---	A. Copper B. 1. II 1/8" 1a 80 - 22 5/16" 1a 185 - 26 2. I 1/4" 2a 250 - 28 5/16" 2a 360 - 30 3. I 3/8" 3a 440 - 32 C. 210A Ave. 140° - 280°F. D.	A. None B. None	1 2	1000 1440	1 1/2" F 1" B	1/2" U " D		1" 1cm	14	Failed radiograph 3" of cracking at crossbar Junction
		Weld Metal											

IDENTIFICATION A. FIRMS RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR F. ARMOR FABRICATOR	STEEL A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. BHN E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	WELDING A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING 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.	EL.	G.D.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-367 B. 4/6/43 C. 9 D. Republic Steel Corp. E. Alloy Rods Co. F. Fitzgibbons Boiler Co.Inc.	A. 1-1/2" B. R-V (.47Mn,.32Si, .22Cr,4.05Ni, .39Mo) C. .38 D. --- E. --- F. ---	A. A-I (.112C, 1.50Mn, .045Si, 18.8Cr, 10.4Ni, 8.35Mo)* B. Armorarc C. Mg D. DC REV	A. DV B. 3/16" C. Flame Cutting	A. Copper B. 1. II 1/4" 1a 250 - 35 1/4" 1a 370 - 25 2. III 5/16" 1a 3b 350 - 35 3. I 5/16" 2a 350 - 35 C. 18 hrs. Below 335°F. D. One more pass in crossbar. Grinding after first pass.	A.None B.None	1 2 3	1102 1094 1209	1" R	1½" R 6" U 6" D 7½" D	Imp Imp	II I II	12¾" 5" 7¼" 25¼"		Passed radiograph Several small cracks and some incomplete fusion
A. AD-367 B. 4/6/43 C. 10 D. Jones & Laughlin Steel Corp. E. Metal & Thermit Corp. F. Fitzgibbons Boiler Co.Inc.	A. 1-1/2" B. R-III (1.63Mn,.24Si, .34Mo) C. .25 D. --- E. --- F. ---	A. A-I (.07-.17C, 3.3-4.75 Mn,.30-.80 Si,18.0-20.5Cr, 9.0-10.7 Ni,1.10Mo)* B. Murrex C. Lime D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting	A. None B. 1. II 3/16" 3a 180 - 25 2. III 3/16" 1a 4b 180 - 25 1/4" 4b 240 - 25 5/16" 6b 320 - 25 3. III 5/16" 6b 320 - 25 C. 14-1/2 hrs. Below 250°F. D. Bottom of first pass ground clean. One less pass in crossbar.	A.None B.None	1 2 3	1105 1185 1250 est.	¼" R ¼" R	¼" R 6½" U 6½" D 14" R 14" D	Imp Imp Imp	II V I II III	14" 1½" 7½" 3½" 3½" 18"		Passed radiograph
A. AD-798 B. 8/15/43 C. 11 D. Carnegie Illinois Steel Corp. E. Metal & Thermit Corp. F. Fitzgibbons Boiler Co.Inc.	A. 1-1/2" B. R-I (1.26Mn,.23Si, .84Cr,.70Ni, .17Mo) C. .28 D. Face 388 back 388 E. --- F. 1562°F. 3/4 hr. Water 1058°F. 1-3/4 hrs. Water	A. A-I (.07-.17C, 3.3-4.25 Mn,.30-.80 Si,18.0-20.5Cr, 9.0-10.7Ni .80-1.10 Mo)* B. Murex C. Lime D. DC REV	A. 60°DV B. 5/32" C. Flame Cutting	A. None B. 1. II 3/16" 1a 175 - 33 3/16" 1a 190 - 32 2. III 1/4" 3a 3b 335 - 33 5/16" 4b 330 - 33 3. II 5/16" 4b 330 - 33 C. 18-1/2 hrs. Below 250°F. D. Bottom of first pass ground clean. Two more pass in crossbar.	A.None B.None	1 2	1104 1186 X	¼" R	¼" R ¼" U ¼" D	Imp Imp	II II	11" 17" 28"		Passed radiograph Moderate amount of slag at both junctions of cross

*Weld Metal

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 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 SIZE EL. NO. TYPE AMPS V. 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	H	VEL. F/S	LOCATION OF H L.L. R.L. O.B.	CRACKING LOC. TYPE AMT.	
A. AD-732 B. 7/3/43 C. 1 D. Jones & Laughlin Steel Corp. Great Lakes Steel Corp. E. Crucible Steel Company F. Florence Stove Company	A. 1-1/8" B. R-III J&L (1.68Mn,.20Si, .28Mo) R-IV G L (.84Mn,.80Si, .67Cr,.20Mo) C. .26 .39 D. Face 355 Back 277 Face 348 Back 262 E. B.O.H. F. 1650°F. Water 1175°F. Air	A. A-I (.09C, 1.92Mn, .30Si, 19.56Cr, 10.25Ni, 1.93Mo)* B. Rezistal C. Titania D. DC REV	A. 45°DV B. 1/2" C. Flame Cutting Flame Softening Grinding	A. Copper B. 1. II 5/32" 2b 140 - 32 3/16" 2b 170 - 26 2. II 1/4" 8b 220 - 30 3. III 5/32" 4b 140 - 22 1/4" 2b 220 - 30 C. 3-1/2 hrs. 140° - 195°F. D. Grinding after first two passes, time 10 mins. Crater cracking after first two passes.	A. 150° F. B. None	1 2 3	1082 1119 1137	1/4" R 2" R 1 1/4" R	5 1/4" U 3/4" D 8" U	Imm II 3" M 1 1/2" Imm 5 4 1/4" II 5" 13 1/4"	Passed railowrarn Some scattered ming and porosity

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING	HEAT	BALLISTIC RESULTS	REMARKS ON RADIOGRAPHIC RESULTS, ETC
A. FIRING ORDER 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 SEQUENCE NO. TYPE AMPS V C. ROOT TYPE D. ROOT TYPE E. GROOVE TYPE F. TOTAL WELDING TIME & INTER PASS TEMPERATURE G. REMARKS	A. PRE B. POST	A. M. V. E. L. P/B LOCATION OF H L.L. R.L. C.G. GRADING LOC. TYPE AMT	
A. AD-449 B. 5/29/43 C. W-301 D. Ford Motor Co. E. Alloy Rode Co. F. Ford Motor Co.	A. 1-1/2" B. R-II (1.26Mn,.26Si, .50Cr,.08Ni, .43Mo) C. .28 D. Face 285 Back 285 E. B.O.H. F. 1650°F. 3-1/2 hrs. Spray 1100°F. 5-1/4 hrs. Air	A. A-II (.14C,3.70 Mn,.08Si, 19.0Cr, 9.25Ni,)* B. Armoreare "B" C. 3/16 Lime 1/4 TiO_2 D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. None B. 1. II 3/16" 2a 125 - 25 2. I 1/4" 4e 135 - 22 3. I 1/4" 2a 135 - 22 C. 10 hrs. 220° - 250°F. D. Chipping after each pass. Time 2 hours.	A. None B. None	1 1069 1" L 5½" D Imp I 1½" II 11½" 2 1100 est. ⅜" R 5½" U Imp I 11" II 3" 3 1055 1½" R 7½" U Imp I 23" 50"	Passed radiograph
A. AD-750 B. 7/20/43 C. W-231 D. Ford Motor Co. E. Page Steel & Wire Company F. Ford Motor Co.	A. 1-1/2" B. R-II (1.28Mn,.23Si, .53Cr,.05Ni, .45Mo,.07Cu) C. .28 D. Face 269 Back 277 E. B.O.H. F. 1650°F. 3-1/2 hrs. Spray 1100°F. 5-1/4 hrs. Air	A. A-I (.13C,3.95 Mn,.33Si, 21.88Cr, 9.76Ni, .58Mo)* B. Page Allegheny C. TiO_2 & Lime E. DC REV	A. 45°DV B. 1/2" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 180 - 28 2. I 1/4" 2a 300 - 30 5/16" 3a 400 - 31 3. II 1/4" 6b 300 - 30 C. 8 hrs. 150° - 215°F. D. Grinding after third pass. Time 1 hour.	A. None B. None	1 1.01 ¾" L 6" U Imp II 1" III 6" 2 1184 ⅜" L 6" D Imp I 10½" II 4½" 33½"	Passed radiograph
A. AD-750 B. 7/20/43 C. W-234 D. Ford Motor Co. E. Harniechfeger Corp. F. Ford Motor Co.	A. 1-1/2" B. R-II (1.33Mn,.25Si, .50Cr,.08Ni, .45Mo,.08Cu) C. .27 D. Face 277 Back 285 E. B.O.H. F. 1650°F. 3-1/2 hrs. Spray 1100°F. 5-1/4 hrs. Air	A. A-I (.17C,4.75 Mn,.80Si, 30.5Cr, 10.7Ni, 1.10Mo)* B. AW-3-C C. Lime D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 310 - 24 2. I 1/4" 2e 300 - 27 5/16" 3e 400 - 33 3. III 1/4" 6b 310 - 24 C. 8 hrs. 100° - 300°F. D. Grinding after third pass, time 3 hours.	A. None B. None	1 1099 ¾" L 6¾" D Imp I 3½" II 4½" III 5⅝" 2 1178 1½" R 5½" U Imp I 1½" II 9½" III 31" O I 39"	Passed radiograph

*Weld Metal

IDENTIFICATION A. FIRING RECORD NO. B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE NUMBER 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	VEL F/S	BALLISTIC RESULTS LOCATION OF H L.L. R.L. C.G.	CRACKING LOC. TYPE	AMT.	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-750 B. 7/20/43 C. W-235 D. Ford Motor Co. E. Crucible Steel Company F. Ford Motor Co.	A. 1-1/2" B. M-II (1.38Mn,.28Si, .54Cr,.08Ni, .40Mo) C. .28 D. Face 286 Back 293 E. B.O.H. F. 1650°F. 3-1/2 hrs. Spray 1100°F. 5-1/4 hrs. Air	A. A-I (.09C,3.91 Mn,.18Si, 20.08Cr, 10.0Ni, .98Mo)* B. Armorize Mn C. Lime & TiO_2 D. DC REV	A. 45°DV B. 1/6" C. Flame Cutting	A. Copper B. 1. II 5/32" 1a 135 - 25 3/16" 1a 180 - 27 2. I 1/4" 2a 260 - 30 5/16" 4a 340 - 32 3. III 1/4" 4b 260 - 30 5/16" 2b 340 - 32 C. 8 hrs. 100°F. -200°F. D. Grinding after second pass, time 2 hours.	A. None B. None	1 2	1098 1191	4" L 1½" R	3½" U 5½" D	Imp Imp O	III II III	5" 7½" 2½" 15"	Passed radiograph Some porosity and incomplete fusion in crossbar

*Weld Metal

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WELD JOB	BASE DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS							REMARKS OR DIAGRAM RADIOGRAPHIC RESULTS, ETC.
A. Fabric Req'n 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 (Include Angle, Root Face B. Root Gap C. Plate Preparation	A. Backing Passes C. Deposition Size El. No Type Amp V. 1. Root Type 2. Body Type 3. Groove Type 4. Total Welding Time & Inter Pass Temperature 5. Remarks	A. Pre B. Post	N	Vel. F/S	Location of N L.L.	R.L.	S.S.	Grinding Loc.	Type	Amt.	
A. AD-358 B. 4/13/43 C. SH D. Republic Steel Corp. E. Alloy Rods Co. F. General American Transportation	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .58Mo) 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 (.08-.13C, 8.50-4.50 Mn,.35-.70Si, 19.00-21.00Cr, 8.50-10.50Ni)* B. Arcoloy "8" C. Titanium Mn D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1e 160 - 25 3/16" 1e 220 - 30 2. III 3/16" 1a 2b 200 - 25 1/4" 1e 300 - 30 1/4" 2b 280 - 25 3/16" 2b 220 - 30 1/4" 2b 260 - 30 1/4" 2b 240 - 25 1/4" 1b 280 - 30 3. II 1/4" 4b 260 - 30 3/16" 5b 180 - 30 C. 11-1/2 hrs. 110° - 220°F. D. Cracking after first and fifth passes, first pass ground out, time 2-3/4 hours.	A.None B.180° F.	1 2	1098 1218	 1/2" L	1/2" R	9-1/2" D 6" U	Imp Imp O	III III	9-1/2" 11" 1-1/2" 22"	Passed radiograph
A. AD-466 B. 6/10/43 C. SH D. Republic Steel Corp. E. Harnischfeger Corp. F. General American Transportation	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 1600°F. 3/4 hr. Spray 1200°F. 1-1/2 hrs.	A. A-I (.11-.13C, 1.64-1.80 Mn,.55-.99Si, 18.3-19.7 Cr,9.8-10.7Ni, 1.23-2.00 Mo)* B. AW-3-A C. Lime & Titanium D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. II 5/32" 1e 110 - 25 3/16" 1e 190 - 25 2. III 3/16" 1e 130 - 25 1/4" 3e 6b 200 - 26 1/4" 1e 220 - 32 3. II 1/4" 8b 180 - 25 C. 9-1/2 hrs. 100° - 220°F. D. Grinding after third pass, time 6 hours. First two beads buttered.	A.None B.220° F.	1 2 3	1200 1253 1295	1" L 1-1/2" L 1/4" R	 3-1/2" D 5-1/2" J	6" U O Imp	Imp I II III V	II I	9-1/2" 1-1/2" 10" 3" 8" 1/2" 33"	Failed radiograph 1" crossbar crack
		*Weld Metal											

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IDENTIFICATION 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	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	RADIOGRAPHIC RESULTS H	YEL. F/S	LOCATION OF H L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-759 B. 7/23/43 C. 7-H D. Republic Steel Corp. E. Harnischfeger Corp. E. General American Transportation Corp.	A. 1-1/2" B. R-I (.87Mn,.27Si, .67Cr,.89Ni, .52Mo) C. .26 D. Face 255 Back 255 E --- F. 1300°F. 1 hr 1600°F. 3/4 hr. Spray 1200°F. 1-1/2 hrs.	A. A-I (.12-.13C, 1.64-1.80 Mn,.55-.58Si, 19.3-19.7 Cr,10.4-10.7Ni, 1.82-2.00 Mo)* B. AW-3-A C. Lime & Titanium D. DC REV	A. 60°DV B. 3/16" C. Flame Cutting Grinding Buttering	A. None B. 1. I 5/32" 1a 110 - 25 2. I 1/4" 7a 220 - 32 3. I 1/4" 2a 220 - 32 C. 18 hrs. 110° - 205°F. D. First two beads buttered. Weld metal burned out over the two longitudinal seams and rewelded. 1/4" 7 passes 220-230 32-34 120° - 155°F.	A. None B. 220°F.	1 2	1073 1196	1" R X		4½" U 7½" D	Imp Imp	IL I III III	9½" 1" 1½" 1½" 23½"	Passed radiograph Moderate amount of slag in cross-bar

*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 B. DEPOSITION SEQUENCE, NO. TYPE AND SIZE 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 L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT	REMARKS OR COMMENTS RADIOGRAPHIC RESULTS, ETC.
A. AD-424 B. 5/13/43 C. 3 D. Great Lakes Steel Corp. Jones & Laughlin Steel Corp. E. Crucible Steel Corp. F. General Spring Bumper Div.	A. 1-1/2" B. R-IV G L (.85Mn,.73Si, .66Cr,.21Mo, .09Zr) R-III J&L (1.47Mn,.21Si, .41Mo) C. .30 .25 D. Face 269 Back 269 Face 255 Back 255 E. --- F. 1600°F. G L 1.5 hrs. 1180°F. 1.5 hrs. same for J&L	A. A-I (.14C,2.20 Mn,.22Si, 18.6Cr, 10.2Ni, 2.30Mo)* B. Armorize C. Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding Descale	A. Copper B. 1. II 5/32" 1a 150 - 3/16" 1a 170 - 2. III 3/16" 9b 170 - 1/4" 7b 230 - 1/4" 2a 3b 235 - 1/4" 1b 240 - 3. III 3/16" 4b 170 - 1/4" 2b 240 - C. 8:45 hrs. 110° - 180°F. D. First two beads buttered. Descale ground off, time 11:15 hrs.	A.110° F. B.None	1 2	1096 1180	1" L 1" L	1" 5" U	6¾" D 5" U	Imp Imp	II I II VI	3" 5" 2¼" 1¾" 3" 3"	Passed radiograph Some traces of porosity throughout

*Weld Metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT °F	BALLISTIC RESULTS						REMARKS ON GRADING RADIOGRAPHIC RESULTS, ETC.
A. Firm's record no. B. Date of test C. Plate no. D. Armor manufacturer E. Electrode impr. F. Armor fabricator	A. Plate thickness C. Type G. Carbon content B. 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 & interpass temperature D. Remarks	A. Pre B. Post	H	Vel. f/s	Location of H L.L.	B.L.	S.L.	Grading (2x) Type	Amt.	
A. AD-713 B. 6/29/43 C. HT-3 D. Great Lakes Steel Corp. E. Crucible Steel Corp. F. Holland Furnace Company	A. 1-1/2" B. R-IV (.89Mn,.68Si, .61Cr,.16Mo, .08Zr) C. .29 D. Face 269 Back 269 E. B.O.H. F. 1650°F. 3-3/4 hrs. Water 1140°F. 4 hrs. Air	A. A-II (.10C,1.91 Mn,.45Si, 16.76Cr, 8.4Ni, 1.85Mo)* B. Rezistal C. Tallurium D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 140 - 30 3/16" 1a 180 - 30 2. II 3/16" 4b 180 - 30 1/4" 8b 230 - 36 3. III 5/32" 4b 140 - 36 1/4" 2b 240 - 36 C. 5 hrs. 175° - 250°F. D. Grinding after first two passes, time 8 hours.	A. 300°F. B. None	1 2	1085 1218	X	½" R	5½" U 6½" D	Imp	I II	15½" 9½" 25"	Passed radiograph

*Weld Metal

A. 430-360 B. 1/16"-3 C. 14 D. Republic Steel Corp. Carnegie Steel Co. E. Harnischfeger Corp. F. Ilco Ordnance Corp.	A. 1-1/2" B. R-V R S (.93Mn,.28Si, 1.05Cr,.99Ni, .96Mo) R-V C S (.95Mn,.275i, 1.99Cr,.92Ni, .36Mo) C. .25 .27 D. Face 250 Back 250 E. Acid-Elec. F. 1600°F. 3 hrs. Water 1200°F. 3-1/2 hrs. Air	A. A-2 (.10C,1.8 Mn,.58Si, 18.1Cr, 9.8Ni, 1.8%Mo)* B. AW-A-A C. Titan[illegible] D. DC REV	A. 450DV B. 5/16" C. Flame Cutting Machining	A. Copper chill B. 1. II 1/4" 1a 280 - 30 5/16" 1a 360 - 39 2. I 5/16" 1a 490 - [illegible] 5/16" 2a 380 - 30 5/16" 2a 390 - 38 5/16" 1a 400 - 34 3. III 5/16" 3b 380 - 30 5/16" 2b 350 - 28 5/16" 1b 400 - 34 C 10 hrs. 70° - 170°F. D. 20% cracking after first pass and 50% after the third pass. Cracks were ground out, time 4-1/2 hours. Slag removed after second and fourth passes. Capping beads ground.	A. Non[illegible] R. [illegible]ong	X [illegible]/16 1[illegible] R[illegible]	[illegible]" Amp[illegible] D 3[illegible] U	II [illegible] III 3/8" O III 3" 15"	L" Passed radiograph

*Weld metal

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IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS	REMARKS OR 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 SL 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	V V/S LOCATION OF H LIT BL CB CRACKING LOC TYPE AMT	
A. AD-401 B. 4/27/43 C. 16 D. Republic Steel Corp. Carnegie Steel Co. E. Crucible Steel Company Harnischfeger Corp. Alloy Rods Co. A.O.Smith Corp. Metal & Thermit Corp. F. Ilco Ordnance Corp.	A. 1-1/2" B. R-I R S (.95Mn,.275i, .39Cr,.92Ni, .36Mo) R-V C S (.95Mn,.27Si, 1.39Cr,.92Ni, .36Mo) C. .27 .27 D. Face 250 Back 250 E. ACid-Elec. F. 1600°F. 3 hrs. Water 1200°F. 2-1/2 hrs. Air	A. A-II C (.12C,1.9 Mn,.29Si, 19.1Cr, 10.8Ni)* A-I H (.10C,3.78 Mn,.53Si, 18.3Cr, 10.1Ni, .82Mo)* A-II A (.10C,4.0 Mn,.55Si, 20.0Cr, 9.5Ni)* A-I S (.08C,3.5 Mn,.35Si, 19.0Cr, 10.0Ni, 1.0Mo)* A-I MAT (.10C,1.15 Mn,.50Si, 19.0Cr, 10.0Ni, 2.1Mo)* B. Rezistal AV-3 Armoraro "B" SW-164 Murex C. Lime Titanium Titanium Lime Titanium D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding	A. Copper B. 1. II 1/4" 1a 285 - 28 1/4" 1a 310 - 29 3. I 5/16" 2a 390 - 30 5/16" 1a 400 - 30 5/16" 1a 410 - 30 3. III 1/4" 2b 380 - 28 5/16" 1b 390 - 29 1/4" 2b 260 - 28 5/16" 1b 400 - 30 C. 10 hrs. 70° - 212°F. D. 5% cracking after first pass and 40% after the third pass. Cracks were ground out, time 3 hours. Capping bead ground.	A.None B.None	1 1114 ¼" R 6" D Imp V 1¼" Passed radiograph 2 1175 ¾" R 3" U Imp II 3¾" III 5¼" 10"	
	*Weld Metal						17

A. AD-445 B. 5/27/43 C. 19 D. Republic Steel Co. Carnegie Steel Company E. Crucible Steel Co. F. Ilco Ordnance Corp.	A. 1-1/2" B. R-I R (1.07Mn,.25Si, .77Cr,.84Ni, .39Mo) R-I C (1.07Mn,.16Si, .70Cr,1.03Ni, .23Mo) C. .25 .26 D. Face 386 Back 277 E. --- F. ---	A. A-I (.13C,2.07 Mn,.31Si, 19.2Cr, 9.6Ni, 2.4Mo)* B. Armorize rezistal C. Titanium D. DC REV	A. 54°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 1/4" 1a 260 - 30 1/4" 1a 290 - 28 2. III 5/16" 1a 285 - 33 1/4" 2b 310 - 30 5/16" 1a 4b 390 - 30 1/4" 2b 290 - 30 3. III 5/16" 2b 390 - 30 1/4" 4b 290 - 28 C. 10 hrs. 70° - 210°F. D. 40% cracking removed after first pass. Capping beads ground.	A.None B.None	1 2 3	1105 1175 1183	 3/8" L 1 3/8" L	X	8" D 6 1/2" U 7 1/2" U	Imp Imp	II III III	1" 5" 7" 13"	Passed radiograph. Crater cracks at junctions
A. AD-758 B. 7/23/43 C. 31 D. Carnegie Steel Co. Republic Steel Co. E. Alloy Rods Co. F. Ilco Ordnance Corp.	A. 1-1/2" B. R-I C (1.07Mn,.24Si, .70Cr,1.03Ni, .23Mo) R-I R (1.07Mn,.25Si, .77Cr,.84Ni, .39Mo) C. .23 .25 D. Face 268 Back 277 Face 280 Back 280 E. M.O.H. F. 1580°F. C 3/4 hr. Water 970°F. 1-3/4 hrs. Water 1600°F. R 2 hrs. Water 1125°F. 2 hrs. Water	A. A-II (.08-.13C, 3.5-4.5 Mn,.35-.70Si, 19.0-31.0 Cr,8.5-10.5Ni)* B. Armoraro C. Titanium D. DC REV	A. 54°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 3/16" 1a 165 - 28 3/16" 1a 180 - 28 3. III 5/16" 1a 385 - 31 1/4" 8b 275 - 30 5/16" 1b 385 - 31 5/16" 1b 375 - 31 3. III 3/16" 2b 160 - 28 5/16" 1b 375 - 31 3/16" 2b 165 - 28 5/16" 1b 365 - 31 C. 6 hrs. 70° - 200°F. D. 2" of cracking after first pass, took 1/2 hr. to grind out. 1" cracking after fifth pass required 1/3 hr. of grinding.	A.None B.None	1 2 3	1106 1200 est. 1305	3/8" R 3/8" L	X	6 1/2" U 7 1/2" D 7" D	Imp Imp Imp	II III II III	1" 3" 10" 3" 20" 36"	Passed radiograph Small amount of slag and porosity throughout the welds
		*Weld Metal												

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. TYPE AMP 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	H	WELD PAS	RADIATED PENETRATION LOCATION OF H L.I.	R.L.	S.E.	GRADING LOC	TYPE	AMT	REMARKS OR DISCONTINUITIES RADIOGRAPHIC RESULTS, ETC.
A AD-758 B. 7/22/43 C. 33 D. Carnegie Steel Co. Republic Steel Co. E. Page Steel & Wire F. Ilco Ordnance Corp.	A. 1-1/2" B. R-I C (1.07Mn,.168i, .70Cr,1.03Ni, .22Mo) R-I R (1.07Mn,.258i, .77Cr,.84Ni, .39Mo) C. .26 .25 D. Face 286 Back 277 Face 280 Back 280 E. B.O.H. F. 1580°F. C 3/4 hr. Water 970°F. 1-3/4 Water 1600°F. R 2 hrs. Water 1125°F. 2 hrs. Water	A. A-I (.08-.17C, 1.83-2.41 Mn,.24-.30Si, 18.46-20.70Cr, 9.45-10.90Ni, 1.48-1.89 Mo)* B. Page Allegheny C. Titania D. DC REV	A. 54°DV B. 5/16" C. ---	A. Copper chill B. 1. II 3/16" 1a 175 - 28 1/4" 1a 290 - 29 2. III 5/16" 1a 385 - 31 5/16" 1a 4b 375 - 31 1/4" 4b 275 - 29 3. III 3/16" 4b 175 - 28 5/16" 2b 375 - 31 C. 6 hrs. 70° - 210°F. D. 90% cracking after first pass removed.	A.None B.None	1 2 3 4	1106 1196 1257 1305	1½" R 1" R ⅜" L ½" L		7⅛" U 8" D 6" D 7⅛" U	Imp Imp Imp	II III II III I II III	2" 1½" 4" 12½" 2" 5½" 8½" 50¼"	Passed radiograph
A. AD-782 B. 8/9/43 C. 34 D. Republic Steel Co. Carnegie Steel Co. E. A.O.Smith F. Ilco Ordnance Corp.	A. 1-1/2" B. R-I R (1.07Mn,.258i, .77Cr,.84Ni, .39Mo) R-I C (1.07Mn,.168i, .70Cr,1.03Ni, .22Mo) C. .25 .26 D. Face 280 Back 280 Face 286 Back 277 E. B.O.H. F. 1600°F. R 2 hrs. Water 1125°F. 2 hrs. Water 1580°F. C 3/4 hr. Water 970°F. 1-3/4 hrs. Water	A. A-I (.08C,3.20-3.5Mn,.35-.50Si,18.0-19.0Cr, 9.0-10.0Ni, 1.0Mo)* B. SW-164 C. Lime D. DC REV	A. 54°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 3/16" 3a 170 - 28 2. III 5/16" 3a 340 - 31 1/4" 4b 240 - 29 5/16" 4b 340 - 31 3. III 3/16" 4b 170 - 28 5/16" 2b 340 - 31 C. 8-1/2 hrs. 80° - 210°F. D. Pin holes removed after first pass.	A.None B.None	1 2 3 4	1118 1100 1099 1162	½" L ⅜" R		3⅜" R 6" U 7⅛" D X 8½" D 8" U	Imp Imp	II II V	3½" 4" 1½" 8½"	Passed radiograph Moderate amount of porosity and slag throughout the welds
		*Weld Metal																

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, WELDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES B. DEPOSITION (SIZE EL. AMP TYPE ARC TRAV) 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & ENTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BULLETIN RESULTS H	VEL. F/S	LOCATION OF R L.L.	EL.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-797 B. 8/25/43 C. H-3 D. Great Lakes Steel Corp. E. Crucible Steel Co. F. Kalamazoo Stove & Furnace Co.	A. 1-1/2" B. R-III (1.62Mn, .20Si, .42Mo) R-IV (1.07Mn, .85Si, .77Cr, .22Mo, .08Zr) C. .26 .28 D. Face 255 Back 255 Face 269 Back 269 E. B.O.H. F. 1600°F. 1-1/4 hrs. Water 1650°F. 1-1/4 hrs. Water 1140°F. 2-1/2 hrs. Air	A. A-I (.08C, 2.60 Mn, .41Si, 15.23Cr, 8.0Ni, 1.25Mo)* B. Reeletal C. Armorized D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Flame Softening Grinding	A. Copper B. 1. II 5/32" 2a 120 - 80 2. III 3/16" 2a 4b 150 - 50 3. III 3/16" 3b 150 - 50 5/32" 4b 120 - 80 C. 14 hrs. --- D. Grinding after first two passes.	A. 610°F. B. None	1 2	1096 1300	 1¼" L	 	3/8" R 6¼" U	Imp	I II III	5" 7" 2" 14"	Passed radiograph

*Weld Metal

IDENTIFICATION A Firing Record No B Date of Test C Plate No D Armor Manufacturer E Electrode Supply F Furnace Fabrication	ARMOR DATA A Plate Thickness B Type C Carbon Content D Ppm E Process K Heat Treatment Temp Time & Method	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 Sequence 1. Root Type 2. Body Type 3. Crown Type C Total Welding Time & After Pass Temperature D Remarks	HEAT A Pre B Post	Ht	Vel F/M	BALLISTIC RESULTS Location of Ht L ⊥ R L ⊥ D	CRACKING Loc Type Amt	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AL-3A1 B. 4/17/43 C. [illegible] D. Youngstown Sheet & Tube Co E. Arcos Corp F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R C. --- D. --- E. --- F. ---	A. A-I B. 1040, .37Mn, .3031, 1.50Cr, 10.25Ni, .37Mo)* B. Chromang C. --- D. DC REV	A. DV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 1a 160 - 30 3/16" 1a 205 - 30 1/4" 4b 270 - 30 2. II 5/16" 4b 280 - 30 3. 5 hrs. 70° - 200°F. D. Backing removed after first pass.	A. None B. None	1	1090	8¾" L 4½" D		Passed radiograph
						2	1102	1¼" L 4½" D	Imp I 11½" II 7½" 19"	
A. AL-4AC B. 5/13/43 C. [illegible] D. Jones & Laughlin Steel Corp. E. Alloy Rods Co F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.60Mn, .19Si, .50Mo) C. .28 D. Face 289 Back 285 E. H.O.H. F. 1605°F. 3-1/2 hrs. Water 1200°F. 3-1/2 hrs. Air	A. A-I B. .07-.17C, .30-3.75 Mn, .60Si, 10.0-20.5 Cr, 9.0-10.7Ni, 1.10Mo)* B. Armorang C. Lime D. DC REV	A. 60°DV B. 1/8" C. Machining	A. 3/16" Mild steel B. 1. II 5/32" 2a 140 - 30 2. II 5/32" 5b 140 - 30 1/4" 8b 210 - 30 3/16" 1b 185 - 30 5/32" 1b 250 - 30 3. II 5/16" 4b 260 - 30 C. 4-1/2 hrs. 70° - 200°F. D. Backing removed after first pass.	A. None B. None	1	1090	2" L ¼" D		Passed radiograph
						2	1104	¼" L 7" D	Imp II 2½"	
						3	1096	¾" R 6½" C	Imp I 5¾" II 9½" 34½"	
A. AD-4.0 B. 5/25/43 C. [illegible] D. Youngstown Sheet & Tube Co E. Alloy Rods Co F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.60Mn, .20Si, .50Mo) C. .28 D. Face 289 Back 285 E. H.O.H. F. 1605°F. 3 hrs. Water 1175°F. 3 hrs. Air	A. A-I B. .07-.17C, .30-1.75 Mn, .60Si, 10.0-20.5 Cr, 9.0-10.7Ni, 1.10Mo)* B. Armorang C. Lime D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 2a 140 - 30 2. II 5/32" 2b 140 - 30 3/16" 2b 185 - 30 1/4" 8b 210 - 30 3. II 5/16" 4b 260 - 30 C. 10 hrs. 70° - 200°F. D. Backing removed after first pass.	A. None B. None	1	1090	¼" L 5½" D	Imp II 1¼"	Passed radiograph
						2	1090	¼" L 4½" D	Imp I 6¼" II 12½" 21"	

*Weld Metal

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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 SEQUENCE, NO. PASSES, TYPE, AMP, V 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE E. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	ARC A. PRE-HEAT B. POST	BALLISTIC RESULTS V50 FPS	LOCATION OF HIT L L R L T	CRACKING LOC. TYPE AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-420 B. 5/13/43 C. 14 D. Youngstown Sheet & Tube Company E. Arcos Corp. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.62Mn,.30Si, .28Mo) C. .23 D. Face 369 Back 385 E. B.O.H. F. 1650°F. 3 hrs. Water 1175°F. 3 hrs. Water	A. A-I (.104C, 2.27Mn, .32Si, 18.50Cr, 10.25Ni, .97Mo)* B. Chromang C. Lima D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 2a 155 - 30 2. II 3/16" 4b 185 - 30 1/4" 8b 210 - 30 3. III 1/4" 6b 210 - 30 C. 10 hrs. 70° - 220°F. D. Backing removed after first pass.	A. None B. None	1 1095 2 1191	1/8" L 1/4" L	5 1/2" U 6 3/8" D	Imp I II Imp I II
A. AD-428 B. 5/15/43 C. 15 D. Youngstown Sheet & Tube Company E. Lincoln Electric F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.62Mn,.30Si, .28Mo) C. .23 D. Face 369 Back 285 E. B.O.H. F. 1650°F. 3 hrs. Water 1175°F. 3 hrs. Water	A. A-II (.14C,3.84 Mn,.30Si, 17.71Cr, 8.57Ni, .06Mo)* B. Armor-weld C. Lima D. DC REV	A. 60°DV B. --- C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 2a 150 - 30 2. II 5/32" 4b 150 - 30 3/16" 4b 200 - 30 1/4" 6b 220 - 30 3. III 1/4" 6b 220 - 30 C. 11 hrs. 70° - 220°F. D. Backing removed after first pass.	A. None B. None	1 1060 2 1109	1 1/8" L 1" L	6 3/8" D 6 1/4" U	Imp I II
A. AD-443 B. 5/27/43 C. 16 D. Youngstown Sheet & Tube Company E. Arcos Corp. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.62Mn,.30Si, .28Mo) C. .23 D. Face 369 Back 285 E. B.O.H. F. 1650°F. 3 hrs. Water 1175°F. 3 hrs. Water	A. A-I (.104C, 2.27Mn, .32Si, 18.50Cr, 10.25Ni, .97Mo)* B. Chromang C. Lima D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 2a 160 - 30 2. II 5/32" 4b 160 - 30 3/16" 1b 190 - 30 3/16" 5b 195 - 30 1/4" 4b 250 - 30 3. III 1/4" 3b 250 - 30 1/4" 1b 225 - 30 3/16" 2b 195 - 30 C. 7 hrs. 70° - 395°F. D. Backing removed after first pass.	A. None B. None	1 1102 2 1177	1/8" L 1 1/2" R	6 1/2" D 6 1/2" U	Imp II III Imp I II
		*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. Side 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 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	Ballistic Results No.	V50 f/s	Location of Hit L.L.	R.L.	G.S.	Condition Lot	Type	Rem.	Remarks and Recommendations Regarding Welding Procedure
A. AD-443 B. 5/27/43 C. 17 D. Youngstown Sheet & Tube Company E. Arcos Corp. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.82Mn,.28Si, .02Cr,.04Ni) C. .25 D. Face 277 Back 285 E. B.O.H. F. 1650°F. 2 hrs. Water 1130°F. 3 hrs.	A. A-I (.10C, 2.27Mn, .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 B. 1. II 5/32" 2a 160 - 30 2. II 5/32" 4b 160 - 30 3/16" 5b 190 - 30 1/4" 2b 300 - 30 1/4" 2b 240 - 30 3. III 3/16" 2b 190 - 30 1/4" 2b 300 - 30 1/4" 3b 250 - 30 C. 7 hrs. 70° - 380°F. D. Backing removed after first pass.	A. None B. None	1 2 3	1098 1108 1200 est.	 1-1/4" R 1-1/4" L	2-1/2" L 5-1/2" U 6-1/2" U	6-1/2" D Imp Imp	 III V I II V	3" 13" 5" 5" 13" 16"	Passed radiograph
A. AD-443 B. 5/27/43 C. 18 D. Youngstown Sheet & Tube Company E. Lincoln Electric Co. F. Lima Locomotive Tank Arsenal	A. 1-1/2" B. R-III (1.80Mn,.28Si, .30Mo) C. .25 D. Face 269 Back 286 E. B.O.H. F. 1680°F. 2 hrs. Water 1130°F. 3 hrs. Water	A. A-II (.08-.12C, 3.50-4.25 Mn,.45-.80Si, 19.0-20.5 Cr,8.5-10.0Ni)* B. Armor-weld C. Lime D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 1a 165 - 30 5/32" 1a 170 - 30 2. II 5/32" 4b 170 - 30 3/16" 5b 220 - 30 1/4" 2b 260 - 30 1/4" 2b 255 - 30 3/16" 1b 320 - 30 3. III 1/4" 1b 260 - 30 1/4" 2b 330 - 30 1/4" 1b 300 - 30 3/16" 1b 330 - 30 3/16" 1b 320 - 30 C. 6-1/2 hrs. 70° - 330°F. D. Backing removed after first pass.	A. None B. None	1 2	1113 1195	1" R 1" R	5-3/4" D 5" D	 Imp	 I II	10" 13" 23"	Passed radiograph
		*Weld Metal																

IDENTIFICATION A. ORDNANCE NO. B. ORDNANCE 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 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. PRE B. POST	#	FAIL	BALLISTIC RESULTS LOCATION OF HIT L.L. R.L. O.D.	CRACKING LOC. TYPE AMT.	REMARKS OR GRADING RADIOGRAPHIC RESULTS, ET
A. AD-710 B. 6/26/43 C. 20 D. Jones & Laughlin Steel Corp. E. Alloy Rods Co F. Lima Loco-motive Tank Arsenal	A. 1-1/2" B. R-III (1.60Mn,.19Si, Mo ?) C. .28 D. Face 269 Back 295 E. B.O.H. F. 1650°F. 1 hr. Water 1200°F. 1 hr. Air	A. A-1 (.07-.17C, 3.30-3.75 Mn,.80Si, 18.0-20.5 Cr,9.0-10.70Ni, 1.10Mo)* B. Armoraro C. Lima D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steal B. 1. II 5/32" 2a 160 - 30 2. II 5/32" 2b 160 - 30 5/32" 2b 150 - 30 3/16" 4b 185 - 30 1/4" 6b 250 - 30 3. III 1/4" 6b 250 - 30 C. 5-1/2 hrs. 70° - 360°F. D. Backing removad after first pass.	A. None B. None	1 2 3 4	1104 1100 1054 1113	1/2" R 1 1/2" R 1 1/2" L 2 1/2" R	8" U 7" D 7 1/2" U 7" D	Imp I 6" II 9 1/2" O II 3 1/2" O II 3 1/2" 16 1/2"	Passed radiograph Small amount of porosity in right lag
A. AD-710 B. 6/26/43 C. 23 D. Youngstown Sheet & Tube Company E. Alloy Rods Co F. Lima Loco-motive Tank Arsenal	A. 1-1/2" B. R-III (1.80Mn,.20Si, .02Cr,.30Mo) C. .25 D. Face 277 Back 285 E. B.O.H. F. 1650°F. 3 hrs. Water 1130°F. 3 hrs. Water	A. A-I (.07-.17C, 3.30-3.75 Mn,.80Si, 18.0-20.5 Cr,9.0-10.7Ni 1.10Mo)* B. Armoraro C. Lima D. DC REV	A. 60°DV B. 3/16" C. Machining	A. 1/4" Mild steal B. 1. II 5/32" 2a 160 - 30 2. II 5/32" 4b 160 - 30 3/16" 4b 175 - 30 1/4" 6b 250 - 30 3. III 1/4" 4b 250 - 30 3/16" 2b 175 - 30 C. 6 hrs. 70° - 300°F. D. Packing removad after first pass.	A. None B. None	1 2	1104 1055	1/2" R 1/2" R	7 1/2" U 6 1/2" D	Imp I 1 1/2" II 15 1/2" Imp I 6 1/2" II 11 1/2" 35 1/2"	Passed radiograph Small amount of porosity scattered throughout
		*Weld Metal							

IDENTIFICATION A. FIRMS ASSOCIATED B. DATE OF TEST C. PLATE NO. D. ARMOR MANUFACTURER E. ELECTRODE MFGR. F. ARMOR FABRICATOR	BASE METAL A. PLATE THICKNESS B. TYPE C. CARBON CONTENT D. SAE E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	WELDING RODS 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	PASS NO.	YIELD STRENGTH P/A	BALLISTIC RESULTS LOCATION OF HIT L.L.	R.L.	O.M.	CRACKING LOC.	TYPE	AMT	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-415 B. 5/4/43 C. DR-37 D. Carnegie Illinois Steel Corp. E. Crucible Steel Corp. F. Midland Steel Produote Co.	1-1/2" R-I (1.01Mn,.193i, .42Cr,1.00Ni, .37Mo) C. .24 D. Face 293 Back 286 E. B.O.H. F. 850°F. 3/4 hr. Water 545°F. 1-1/4 hrs. Water	A. A-I (1.82Mn, ..[illegible]i, 19.52Cr. 9.24Ni, .94Mo .09C)* B. Armorize C. TiO D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 150 - 23 2. I 1/4" 2a 260 - 25 2/2" 2a 550 - 33 3. I 1/2" 2a 550 - 33 C. 2-1/4 hrs. 110° - 241°F. D.	A.None B.None	1 2 3	1109 1170 1245	1/4" L X		5" U 1/4" 8 3/8" L D 3 1/2" U	Imp Imp	II II I II III	12" 7" 2 1/2" 22" 2 1/2" 4" 50 1/2"	Failed radiograph Excessive incomplete fusion in all welds
A. AD-415 B. 5/4/43 C. CR-44 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Produote Co.	1-1/2" R-I (1.01Mn,.1961, .42Cr,1.00Ni, .37Mo) C. .24 D. Face 293 Back 296 E. B.O.H. F. 850°F. 3/4 hr. 545°F. 1-1/4 hrs. Water	A. A-I (.09C,1.82 Mn,.2361, 19.52Cr, 9.24Ni, 1.94Mo)* B. Armorize C. TiO D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 150 - 23 2. I 5/16" 2a 330 - 28 1/8 2a 550 - 33 3. I 1/2" 2a 550 - 33 C. 2-1/4 hrs. 130° - 425°F. D.	A.None B.None	1 2 3	1113 1191 1250	1/4" R 1/4" R 1/4" L		7 3/8" D 6 1/4" U 7 3/8" U	Imp Imp Imp	II I II I II	5" 3 3/8" 9 1/2" 28 3/8" 2 1/2" 49"	Passed radiograph
A. AD-415 B. 5/4/43 C. CR-45 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Produote Co.	1-1/2" R-I (1.01Mn,.1961, .42Cr,1.00Ni, .37Mo) C. .24 D. Face 293 Back 286 E. B.O.H. F. 850°F. 3/4 hr. 545°F. 1-1/4 hrs. Water	A. A-I (.09C,1.82 Mn,.2381, 19.52Cr, 9.24Ni, 1.94Mo)* B. Armorize C. TiO D. AC STR	A. 75°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 150 - 23 2. I 5/16" 2a 330 - 28 1/2" 2a 550 - 33 3. I 1/2" 2a 550 - 33 C. 2-1/4 hrs. 120° - 400°F. D.	A.None B.None	1 2 3 4	1108 1175 1241 1315	1 1/4" R X		1" R 6 1/4" D 6" U 1 1/4" L 6 1/4" U 8 1/4" D	Imp Imp	I II III V	6 1/4" 9 1/2" 2 1/2" 5 1/2" 23 1/2"	Passed radiograph 25
		*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, INCLUDES 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	BALLISTIC RESULTS H	VEL. F/S	LOCATION OF H L.L.	R.L.	d.s.	CRACKING LOC.	TYPE	Amt	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-415 B. 5/4/43 C. CR-46 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.01Mn,.198i, .42Cr,1.00Ni, .37Mo) C. .24 D. Face 293 Sack 286 E. S.O.H. F. 850°F. 3/4 hr. 545°F. 1-1/4 hrs. Water	A. A-I (.09C,1.82 Mn,.238i, 19.52Cr, 9.24Ni, 1.94Mo)* B. Armorize C. TiO_2 D. AC STR	A. 70°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 150 - 23 2. I 1/4" 2a 260 - 25 1/2" 4a 550 - 33 3. I 1/2" 2a 550 - 33 C. 2-1/4 hrs. 135° - 252°F. D.	A. None B. None	1	1111	1" R		7½" D				Passed radiograph
						2	1174		½" R	7½" U	Imp	I II III	½" 1" 5½"	
						3	1238	½" R		8½" U	Imp	II III V O	7½" 2½" 2" ½"	
						4	1301		X	6½" D	Imp	III O III	7½" 1" ½"	
													47½"	
A. AD-446 B. 5/27/43 C. CR-47 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (.95Mn,.268i, .40Cr,.928i, .38Mo) C. .28 D. Face 293 Sack 302 E. --- F. 1562°F. 3/4 hr. Water 1004°F. 1-1/4 hrs. Water	A. A-I (.12C,2.17 Mn,.358i, 20.02Cr, 10.25Ni, .71Mo)* B. Armorize C. TiO_2 D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 150 - 23 3/16" 1a 170 - 24 2. III 1/4" 2a 250 - 25 5/16" 2a 4b 320 - 27 3. III 3/16" 4b 160 - 24 5/16" 2b 320 - 27 C. 5:18 hrs. 80° - 200°F. D. 1/2 hr. grinding time due to weld crack in root pass.	A. None B. None	1	1077		⅝" L	5½" D	Imp	II	½"	Passed radiograph
						2	1205	1½" L		5" U	Imp	I II III V	1" 6½" 3½" 1½"	
						3	1250		½" L	6" U	Imp	II	15" 3"	
													30½"	
		*Weld Metal												

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING / TEMPERATURE	HEAT A. PRE B. POST	H	RADIATION RESULTS: WELD LOCATION OF H (YEL. P/S; L.L.; R.L.; S.S.)	GRADING (LOC.; TYPE; AMT.)	REMARKS OR COMMENTS RADIOGRAPHS MADE TO MIL. STD.
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, UNBLUNTED 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. AD-446 B. 5/27/43 C. CR-48 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. 26 D. Face 321 Back 321 E. --- F. 1563°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.085C, 2.23Mn, 1.17Si, 19.78Cr, 10.01Ni, .71Mo)* B. Armorize C. TiO_2 D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 150 - 23 3/16" 1a 170 - 24 2. I 1/4" 2a 250 - 25 5/16" 4a 320 - 27 3. III 3/16" 4b 160 - 24 5/16" 2b 320 - 27 C. 5 hrs. 70° - 204°F. D. 3" crack in root pass.	A. None B. None	1 2 3 4	1106 1" R 5¼" U 1195 ¾" R 4" D 1256 1" L 6½" D 1310 1" R 7⅛" U	Imp II 3½" III 3" Imp II 1½" III 4" V 3" O II ½" Imp III 1" III 6½" V 4½" O III ½" V ½" 39"	Passed radiograph
A. AD-446 B. 5/27/43 C. CR-49 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 321 Back 321 E. --- F. 1562°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.085C, 2.23Mn, 1.17Si, 19.78Cr, 10.01Ni, .71Mo)* B. Armorize C. TiO_2 D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 150 - 23 3/16" 1a 170 - 24 2. I 1/4" 2a 250 - 25 5/16" 4a 320 - 27 3. III 3/16" 4b 160 - 24 5/16" 2b 320 - 27 C. 5 hrs. 70° - 198°F. D. 2" of cracking scattered through root weld.	A. None B. None	1 2 3	1121 ¼" L 4⅜" U 1198 ¼" R 4½" D 1253 ¼" L 6⅜" D	Imp III 2½" Imp II 2½" III 3½" Imp I 2½" II 2½" 35½"	Passed radiograph

*Weld Metal

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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. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	V50	LOCATION OF N L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	ANY	REMARKS ON CRACKING RADIOGRAPHING RESULTS, ETC.
A. AD-446 B. 5/27/43 C. CR-50 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Produote Co.	A. 1-1/2" B. R-1 (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 321 Back 321 E. --- F. 1562°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.105C, 1.99Mn, .48Si, 30.10Cr, 10.70Ni, 1.99Mo)* B. Armorize C. TiO_2 D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 140 - 23 3/16" 1e 160 - 24 2. III 1/4" 4e 4b 260 - 25 3. III 3/16" 4b 150 - 23 1/4" 2b 260 - 25 C. 6 hrs. 70° - 206°F. D.	A. None B. None	1	1116		1" R	4½" D	Imp	II V	2½" 3"	Passed radiograph
						2	1197	1½" L		5" U				
						3	1190		1½" R	7½" U	Imp	I II	3" 12"	
						4	1349	1" L		7⅝" D	Imp	I II III V	2½" 4½" 4½" 3"	
													5⅛"x4½"	opening
														33½"
A. AD-446 B. 5/27/43 C. CR-51 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Producte Co.	A. 1-1/2" B. R-1 (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 321 Back 321 E. --- F. 1562°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.11C,4.11 Mn,.33Si, 20.16Cr, 9.94Ni, .86Mo)* B. Armorite C. TiO_2 D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 140 - 23 3/16" 1e 160 - 24 2. III 1/4" 4a 8b 260 - 25 3. III 5/16 4b 150 - 23 1/4" 2b 260 - 25 C. 6 hrs. 80° - 206°F. D. Cannot use 1/4" rod in root pass as it cracked excessively.	A. None B. None	1	1104		½" R	6" U	Imp	II	8"	Passed radiograph Some scattered porosity
						2	1212	½" R		5½" D	Imp	II III O	2" 4" 2"	
						3	1258	X		7" U	Imp	I II III	15½" 6½" 8½"	
A. AD-446 B. 5/27/43 C. CR-52 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Producte Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 321 Back 321 E. --- F. 1562°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.065C, 1.90Mn, .23Si, 20.12Cr, 10.44Ni, 1.20Mo)* B. Armorite C. TiO_2 D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 140 - 23 3/16" 1a 160 - 24 3. I 1/4" 2a 260 - 25 5/16" 4a 320 - 27 3. III 3/16" 4b 150 - 23 5/16" 2b 320 - 27 C. 4:48 hrs. 70° - 195°F. D.	A. None B. None	1	1102		⅜" R	9" D				Passed radiograph
						2	1191	X		5½" U	Imp	II	11"	
						3	1253		⅜" L	6" U	Imp	I II III O	7" 1½" 1" ⅜"	28.
														20½"
		*Weld Metal												

IDENTIFICATION A FIRING RECORD NO B DATE OF TEST C PLATE NO D ARMOR MANUFACTURER E ELECTRODE MFGR. F ARMOR FABRICATION	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 I. ROOT TYPE E. BODY TYPE J. CROWN TYPE G. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A PRE B POST	H	VEL F/S	BALLISTIC RESULTS LOCATION OF H LLT	RLT	CB	CRACKING LOC	TYPE	AMT	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-446 B. 5/27/43 C. CR-53 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 393 Back 302 E. --- F. 1562°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.08C,2.05 Mn,.94Si, 19.76Cr, 10.16Ni, 1.23Mo)* B. Armorize C. TiO_a D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1e 140 - 33 3/16" 1a 160 - 34 2. III 1/4" 4a 6b 260 - 25 3. III 3/16" 4b 150 - 33 1/4" 2b 260 - 25 C. 6:18 hrs. 80° - 204°F. D.	A.None B.None	1	1116		$\frac{1}{4}$" R	$7\frac{1}{4}$" D	Imp	III	$\frac{1}{4}$"	Passed radiograph
						2	1195	$\frac{3}{4}$" L		$7\frac{1}{4}$" U	Imp	II V	$1\frac{1}{4}$" $2\frac{3}{4}$"	
						3	1245		$\frac{1}{4}$" L	7" U	Imp	I II III	$2\frac{1}{4}$" 2" 4"	
						4	1309	X		$6\frac{1}{4}$" D	Imp	I II III V O	$10\frac{3}{4}$" $1\frac{1}{4}$" $2\frac{3}{4}$" 2" III $2\frac{3}{4}$" $31\frac{1}{4}$"	
A. AD-446 B. 5/27/43 C. CR-54 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 393 Back 302 E. --- F. 1562°F. 3/4 hr. Water 1023°F. 1-1/4 hrs. Water	A. A-I (.08C,2.05 Mn,.94Si, 19.76Cr, 10.16Ni, 1.23Mo)* B. Armorite C. TiO_a D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 1e 140 - 33 3/16" 1a 160 - 34 2. III 1/4" 4a 4b 270 - 25 3. III 3/16" 4b 150 - 33 1/4" 2b 270 - 25 C. 6:30 hrs. 70° - 201°F. D.	A.None B.None	1	1119		1" R	7" D	Imp	I II	$1\frac{1}{4}$" $7\frac{3}{4}$"	Passed radiograph
						2	1202	$\frac{3}{4}$" R		6" U				
						3	1249	$\frac{1}{4}$" R		8" D	Imp	I II III O	$6\frac{3}{4}$" $4\frac{1}{4}$" 1" I $2\frac{1}{4}$" $23\frac{3}{4}$"	
A. AD-446 B. 5/27/43 C. CR-55 D. Carnegie Illinois Steel Co. E. Crucible Steel Corp. F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.05Mn,.19Si, .51Cr,.96Ni, .46Mo) C. .26 D. Face 393 Back 302 E. --- F. 1563°F. 3/4 hr. Water 1022°F. 1-1/4 hrs. Water	A. A-I (.06SC, 1.90Mn, .33Si, 20.12Cr, 10.44Ni, 1.30Mo)* B. Armorite C. TiO_a D. AC STR	A. 45°DV B. 5/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 1e 140 - 33 3/16" 1a 160 - 34 2. III 1/4" 2a 360 - 35 5/16" 2a 4b 320 - 37 3. III 3/16" 4b 150 - 33 5/16" 3b 330 - 27 C. 5:30 hrs. 80° - 198°F. D.	A.None B.None	1	1116		$\frac{1}{4}$" L	$6\frac{3}{4}$" D	Imp	II	$5\frac{1}{2}$"	Passed radiograph
						2	1191	$\frac{1}{4}$" R		$6\frac{3}{4}$" U	Imp	I II III	$2\frac{1}{2}$" 3" $2\frac{1}{2}$" 13"	

*Weld Metal

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IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS						REMARKS ON CRACKING
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. SHIM 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 ZL. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. GROVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	A. PRE B. POST	H	VEL. F/S	LOCATION OF H L.L.	R.L.	C.G	CRACKING LOC.	TYPE	AMT	RADIOGRAPHIC RESULTS, ETC.
A. AD-891 B. 9/30/43 C. CR-71 D. Carnegie Illinois Steel Co. E. Reid Avery Co F. Midland Steel Products Co.	A. 1-1/2" B. R-I (1.31Mn, .20Si, .65Cr, .72Ni, .20Mo) C. .27 D. Face 293 Back 286 E. --- F. 1562°F. 3/4 hr. Water 1040°F. 1-3/4 hrs. Water	A. A-I (6.45Mn, .398i, 18.82Cr, 10.30Ni, .81Mo)* B. Type 307 C. --- D. AC STR	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 1a 150 - 23 3/16" 1a 170 - 24 2. I 1/4" 2a 250 - 35 5/16" 4a 320 - 27 3. III 3/16" 4b 160 - 24 5/16" 2b 320 - 27 C. 7 hrs. 105° - 212°F. D.	A. None B. None	1	1331	2" R		6" U				Passed radiograph Small amount of slag throughout crossbar and right leg weld
						2	1174		½" R	7½" D	Imp	III	⅛"	
						3	1181	¾" R		6" D	Imp	III	2⅜"	
						4	1349		1" L	4" U	Imp	III	5⅛" / 6⅝"	

*Weld Metal

IDENTIFICATION A. FIRING 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. 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 H L.L.	A.L.	G.L.	CRACKING LOC.	TYPE	AMT.	REMARKS ON RADIOGRAPHIC TESTS, ETC.
A. AD-453 B. 5/31/43 C. 38 D. Jonee & Laughlin Steel Corp. E. Page Steel & Wire Company F. New York Air Brake Company	A. 1-1/2" B. R-III (1.58Mn,.2381, .41Mo) C. .25 D. Face 302 Back 300 E. O.H. F. 1625°F. 2-1/2 hrs. Water 1080°F. 2-3/4 hrs. Air	A. A-II (.12C,4.2 Mn,.3581, 19.31Cr, 11.15Ni)* B. Page-Allegheney C. Titanium D. DC REV	A. 45°DV B. 1/4" C. Grinding	A. Copper B. 1. II 5/32" 2a 150 - 27 2. I 3/16" 2a 200 - 25 1/4" 2a 300 - 27 5/16" 2a 350 - 28 3. III 5/32 4b 200 - 27 5/16" 2b 350 - 28 C. 20 hrs. 175° - 350°F. D. Some cracking , chipping and grinding after two passes.	A.None B.None	1 2 3	1081 1208 1202	 1/4" R 	1" L X	7 1/4" D 6" U 7" U	Imp Imp Imp O	III I II I II III	1/8" 4" 9 3/4" 2" 10 1/2" 1 1/2" 28"	Failed radiograph Large amount of incomplete fusion throughout the welds 1-1/8" crack in crossbar
A. AD-755 B. 7/22/43 C. 40 D. Jones & Laughlin Steel Corp. E. Metal & Thermit Co. F. New York Air Brake Co.	A. 1-1/2" B. R-III (1.58Mn,.2381, .41Mo) C. .25 D. Face 302 Back 300 E. O. H. F. 1625°F. 2-1/2 hrs. Water 1080°F. 2-3/4 hrs. Air	A. A-I (.12C,4.00 Mn,.8081, 19.25Cr, 8.5Ni, .55Mo)* B. Murex C. Lime D. DC REV	A. 45°DV B. 1/4" C. ---	A. Copper B. 1. II 5/32" 1e 150 - 3B 3/16" 1a 200 - 35 2. I 1/4" 2a 275 - 30 5/16" 2a 375 - 2B 3. I 5/16" 2a 375 - 2B C. 11:10 hrs. 80° - 240°F. D. One more pass in crossbar. Chipping after first, second and third passes, time one hour.	A.None B.None	1	1100 est.	1 1/2" L		5 1/2" U	Imp	I II	6 3/4" 11 1/2" 18"	Passed radiograph

*Weld Metal

IDENTIFICATION A. PWRA 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. L. 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	LOCATION OF R LI	RL	OBSERVATIONS BB	RADIOGRAPHIC OBSERVATIONS RADIOGRAPHIC RESULTS, ETC.
A. AD-468 B. 6/13/43 C. 39 D. Carnegie Illinois Steel Co. Republic Steel Corp. E. Crucible Steel Corp. F. Pressed Steel Car Company	A. 1-1/2" B. R-I C I (1.28Mn,.30Si, .82Ni) Body of R-I R 8 (.93Mn,.25Si, .99Cr,1.25Ni, .61Mo) C. .27 .278 D. Face 302 Back 303 Face 372 Back 368 E. --- F. 1530°F. 1-1/2 hrs. Water 1600°F. 3 hrs. Water	A. A-I (.12C,1.74 Mn,.24Si, 18.38Cr, 8.64Ni, 1.68Mo)* B. Rezistal C. Slag D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 140 - 35 3/16" 1a 150 - 35 2. III 5/16" 3a 2b 300 - 35 5/16" 1a 5b 300 - 37 3. II 5/16" 8b 300 - 27 C. 14 hrs. --- D. Chipping and grinding after first, third and fourth passes, time 6 hours. One more pass in right leg and six more in crossbar. Right and left sections welded by Carnegie Illinois and both center sections by Republic Steel.	A. 70°F. B. None	1 1095 2 1062		1" R 2" R	6½" J 9½" D	Imp	II 2½" III 5½" II 2¾" III 4½" 15"	Passed radiograph Some slag and incomplete fusion
A. AD-468 B. 6/12/43 C. 40 D. Great Lakes Steel Corp. Republic Steel Corp. E. Crucible Steel Corp. F. Pressed Steel Car Company	A. 1-1/2" B. R-IV G L (.94Mn,.80Si, .71Cr,.21Mo) R-IV R 6 (.85Mn,.60Si, .69Cr,.16Mo) C. .28 .28 D. Face 278 Back 278 Face 285 Back 285 E. --- F. 1650°F. 2 hrs. Water 1650°F. 2-1/2 hrs. Water 1600°F. R 8 3 hrs. Water	A. A-I (.14C,1.75 Mn,.27Si, 18.99Cr, 8.85Ni, 1.66Mo, .08Cu)* B. Rezistal C. Slag D.	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 120 - 5/16" 1a 140 - 2. III 5/16" 4a 4b 300 - 3. II 5/16" 6b 300 - C. 16 hrs. --- D. Right and left sections welded by Great Lakes and both center sections by Republic Steel. Chipping and grinding after first and second passes, time 5 hours. Nine more passes in crossbar.	A. 700-100°F. B. None	1 1109 2 1237 3 1192		1¼" L 1" L 1¼" L	8" D 8" U 4½" U	Imp Imp Imp	III 5" I 6" II 5½" III 6½" I 4½" II 1" III 6" 3½"	Passed radiograph 32

*Weld Metal

IDENTIFICATION A. FIRM RECORD NO. B. DATE OF TEST C. PLATE NO. D. A-[illegible] 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 COOLANT	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 L. ROOT TYPE S. POST TYPE A. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE B. POST	PEENING RESULTS H / VEL. FPS / LOCATION OF H: LL / RL / CS / DEPRESSIONS: LOC / TYPE / Amt.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-468 B. 6/12/43 C. 42 D. Carnegie Illinois Steel Co. Republic Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R-I C I (1.28Mn,.208i, .82Ni,.60Cr, .18Mo) R-I R S (.93Mn,.258i, .99Cr,1.25Ni, .61Mo) C. .27 .278 D. Face 295 Back 295 E. --- F. 1600°F. 3 hrs. Water 1530°F. 1-1/2 hrs. Water	A. A-II (.14C,4.11 Mn,.67Si, 18.58Cr, 8.72Ni, .12Cu)* B. A-5 C. Slag D. AC STR	A. 75°DV B. 5/32" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 100 - 3/16" 1a 140 - 2. III 5/16" 4a 4b 300 - 3. III 5/16" 6b 300 - C. 11 hrs. --- D. Right and left sections welded by Republic Steel, and both center sections by Carnegie Illinois. Chipping and grinding time 5 hours.	A. 70°F B. None	1 1104 — 1⅜" R — 11" U 2 1300 est. 1" L — 5" D 3 1242 — 1¼" L — 7⅜" D — Imp — II 5" III 1½" 4 1292 1" L — 9½" U — Imp — I 2" II 1" III 7" III 2" V 4½" O Imp 21½"	Passed radiograph
A. AD-741 B. 7/15/43 C. 46 D. Republic Steel Corp. Youngstown Sheet & Tube Company E. Reid Avery Company F. Pressed Steel Car Company	A. 1-1/2" B. R-I R S (.93Mn,.258i, .99Cr,1.25Ni, .61Mo) R-III Y (1.74Mn,.218i, .02Cr,.03Ni, .33Mo) C. .27 .26 D. Face 272 Back 272 Face 274 Back 274 E. --- F. 1600°F. 3 hrs. Water 1600°F. 3 hrs. Water 1600°F. 3 hrs. Water	A. A-I (.07-.17C, 3.30-4.75 Mn,.008i, 9.0-10.7 Ni,18.50-20.50Cr, 1.10Mo)* B. --- C. Manganese D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 170 - 27 2. III 5/16" 2a 230 - 28 5/16" 2a 4b 400 - 30 3. III 5/16" 6b 400 - 30 C. 14 hrs. --- D. Left and lower center sections welded by Republic Steel, and right and upper center sections by Youngstown. Chipping and grinding time 6 hours.	A. None B. None	1 1105 — 1" L — 5⅝" U — Imp — I 1½" II 1½" III 1½" 2 1174 — 1" R — 7" D — Imp — I 1½" III 1½" 3 1199 ½" R — 5½" D — Imp — I 6½" II 4½" 22½"	Passed radiograph 33

*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 PASSES B. DEPOSITION SEQ NO. NO. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. CROWN TYPE D. TOTAL WELDING TIME & INTER PASS TEMPERATURE E. REMARKS	HEAT A. PRE B. POST	BALLISTIC RESULTS N	V50 f/s	LOCATION OF N L.L.	R.L.	O.B.	CRACKING CRACK	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-760 B. 7/27/43 C. 56 D. Carnegie Illinois Steel Corp. E. Hollup Corp. F. Pressed Steel Car Company	A. 1-1/2" B. R-I (1.16Mn,.19Si, .87Cr,1.15Ni, .22Mo) C. .25 D. Face 290 Back 287 E. --- F. 1562°F. 1-1/2 hrs. Water	A. A-I (.14C,4.26 Mn,.51Si, 19.78Cr, 9.72Ni, .74Mo)* B. Armorod C. Lime D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 150 - 25 3/16" 1a 160 - 25 2. III 1/4" 2a 220 - 26 5/16" 1a 290 - 27 5/16" 1a 4b 300 - 27 3. III 5/16" 6b 300 - 27 C. 14 hours --- D. Chipping and grinding after first, second, fifth and seventh, time 5 hours.	A. 100°F. B. None	1	1100 sst.		1½" L	5½" U				Passed radiograph
						2	1088	¾" R		7½" D	Imp	II	7"	
						3	1177	2" L		5¼" U				
						4	1200 est.		1½" R	5½" D	Imp	II V	3" 2" 12"	
A. AD-769 B. 7/21/43 C. 50 D. Republic Steel Corp. Carnegie Steel Co. E. Crucible Steel Corp. F. Pressed Steel Car Company	A. 1-1/2" B. R-I R S (.89Mn,.19Si, .92Cr,.96Ni, .48Mo) R-I C S (.93Mn,.25Si, .99Cr,1.25Ni .61Mo) C. .28 .278 D. Face 278 Back 287 Face 266 Back 266 E. --- F. 1600°F. 3 hrs. Water 1562°F. 1-1/2 hrs. Water 1600°F. 3 hrs. Water 1058°F. 3 hrs.	A. A-I (.11C,1.86 Mn,.19Si, 20.18Cr, 9.98Ni, 1.86Mo)* B. Nerlstal C. Titanium D. AC STR	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 130 - 3/16" 1a 140 - 2. III 1/4" 2a 220 - 5/16" 2a 4b 300 - 3. III 5/16" 6b 300 - C. 14 hours --- D. Root pass ground.	A. None B. None	1	1180	1" R		13½" U	Imp	II	4½"	Failed radiograph 2" incomplete penetration in crossbar Some porosity and slag
						2	1179		¾" R	16" D	Imp	I V	6" 4"	
						3	1190		¾" L	13" U	Imp	III V	2" 17½"	
						4	1191	X		15" D	Imp	I V	5" 3½" 25½"	

*Weld Metal

IDENTIFICATION A FIRMS RECORD NO B DATE OF TEST C PLATE NO D ARMOR MANUFACTURER E ELECTRODE MFGR F ARMOR FABRICATOR	PLATE A PLATE THICKNESS B TYPE C CARBON CONTENT D Spec 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 SEQUENCE 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 F/S	RADIOGRAPHIC RESULTS LOCATION OF H LL	RL	CB	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-774 B. 8/3/43 C. 58 D. Carnegie Illinois Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R-1 (1.16Mn,.19Si, .87Cr,1.13Ni, .22Mo) C. .35 D. Face 290 Back 300 E. --- F. 1562°F. 1-1/2 hrs. Water	A. A-II (.12C,3.08 Mn,.61Si, 20.30Cr, 10.65Ni, .16Mo,.07 V,.11Cb)* B. A-5 C. Lime D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 5/32" 1a 130 - 25 5/32" 1a 140 - 25 2. II 5/32" 4b 140 - 25 2/16" 26b 170 - 26 3. II 3/16" 16b 170 - 26 C. 28 hrs. --- D. One more pass in cross-bar.	A.None B.None	1 2 3	1121 1192 1247	1½" R 1½" L ½" R		7½" U 6¾" U 7½" D	Imp Imp Imp	II II I II	3½" 3½" 12¾" 4¾" 23½"	Passed rad.ograph
A. AD-774 B. 8/3/43 C. 59 D. Carnegie Illinois Steel Corp. E. Crucible Steel Co. F. Pressed Steel Car Company	A. 1-1/2" B. R-I (1.16Mn,.19Si, .87Cr,1.13Ni, .22Mo) C. .35 D. Face 282 Back 290 E. --- F. 1562°F. 1-1/2 hrs. Water	A. A-I (.12C,2.04 Mn,.36Si, 19.64Cr, 9.24Ni, 1.86Mo)* B. Rezistal C. Titanium D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 5/32" 2a 140 - 2. II 5/32" 12b 140 - 3/16" 24b 170 - 3. II 3/16" 20b 170 - C. 28 hrs. --- D. Root pass ground out. Chipping and grinding after first two passes, time 9 hours.	A.100°F. B.None	1 2 3	1081 1188 1250	1½" R 1½" L ½" R		5" U 6" D 5½" U	Imp Imp Imp	II II II	5½" ½" 14" 30"	Passed radiograph
A. AD-774 B. 8/3/43 C. 61 D. Carnegie Illinois Steel Corp. E. McKay Company F. Pressed Steel Car Company	A. 1-1/2" B. R-1 (1.16Mn,.19Si, .87Cr,1.13Ni, .22Mo) C. .35 D. Face 295 Back 295 E. --- F. 1562°F. 1-1/2 hrs. Water	A. A-II (.12C,3.08 Mn,.61Si, 20.30Cr, 10.65Ni, .16Mo, .07V, .11Cb)* B. A-5 C. Lime D. DC REV	A. 75°DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 5/32" 1a 120 - 25 5/32" 1a 130 - 25 2. I 5/32" 3a 130 - 25 3/16" 1a 160 - 26 3/16" 1a 170 - 26 3. I 3/16" 2a 170 - 26 C. 28 hrs. --- D. Root pass ground out. Chip. ing and grinding after second pass, time 9 hours.	A.None B.None	1 2 3 4	1100 est. 1100 est. 1100 .875	¾" L ½" L ½" R ¾" L		6" D 4" U 5" U 5" U	Imp Imp Imp Imp	III III III II	½" 1¾" 1¼" 3¾" ¾" 5"	Passed radiograph Small amount of porosity

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*Alclad Metal

IDENTIFICATION A. PLATE MANUFACTURER 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 TIME TEMP COOLING	ELECTRODE DATA A. TYPE B. TENSILE RANGE C. POSITION D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, INCLUDED ANGLE, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. SA DESIGN B. DEPOSITION SEE SL. JR. TYPE ROOT T. 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PWHT B. PWHT	#	WELD PASS	SA WITH BUTTS LOCATION OF B LAYER	SIZE	LOCATION	TYPE	QTY	RADIOGRAPHIC OR ULTRASONIC INSPECTION RESULTS AND REMARKS
A. AL-733 B. 7/8/43 C. 66 D. Carnegie Steel Corp. E. Metal & Thermit Corp. F. Pullman Standard Car Mfg. Co.	A. 1-1/2" B. R-I (1.17Mn,.20Si, .64Cr,.50Ni, .19Mo) C. .27 D. Face 280 Back 280 E. B.O.H. F. ---	A. A-I (.10C,3.32 3.79Mn, .32-.6481 19.44-20.82Cr, 9.10-9.85 Ni,.78-.91Mo)* B. Murex 307 C. Lime D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding Machining	A. Copper B. 1. II 3/16" 2a 140 - 2. I 1/4" 1a 250 - 1/4" 1a 290 - 5/16" 4a 290 - 3. III 5/16" 5b 290 - C. 8 hrs. 100° - 120°F. D. Chipping after all passes. time 2 hours.	A.None B.None	1 2 3 4	1131 1109 1215 1267	 $\frac{3}{8}$" L $\frac{1}{4}$" R	 	$2\frac{1}{2}$" R $7\frac{1}{2}$" D $\frac{1}{2}$" R $7\frac{1}{2}$" D $7\frac{3}{8}$" U	 Imp Imp Imp	 II III V II III II III O II III	 $2\frac{3}{4}$ $2\frac{1}{4}$ $3\frac{1}{2}$ $2\frac{1}{4}$ $5\frac{1}{4}$ $7\frac{1}{4}$ $11\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $38\frac{1}{2}$	Passed radiograph
A. AD-744 B. 7/15/43 C. 69 D. Carnegie Steel Corp. Republic Steel Corp. E. A.O. Smith F. Pullman Standard Car Mfg. Co.	A. 1-1/2" B. R-I (1.07Mn,.25Si .77Cr,.84Ni, .39Mo) R R-I (1.17Mn,.20Si .64Cr,.50Ni, .19Mo) C C. .35 .27 D. Face 280 Back 280 E. B.O.H. F. ---	A. A-I (.08-.11C, 3.72-3.90 Mn,.48-.50 Si,18.60-19.5Cr, 9.2-9.70Ni .98-1.15 Mo)* B. 307 C. Lime D. DC REV	A. 45°DV B. 3/8" C. Flame Cutting Grinding Machined	A. Copper B. 1. II 3/16" 1a 140 - 21 1/4" 1a 250 - 29 2. I 1/4" 1a 250 - 29 1/4" 1a 280 - 29 5/16" 4a 290 - 32 3. III 1/4" 2b 250 - 29 1/4" 2b 280 - 29 5/16" 2b 290 - 32 C. 7 hrs. 100° - 170°F. D. Chipping after all passes, time 1 hour.	A.None B.None	1 2 3 4 5	1141 1110 1201 1195 1143	1" R 2" R 	 $\frac{1}{4}$" L $\frac{1}{4}$" L X	6" U $6\frac{3}{4}$" D 6" D $5\frac{3}{4}$" U 2" U	Imp Imp	II II III V	$2\frac{3}{4}$ 3" 6" 1" $12\frac{3}{4}$	Passed radiograph Small amount of porosity
		*Weld Metal														

IDENTIFICATION A. Firing Record No B. Date of Test C. Plate No D. Armor Manufacturer E. Electrode Manf. F. Armor Fabrication	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 & Type and # 1. Root Type 2. Body Type 3. Crown Type C. Total Welding Time & Hyden Pass Temperature D. Remarks	A. Pre B. Post	N	Vel.	Ballistic Results Location of N L.L.	R.L.	O.A.	Cracking Loc.	Type	Amt.	Remarks on Cracking Radiographic Results, Etc.
A. AD-851 B. 8/25/43 C. 3 D. Jones & Laughlin Steel Corp. E. Crucible Steel Co. F. Standard Steel Spring Co.	A. 1-1/2" B. R-III (1.68Mn,.32Si, .44Mo) C. .28 D. Face 285 Back 277 E. B.O.H. F. 1650°F. 3/4 hr. Water 1180°F. 1-1/2 hrs. Water	A. II (1.79Mn,.08 C,.49Si, 20.5Cr, 10.85Ni)* B. Armorized C. Shielded arc D. DC REV	A. 45°DV B. 1/4" C. Flame Cutting Grinding	A. Mild Steel B. 1. I 3/16" 1e - - 2. II 3/16" 19b - - 3. III 3/16" 6b - - C. 12 hrs. 170°F. D. Weld reinforcements ground off.	A. None B. None	1	1105	1" R		6½" U	Imp	III	6½"	Passed radiograph Some imperfect fusion
						2	1113		1¼" R	7" D				
						3	1225		½" R	7" U	Imp	I	3⅝" 4¼"	

*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 SL. NO. TYPE AMP. V C. ROOT TYPE D. BODY TYPE E. CROWN TYPE G. TOTAL WELDING TIME & INTER PASS TEMPERATURE H. REMARKS	HEAT A. PRE B. POST	N	V&L F/S	BALLISTIC RESULTS LOCATION OF X L.L.T.	R.L.	C.B.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD [illegible] B. 9/3/43 C. 42 D. Carnegie Ill. Steel Corp. E. Linde Air Products Co. F. Briggs Mfg.Co.	A. 1" B. R I 1.17Mn .19Si .83Cr .87Ni .21Mo C. .27C D. Face 386 Back 377 E. O.H. F. 1563°F ⅜ hr water 1076°F 1½ hr water	A. A I .37C 3.43 Mn .86Si 11.43Cr 10.61Ni .33Mo* B. Oxweld #42 C. Bare #80 20XD D. AC	A. 45° DV B. 1/4" C. Flame Cutting	A. Copper B. Special 1/4" SUW 780 38 1/4" SUW 790 38 C. 5 hours. 70-170°F D. Elapsed welding time 14 hrs UW Travel speed 54"/min	A. None B. None	1 2	1088 1074	1" R 11" R		34" U 84" D	I'T IWP	I II II I	3⅜" 1⅜" 17⅜" 7¼" 50⅜"	Failed radiograph ⅜" crack in left ⅜ junction of crossbar.
A. AD 868 B. 9/3/43 C. 43 D. Carnegie Ill. Steel Corp. E. Linde Air Products Co. Crucible Steel Corp. F. Briggs Mfg.Co.	A. 1" B. R I 1.17Mn .19Si .83Cr .87Ni .21Mo C. .27C D. Face 386 Back 377 E. O.N. F. 1564°F ⅜ hr water 1076°F 1½ hr water	A. Crucible .08-.09C 1.72-1.76 Mn .19-.30Si 19.17-19.33 Cr 10.80-10.81 Ni 2.09-2.14Mo* B. Armorize C. Titania D. --- A. Linde .27C 3.43Mn .86Si 11.43Cr 10.16Ni .33Mo* B. Oxweld #43 C. #80 D. --- *Weld Metal	A. 45° DV B. 1" C. Flame Cutting	A. Copper B. 1. U 3/15" 2a 180 24 2. V 1/4" 2a 220 25 1/4" SUW 780 38 C. 7 hours 70-170°F D. Elapsed welding time 15 hours. Copper adhesions ground off, time 1 hour. UW Travel speed 54"/min.	A. None B. None	1 2 3 4 5 6	1084 1094 1083 1093 1216 1084	2" R 12" R 14" L 2" R 2" L		7" U 7" D 71" D 7" U 41" U 11" D	IWP	I II III	9¾" 4⅜" 1" 28¼"	Passed radiograph

IDENTIFICATION A. FIRM'S 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. SAE E. PROCESS F. HEAT TREATMENT TEMP TIME QUENCH	ELECTRODE DATA A. TYPE B. TRADE NAME C. COATING D. CURRENT & POLARITY	JOINT DESIGN A. GROOVE, IRREGULAR ANGLE, BODY FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BEVELING PASSES E. DEPOSITION SIZE EL. NO. TYPE AMP I. ROOT TYPE J. BODY TYPE K. CROWN TYPE O. TOTAL WELDING TIME & INTER PASS TEMPERATURE P. REMARKS	HEAT A. PRE B. POST	K	WELDING RESULTS WEL. P/B	LOCATION OF N L.I.	R.I.	DEFLECTION O.D.	LOC	TYPE	AMT	REMARKS OR COMMENTS RADIOGRAPHIC RESULTS, ETC.
A. AD-868 B. 9/3/43 C. 44 D. Carnegie Illinois Steel Corp. E. Linde Air Products Co. F. Briggs Mfg. Company	A. 1-1/2" B. R-I (1.17Mn,.19Si, .83Cr,.87Ni, .21Mo) C. .27 D. Face 286 Back 277 E. O.H. F. 1562°F. 3/4 hr. Water 1076°F. 1-3/4 hrs. Water	A. A-I (.27C,3.43 Mn,.86Si, 11.43Cr, 10.16Ni, .33Mo)* B. Oxweld #42 C. Bare #80 20XD D. AC	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. Special Unionmelt 1/4" 4UM 280 - 3H C. 5 hrs. 70° - 170°F. D. Elapsed welding time, 14 hours.	A. None B. None	1 2	1094 1098	2¾" R	R ¾" L	6" U 8" U	Imp	I	4" 17¾" 21"	Passed radiograph Moderate amount of slag scattered throughout
A. AD-[illegible] B. 9/3/43 C. 45 D. Carnegie Illinois Steel Corp. E. Linde Air Products Co. F. Briggs Mfg. Company	A. [illegible] B. R-I (1.17Mn,.19Si, .83Cr,.87Ni, .21Mo) C. .27 D. Face 286 Back 277 E. O.H. F. 1562°F. 3/4 hr. Water 1076°F. 1-3/4 hrs. Water	A. A-I (.27C,3.43 Mn,.86Si, 11.43Cr, 10.16Ni, .33Mo)* B. Oxweld #42 C. Bare #80 20XD	A. 45°DV B. 1/4" C. Flame Cutting	A. Copper B. Special Unionmelt 1/4" 4UM 280 - 3H C. 5 hrs. 70° - 170°F. D. Elapsed welding time, 14 hours.	A. None B. None	1	1098	1" R		2" U	Imp	I	36"	Failed radiogram Several small cracks in cross-bar and right 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	BALLISTIC RESULTS H	VEL. F/S	LOCATION OF H L.L.	R.L.	S.S.	CRACKING LOC.	TYPE	AMT.	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 795 B. 8/21/43 C. 38 D. Great Lakes Steel Corp. E. McKay Company. Linde Air Products Co. F. Fisher Tank Division.	A. 1¼" B. R II .80Mn .55Cr .36Mo C. .37C D. Face 285 Back 285 E. --- F. ---	McKay A. AII .08C 3.92Mn .5331 19.8Cr 9 7Ni .41Mo* B. Armorloy C. Lime D. Linde Air A. --- B. Oxweld 42 C. --- D. ---	A. 90° DV one side 58° DV other B. 1/8" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 175 22 one side 2. I 1/4" 1a 250 28 5/16" 1a 350 36 3. I 5/16" 2b 350 36 other side 2. & 3.1/4" 1UM 900 34 C. 2:05 hrs. 100-200°F D. 3 minutes of chipping after each pass. Weld reinforcement ground off.	A. None B. None	1	1102	2" °L		7" U	IMP	II	2¼ "	Failed radiograph. 1/2" crater crack in crossbar.
						2	1092		2" °R	14" D	IMP	III	12¼ "	
											O	III	1"	
						3	1177		1" R	7" U	IMP	II	2" "	
												III	12" "	
													50" "	

* 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 B. DEPOSITION SIZE EL. AM. TYPE AMP V. 1. ROOT TYPE 2. BODY TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PWHT B. POST	H	BALLISTIC RESULTS VEL. F/S	LOCATION OF H L.L.	B.L.	S.S.	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 427 B. 6/13/43 C. A9716 D. Ford Motor Company E. Metal & Thermit Corp. Linde Air Products Co. F. Ford Motor Company.	A. 1¼" B. R II 1.36Mn .27Si .55Cr .08Ni .40Mo C. .27C D. Face 286 Back 286 E. B.Elec. F. 1650°F 2 hrs 1125°F 4 hrs	A. Metal & Thermit A I .07C 1.04Mn .50Si 18.3Cr 10.3Ni 2.00Mo* b. Murex C. --- D. DC-REV A. Linde Air .12C 6.24Mn 13.45Cr 11.8Ni .13Mo* B. Oxweld 42 C. # 80 D. --- *Weld metal	A. 45° DV B. 3/16" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 187 28 2. One side III 3/16" 5a 5b 187 28 3. III 3/16" 3b 187 28 Other side 2.& 3. 3/16" 1a 187 28 1/4" IUM 800 38 C. 8 hours 300°F D. Chipping after all passes.	A. None B. None	1	1111		2" 4R	5½" 8U	IMP	II	5½" 8	Passed radiograph
							2	1143	1" 8R		5½" 8D	IMP	III	5½" 8	
													I	4½" 8	
													II	1½" 8	
													III	7" 8	
												O	VI	1"	
												IMP	V	3"	
														46"	

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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. SQ. TYPE AMP V. 1. ROOT TYPE 2. BOOT 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.S	CRACKING LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 726 B. 7/6/43 C. CR 56 D. Carnegie Ill. Steel Company E. McKay Company, Linde Air Products Co. F. Midland Steel Products Co.	A. 1¼" B. R I 1.05Mn .195i .51Cr .96Ni .46Mo C. .26C D. Face 293 Back 302 E. --- F. 1562°F ½ hr water 1022°F 1¼ hr water	A. Linde Air .23C 4.54Mn .528i 7.48Cr 8.18Ni .24Mo* B. Oxweld #43 C. Flux #80 D. AC A. McKay B. Armorloy C. --- D. ---	A. 45° DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 165 22 2. & 3. 1/4" 2a 230 25 1/4" 2UM 830 30 C. 4 hrs. 108-320°F D. UM Travel speed 6"/min.	A. None B. None	1 2 3	1094 1098 1089	11"R 1"R	11"R 7"D 1"R	8" U 8½"D	IMP IMP	I I	17½" 36" 53½"	Passed radiograph Small amount of porosity in crossbar.
A. AD 726 B. 7/6/43 C. CR 60 D. Carnegie Ill. Steel Company E. Linde Air Products Co. F. Midland Steel Products Co.	A. 1¼" B. R I .95Mn .268i .40Cr .92Ni .38Mo C. .28C D. Face 293 Back 302 E. --- F. 1562°F ½ hr water 1004°F 1¼ hr water	A. A II .21C 4.00Mn .49Si 7.68Cr 8.58Ni .24Mo* B. Oxweld #43 C. Flux #80 D. AC STR	A. 45° DV B. 3/16" C. Flame Cutting	A. Melt B. 1. 3/16" IUM 600 28 3/16" 1UM 720 28 2. & 3. 1/4" 2UM 870 30-32 C. 5 hours 170-290°F D. UM Travel speed 6¼-7¼"/min	A. None B. None	1	1144	1"R	1"R	21"U	IMP	I	36"	Passed radiograph. 1/2" of incomplete fusion in crossbar.
A. AD 783 B. 8/9/43 C. CR 68 D. Carnegie Ill. Steel Company E. Crucible Steel Corp. Linde Air Products Co. F. Midland Steel Products Co.	A. 1¼" B. R I 1.21Mn .158i .86Cr 1.02Ni .21Mo C. .27C D. Face 277 Back 277 E. --- F. 1562°F ½ hr water 1067°F 1½ hr water	A. Crucible A II B. Armorize C. Flux #80 D. A. Linde Air .21C 4.00Mn .49Si 7.68Cr 8.58Ni .24Mo* B. Oxweld 43 C. --- D. AC	A. 45° DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 2a 165 22 2. & 3. 3/16" 2a 165 22 1/4" 2UM 870 30 C. 5 hours 110-315°F D. UM Travel speed 6"/min.	A. None B. None	1	1102	1"R	6" U		IMP	I II	33½" 2½" 36"	Passed radiograph. Small amount of slag at right junction.
		*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 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 P	V50 FPS	LOCATION OF P L	R	B	CRACKING LOC.	TYPE	MT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD 869 B. 9/7/43 C. CR 89 D. Carnegie I. Steel Company E. Crucible Steel Corp. McKay Company Linde Air Products Co. F. Midland Steel Produote Co.	A. 1¼" B. R I 1.21Mn .15Si .86Cr 1.03Ni .21Mo C. .27C D. Face 377 Back 377 E. --- F. 1562°F 2 hr water ¼ 1067°F 1½ hr water ¼	Linde Air A. A II .21C 4.84Mn .72Si 10.16Cr 11.98Ni .05Mo* B. Oxweld # 42 C. Flux 780 D. AC McKay A. --- B. Armorloy C. --- D. --- Crucible A. --- B. Armorize C. --- D. ---	A. 45° DV B. 1/4" C. Flame Cutting	A. Copper B. 1. II 3/16" 3a 150 23 2. & 3. one side 3/16" 1a 150 23 1/4" 1a 260 35 1/4" 1UM 900 32 2. other side I 3/16" 1a 150 23 1/4" 1a 260 35 5/16" 1a 320 27 3. I 5/16" 1a 320 27 C. 10 hours 115-260°F D. UM Travel speed 6"/min.	A. None B. None	1	1118	2" °L		6" U	IMP	I II	6¼" 8" 7½" 20¼ 43¼	Failed radiograph. Several cracks in left leg weld and excessive incomplete fusion in right leg weld.
						2	1100		11" °R	6¼" °D	IMP	I II	7½" 20¼	

*Weld metal

IDENTIFICATION A FIRMS 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 GMM 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. L ROOT TYPE X BODY TYPE R CROWN TYPE C TOTAL WELDING TIME & INTER PASS TEMPERATURE D REMARKS	HEAT A PRE B POST	BALLISTIC RESULTS N	V/L F/S	LOCATION OF H L.L.	A.L.	CRACKING OB.	LOC.	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD 453 B. 5/31/43 C. 34 D. Jones & Laughlin Steel Corp. E. McKay Company. Linde Air Products Co. F. New York Air Brake Company.	A. 1¼" B. R III 1.58Mn .238i .elMo C. .25C D. Face 302 Back 300 E. O.H. F. 1625°F 2½hr water 1080°F 2½hr air	McKay A. --- .12C 4.00Mn .60Si 20.00Cr 9.50Ni* B. Armorloy C. --- D. --- Linde A. --- B. Oxweld 42 C. --- D. ---	A. 45° DV B. 1/4" C. Flame Cutting Grinding	A. Copper B. Lege 1. II 5/32" 2a 150 28 2. I 5/32" 2a 150 28 3. I 3/16" 3UM 720 32 Crossbar 1. II 3/16" 2a 200 25 2. II 3/16" 13b 200 25 3. III 1/4" 4b 300 27 5/16" 2b 350 28 C. --- ; 200°F D. UW Travel speed 9"/min. Excessive cracking in crossbar, therefore hand beads were used. Repair was also made on upper leg weld on internal crack disclosed by x-ray.	A.None B.None	1	1106		1" R	61" U	IMP	I	36"	Failed radiograph Excessive amount of cracking in crossbar. Scattered slag throughout the welds.
A. AD 754 B. 7/22/43 C. 41 D. Carnegie Ill. Steel Co. E. Lincoln Elec. Company. Linde Air Products Co. F. New York Air Brake Company.	A. 1¼" B. R I 1.15Mn .186i .60Cr .75Ni .21Mo C. .25C D. Face 2B5 Back 2B5 E. --- F. 1562°F 8 hr water 1040°F 14 hr air	Lincoln A. --- .10C 4.0Mn .60Si 19.50r 9.0Ni* B. Armoweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 3/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 5/16" 1e 200 2[illegible] 2. & 3. 1/4" 2a 250 25 1/4" 3UM 825 32 C. 6 hours 100°-175°F. D. Grinding after first, second and last passes, time 6:10 hours. 1" crack on right leg ground out and repaired; 14" crack in center section ground out and repaired by hand weld-	A.None B.None	1 2	1096 1198	1" L 14" R	 2" D	5" U IMP	IMP	I II III I	2¼ 2¼ 5¼ 36" 45½	Failed radiograph Excessive amount of slag and gas inclusions and cracking in cross bar.
A. AD 754 B. 7/22/43 C. 42 D. Carnegie Ill. Steel Company E. Lincoln Elec. Company Linde Air Products Co. F. New York Air Brake Company.	A. 1¼" B. R I 1.26Mn .83Cr .75Ni .21Mo C..35C D. Face 2B5 Back 2B5 E. --- F. 1562°F 8 hr water 1040°F 14 hr air	Lincoln A. --- .10C 4.0Mn .60Bi 19.5Cr 9.0Ni* B. Armoweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 200 28 2. & 3. 1/4" 3a 250 25 1/4" 3UM 825 32 C. 12 hours 110°-170°F. D. Chipping and grinding after second and last passes, time 7¼ hrs. Entire center section ground out and repaired.	A.None B.None	1 2	1095 1196	1" L 1" L	1" L	8" U 7½" D	IMP IMP	III I II III	13½ 10¼ 1" 6½ 30¼	Failed radiograph 4" of cracking at ends of crossbar.
		*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, WELDED SIDES, ROOT FACE B. ROOT GAP C. PLATE PREPARATION	WELDING PROCEDURE A. BACKING PASSES D. 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	WELD TIME	BALLISTIC RESULTS LOCATION OF S LL	EL.	UL	CRACKING LOC.	TYPE	AMT	REMARKS (Changes, Radiographic Results, Etc.
A. AD 754 B. 7/22/43 C. 44 D. Jones & Laughlin Corp. E. Lincoln Elec. Company Linde Air Products Co. F. New York Air Brake Co.	A. 1¼" B. R III 1.82Mn .20Si .03Cr .03Ni .26Mo C. .29 D. --- E. --- F. 1625°F 34 hr 1060°F	Lincoln A. --- .10C 4.0Mn .60Si 19.5Cr 9.0Ni* B. Armorweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 200 38 2. & 3. 1/4" 2a 250 35 1/4" 2UM 825 32 C. 8 hrs. 100°-170°F D. Chipping and grinding after third and fourth passes, time 3:20 hrs. 1¼" crack on root bead repaired. 1¼" crack on center section of unionmelt weld ground out and repaired by hand welding.	A. None B. None	1 2	1107 1197	1" *L 1" L	51" *U 8¾" *D	LMP	I II III I II III	T 2" 41" * 15" 2" 1¾" * 37¼"	Failed radiograph 3" of cracking in crossbar. Excessive incomplete fusion.
A. AD 754 B. 7/22/43 C. 45 D. Jones & Laughlin Corp. E. Lincoln Elec. Company. Linde Air Products Co. F. New York Air Brake Co.	A. 1¼" B. R III 1.82Mn .20Si .03Cr .03Ni .26Mo C. .29 D. --- E. --- F. 1625°F. 34 hrs. 1060°F.	Lincoln A. --- .10C 4.0Mn .60Si 19.5Cr 9.0Ni* B. Armorweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 200 38 2. & 3. 1/4" 2a 250 35 1/4" 2UM 825 32 C. 5 hours 90-190°F. D. Chipping and grinding after first and last passes, time 5:10 hours.	A. None B. None	1 2 3 4	1107 1108 1198 1196	1¾" *R 1" L 1" *R 1" *L	61" *U 10¼ * D 41" *D 10¼ * U	IMP IMP IMP	I II III III V I II III	1¼" * 3" 1¼ * 5" 3¼" * 1⅝ * 3¼ * 3" 47"	Failed radiograph 2" crack at left junction of cross bar and 3/8" crack at right junction.

*Weld metal

IDENTIFICATION A PANEL 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 NO. TYPE AMP V B DEPOSITION SIZE C ROOT TYPE D BODY TYPE E GROOVE TYPE F TOTAL WELDING TIME & INTER PASS TEMPERATURE G REMARKS	HEAT A PRE B POST	PEN	VEL	BALLISTIC PROBABILITY LOCATION OF IMPACT	STRAIN	RESULTS	REMARKS
A. AD 754 B. 7/22/43 C. 46 D. Republic Steel Corp. E. Lincoln Elec. Company. Linde Air Products Co. F. New York Air Brake Co.	A. 11" B. R V .46Mn .30Si .040r 4.74Ni .36Mo C. .29C D. --- E. --- F. 1550°F 3½ hr 1150°F "	Lincoln A. --- .10C 4.0Mn .60Si 19.50r 9.0Ni* B. Armorweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 300 29 3. & 3. 1/4" 2a 250 25 1/4" 2UM 825 32 C. 7 hours. 100°-180° F. D. Chipping and grinding after first and fourth passes, time 41 hours. 11" crack on root bead, repaired. 1" crack on center section of unionmelt, repaired by hand welding.	A. None B. None	1 1106 1" 2 1198 3 1198	X 7½" IMP I 20½ II 11"		Failed radiograph. 3/8" crack at right junction of crossbar. Some slag and incomplete fusion. Two crater cracks in crossbar.
A. AD 754 B. 7/22/43 C. 47 D. Carnegie Ill. Steel Company. E. Lincoln Elec. Company Linde Air Products Co. F. New York Air Brake Co.	A. 11" B. R I 1.09Mn .13Si .57Cr .87Ni .20Mo C. .35C D. Face 285 Back 285 E. --- F. 1650°F 1½ hr water 945°F 21 hr air	Lincoln A. --- .10C 4.0Mn .60Si 19.50r 9.0Ni* B. Armorweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 300 28 2. & 3. 1/4" 2a 250 25 1/4" 2UM 825 32 C. 6 hours 90-185°F. D. Chipping and grinding time 6:40 hours.	A. None B. None	1 1106 2 1196 3 1199	X 7½" IMP I 15½ II 2½ 7½" IMP II 4½ 7½" IMP I 17½ II 14"		Failed radiograph 1/2" crack at left end of crossbar. 3/8" crack at junction of leg and crossbar.
A. AD 754 B. 7/22/43 C. 48 D. Carnegie Ill. Steel Company. E. Lincoln Elec. Company. Linde Air Products Co. F. New York Air Brake Company.	A. 11" B. R I 1.19Mn .30Si .75Cr .77Ni .18Mo C. .26C D. --- E. --- F. 1562°F ½ hr water 1040°F 11 hr air	Lincoln A. --- .10C 4.0Mn .60Si 19.5Cr 9.0Ni* B. Armorweld C. --- D. DC-REV Linde A. --- B. Oxweld 42 C. --- D. AC	A. 45° DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 5/32" 1a 150 30 3/16" 1a 300 29 3. & 3. 1/4" 2a 250 25 1/4" 2UM 825 32 C. 8 hours 95-170°F D. Chipping and grinding after second pass, time 3 hours. 1" crack on unionmelt, repaired by grinding out and hand welding.	A. None B. None	1 1084 3 1198	7" IMP I 6½ II 11½ X 10" IMP I 14 II 13" III 3½		Failed radiograph 1½" of cracking in crossbar.

*Weld metal

WELDING

ROOT TYPE
2 BODY
3 CROWN TYPE
C. TOTAL WELDING TIME & INTER PASS TEMPERATURE
D. REMARKS

B. 7/15/43 Carnegie Steel Company E. Linde Air Products Co. Crucible Steel Corp. F. Pressed Steel Car	A. 1½" B. R I .10Mn .19Si .72Cr . 50 Face 28 Back 28 -- enter	Linde Air A I .5551 .03Cr Total E. ---	A. 45° B. 3/16" C. Flame Cutting	A. None B. 1/32" 3/16" 1a 160 25 2, 4, 3. 1/4" a 3/16" 1a 1/4" Hours --- ing and ing pass, ¼" back weld through center * for unionmelt back up. Travel speed 6-1/16"/min	B. None	Passed Radiograph

*Weld metal

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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. DIA 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	M	BALLISTIC RESULTS V50 / V0	LOCATION OF M LL	RL	BB	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 733 B. 7/8/43 C. 63 D. Carnegie Steel Corp. Republic Steel Corp. E. Metal & Thermit Corp. Linde Air Products Co. F. Pullman Standard Car Mfg. Company.	A. 1¼" B. R I R 1.07Mn .35Si .77Cr .84Ni .39Mo R I C 1.17Mn .20Si .64Cr .50Ni .19Mo C. .25C .37C D. Face 280 Back 280 E. S.O.H. F. ---	Metal & Thermit A. .10C 3.33-3.67Mn .36-.64Si 19.44-19.61 Cr 9.57-9.85 Ni .91Mo B. Murex C. Lime D. DC-REV Linde Air A. .25C 2.25Mn .80Si 8.0Cr 8.5Ni B. Oxweld 43 C. # 80 D. AC	A. 45° DV B. 3/16" C. Flame Cutting. Flame Softening, Machined.	A. Copper B. 1. 11 3/16" 2e 150 2. & 3. 1/4" 2a 280 1/4" IUM 800 31 1/4" IUM 830 31 C. 6 hours. 100-140°F. D. Chipping after all hand passes, time 2 hours. UM Travel speed 6-1/8"/min.	A. None B. None	1	1180	X		7¼" *D	INP	I	36"	Passed radiograph
A. AD 739 B. 7/13/43 C. 64 D. Carnegie Steel Corp. Republic Steel Corp. E. Metal & Thermit Corp. Linde Air Products Co. F. Pullman Standard Car Mfg. Company	A. 1¼" B. R I R 1.07Mn .35Si .77Cr .84Ni .39Mo R I C .94Mn .27Si .39Cr .93Ni .36Mo C. .25C .27C D. Face 280 Back 280 E. S.O.H. F. ---	Metal & Thermit A. .10C 3.33-3.67Mn .36-.64Si 19.44-19.61 Cr 9.57-9.85Ni .91Mo B. Murex C. Lime D. DC-REV Linde Air A. .25C 3.25Mn .50Si 8.0Cr 8.5Ni B. Oxweld 43 C. # 80 D. AC	A. 45° DV B. 3/16" C. Flame Cutting. Flame Softening, Machined.	A. Copper B. 1. II 3/16" 2e 150 2. & 3. 1/4" 3a 280 1/4" IUM 800 31 1/4" IUM 815 31 C. 7 hours 100-130°F D. Chipping after all hand passes, time 2 hours. UM Travel speed 6-1/8"/min.	A. None B. None	1	1084		11" *L	41" *D	IMP	I II V	8" 17" 11" 36"	Passed radiograph 1" crack in * crossbar

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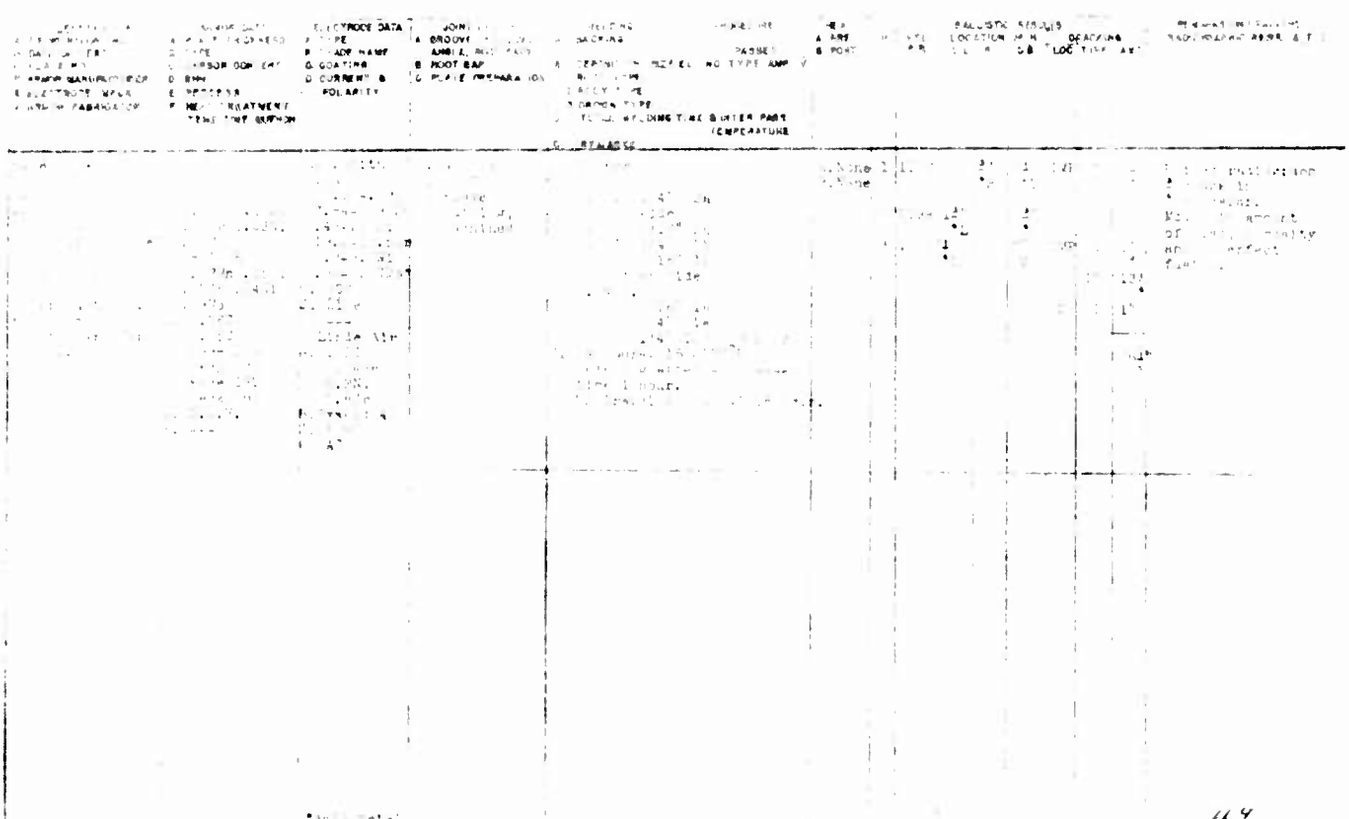

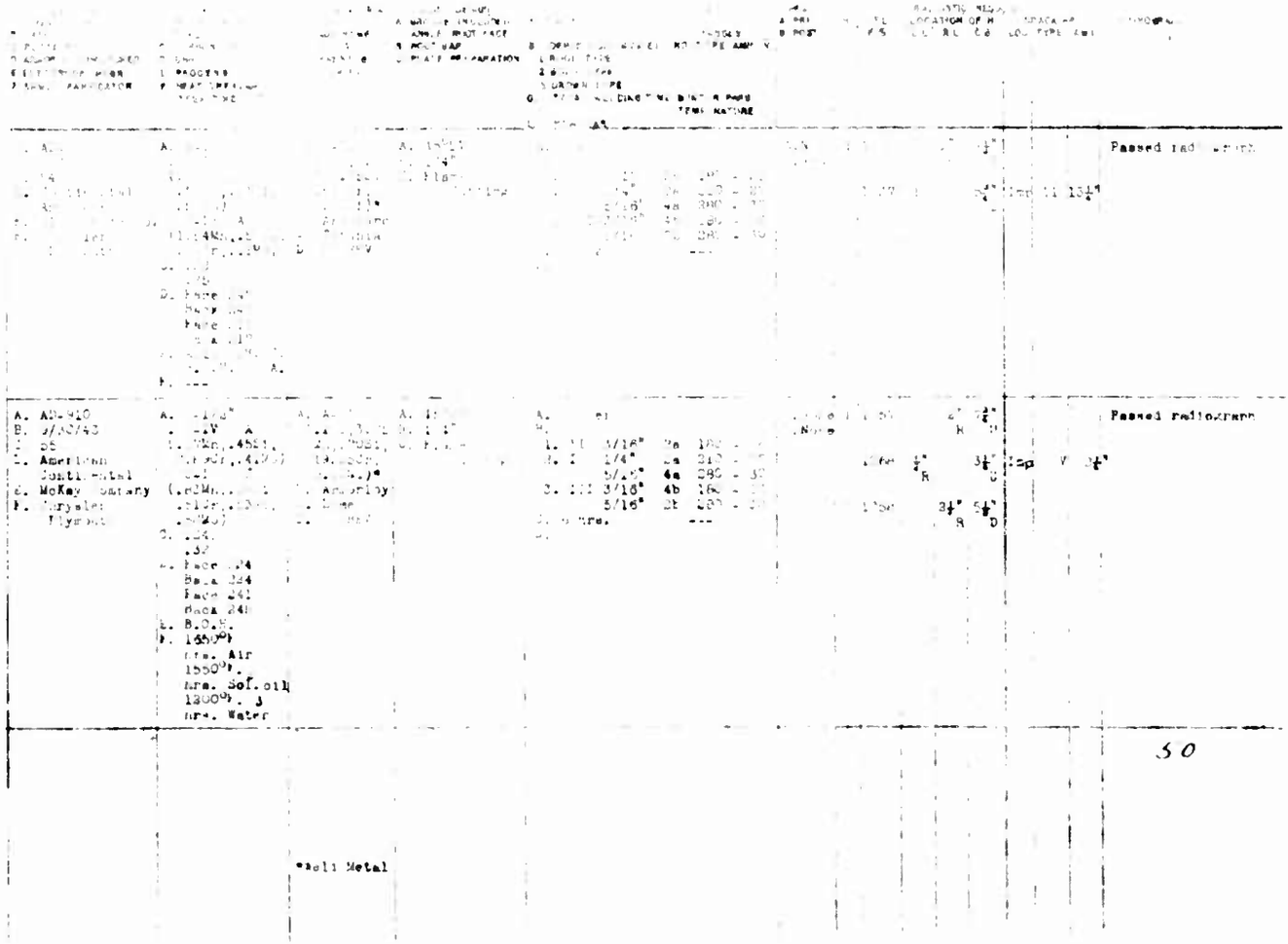

Passed radiogram

Passed radiogram

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*Melt Metal

INVESTIGATION A TRIAL NUMBER 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 D PLATE PREPARATION	WELDING A BACKING B. DEPOSITION SEQ SL L ROOT TYPE M BODY TYPE N GROOVE TYPE O. TOTAL WELDING TIME P. PREHEAT	PROCEDURE PASSES NO TYPE AMP V & INTER PASS TEMPERATURE	HEAT A PRE B POST	BALLISTIC RESULTS NO VEL F/S LOCATION OF HIT LL LR RL RR CRACKING LOC TYPE AMT	REMARKS OR CRACKING RADIOGRAPHIC RESULTS ETC.
A. 71-7 B. 10/6/43 C. -- D. Pittsburgh Steel Fdry. E. Harnischfeger Corp. McKay Rods Co. Maurath Alloy Rods Co. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. C-III (1.82Mn,..Mo1, .44Mo) C. .38 D. Face 39° Back 39° E. Basic F. ---	A. A-I H (.09C,3.82 Mn,.40Si, 18.78Cr, 10.01Ni, 1.38Mo)* A-I All (.12C,3.6* Mn,.38Si, 14.39Cr, 9.45Ni, .6*Mo)* A-II M* (.08C,4.31 Mn,.39Si, 20.71Cr, 9.65Ni, .015Mo)* A-I M- (.12C,4.57 Mn,.23Si, 19.56Cr, 9.78Ni, .44Mo)* A-II H A (.08C,3.50 Mn,.36Si, 18.31Cr, 9.74Ni, .06Mo)* B. Smoothar Armarare Armaloy --- Raco C. Lime Titania Lime Titania Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 1/8" 1a 80 - 32 3/16" 1a 185 - 32 2. I 1/4" 2a 250 - 32 5/16" 2a 360 - 32 3. I 3/8" 2a 440 - 32 C. 115c hrs. 140° - 280°F. D.	A.None B.N320	1 1047 1½" L 3½" D 2 1072 ¼" R 4½" Imp II 4½" III 1¼" V 4½" 3 1133 ¼" L 5½" Imp II 3" III 5" V 3½" 4 1189 ¼" R 4½" Imp I 1½" III 3½" V 5" 15	Passed radiograph Large amount of shrinkage in plate

*Weld Metal

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	BASE METAL DATA A PLATE THICKNESS B TYPE C CARBON CONTENT D SMYS 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 A BACKING B DEPOSITION SEQUENCE, ETC L ROOT TYPE B BODY TYPE B CROWN TYPE D. TOTAL WELDING TIME REMARKS	PROCEDURE PASSES TYPE AND V WATER PASS TEMPERATURE	HEAT A PRE B POST	H						
A. Ac-TCI [illegible] Arcos Babington & Standard Sanitary Corp B. Harnischfeger Corp. McKay Pipe Co. Maurath Allis-Chalmers Co. Whit-Avery Co. F. Pitner Tank Division	A. 1-1/2" B. C-i. 1.65Mn,.60Si, .730Cr,.50Ni, C. .35 D. Face 340 Back 245 E. Basic F. ---	A. A-I H (.12C,2.7Si Mn,.67Si, Mo,.01Cr, .76Ni, Mo)* A-II Mnk (.08C,4. 2Mn,.39Si, 30.9Cr, .85Ni, .10Mo)* A-I V (.13C,4.5? Mn,.23Si 10.50Cr, .44Mo)* A-I All (.12C,3.69 Mn,.28Si, 18.39Cr, 9.45Ni, .60Mo)* A-II M A (.08C,3.10 Mn,.26Si, 18.21Cr, 9.74Ni, .06Mo)* B. Same thru Armcoloy --- Armcoloy Reco C. Lime Lime Titania Titania Titania ---	A. 45°V B. 3/16 C. Flame Cutting Grinding	A. Copper B. 1. 1/4" 1a 80 - 90 3/16" 1a 185 - 23 2. 1/4" 2a 250 - 29 5/16" 3a 360 - 38 3. 3/8" 2a 440 - C. Arc. 140° - 380°F.	A.None B.None	1 200						

*A-11 Metal

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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 PASS 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.G.	DEGREE OF PENETRATION LOSS	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-727 B. 7/6/43 C. 90 D. Symington Gould E. Harnischfeger Corp. McKay Rods Co. Maurath Alloy Rods Co. Reid-Avery Co. F. Fisher Tank Division	A. 1-1/2" B. C-III (1.58Mn,.51Si, .51Mo) C. .29 D. Face 240 Back 330 E. Basic F. ---	A. A-I H (.12C,3.74 Mn,.67Si, 20.21Cr, 9.76Ni, 1.15Mo)* A-I W (.12C,4.57 Mn,.33Si, 19.56Cr, 9.76Ni, .44Mo)* A-II PcK (.08C,4.21 Mn,.39Si, 20.71Cr, 9.65Ni, .015Mo)* A-I All (.12C,3.69 Mn,.28Si, 18.39Cr, 9.45Ni, .66Mo)* A-II R A (.08C,3.50 Mn,.26Si, 18.21Cr, 9.74Ni, .CJMo)* B. Smoothar --- Armorloy Armorare Race C. Lime Titania Lime Lime Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 1/8" 1a 80 - 22 3/16" 1a 185 - 22 2. I 1/4" 2a 350 - 22 5/16" 2a 360 - 22 3. I 3/8" 2a 440 - 22 C. 117.66 mins. 120° - 360°F D.	A.None B.None	1	1028		1¼" L	12" U	Imp	I II V	5½" 7½" 3½"	Failed radiograph Excessive incomplete fusion and cracking. 3/8" of cracking in crossbar
						2	1014	X		15½" D	Imp	I II	16" 1½"	
						3	1071		3½" A	13" D	0	I	3½" 36"	
		*Weld Metal												

SPECIFICATION	ARMOR DATA	ELECTRODE DATA	NOTCH DESIGN	WELDING PROCEDURE	HEAT	MECHANICAL PROPERTIES	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. [illegible] B. [illegible] C. [illegible] D. [illegible] E. Continental Roll & Steel Foundry F. Harnischfeger Corp., Bell-Averry Div., McKay Company F. Fisher Tank Division	A. 1-1/2" B. C-I (1.4Mn,.3Si,.56Cr,.50Ni,.72Mo) C. .30 D. Face 230 Back 215 E. Basic F. ---	A. A-I B (.07C,4.50 Mn,.04Si, 10.51 Ni, 19.09Cr, .40Mo)• A-I B A (.09-.10C, 4.70-4.90 Mn,.22-.30Si,17.91-18.44Cr, 9.87-10.23 Ni,.37-.45 Mo)• A-IIMoK (.06C,3.90 Mn,.44Si, 1H.43Cr, 9.58Ni, .043Mo)• B. Smoothbore Naco Armorloy C. Lime Lime Titania D. DC R&V	A. 45°V B. 5/16" C. Flame Cutting Grinding	A. Repair B. 1. IT 1/8" 1a 3/16" 1a 2. I 1/4" 2a 5/16" 2a 3. I 3/16" 3 3. 0:03 hrs. 1600 D.	A. PRE B. POST	YEL FP 1108	"Chilled radiograph indicative incomplete fusion and cracking" 1-1/2" Of cracking in groupbar

**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 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 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 H	VEL F/S	LOCATION OF H LL	RL	CB	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-727 B. 7/6/43 C. 93 D. National Roll & Foundry Co. E. Harnischfeger Corp. Weld-Avery Co. McKay Company F. Fisher Tank Division	A. 1-1/2" B. C-III (1.32Mn,.40Si, .66Mo) C. .30 D. Face 270 Back 375 E. Basic F. ---	A. A-II H (.07C,4.58 Mn,.47Si, 19.09Cr, 10.51Ni, .04Mo)* A-I R A (.10C,4.74-4.90Mn, .22-.30Si, 17.91-18.31Cr, 9.87-9.95 Ni,.39-.45Mo)* A-II R A (.09C,4.70 Mn,.47Si, 18.44Cr, 10.23Ni, .07Mo)* A-II McK (.06C,3.90 Mn,.44Si, 18.42Cr, 9.58Ni, .043Mo)* B. Smoothard Race Armorloy C. Lime Lime Titania D. DC REV	A. 45°DV B. 5/16" C. Flame Cutting Grinding	A. Copper B. 1. II 1/8" 1a 80 - 22 3/16" 1a 185 - 22 2. I 1/4" 2a 250 - 32 5/16" 2a 350 - 23 3. I 3/8" 2a 440 - 32 C. 3:38 hrs. 120° - 340°F. D.	A.None B.None	1 2 3	1084 1073 1069	1" R 1" R 1" L		13½" D 13½" U 16½" U	Imp Imp Imp O	I II III IV V I II IV V I II III IV V I	8" 3" ½" 3½" 1½" 3" 11" 3½" 1" 2" 45½"	Failed radiograph Cracking through-out crossbar Some incomplete fusion, porosity and inclusions

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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. SAE 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. BOOT TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D. REMARKS	HEAT A. PRE. B. POST	BALLISTIC RESULTS No.	VEL. F/S	LOCATION OF H L.L.	R.L.	B.L.	CRACKING LOC.	TYPE	AMT	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD-362 B. 4/13/43 C. 15 D. Sivyer Castings Corp. E. Alloy Rods Co. F. Ilco Ordnance Corp.	A. 1-1/2" B. C-1 (.66Mn,.43Si, .44Cr,.46Ni, .46Mo) C. .30 D. --- E. Acid-Elec. F. ---	A. A-11 (.10C,4.0 Mn,.55Si, 20.0Cr, 9.5Ni) B. Armorare "B" C. Titanium D. DC REV	A. 50°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 1/4" 1a 270 - 30 5/16" 1a 400 - 35 2. I 5/16" 2a 385 - 33 5/16" 2a 375 - 31 5/16" 2a 370 - 30 5/16" 1a 350 - 30 3. III 5/16" 3b 350 - 30 5/16" 3b 290 - 30 C. 12 hrs. 70° - 170°F. D. 95% cracking after first pass, 50% after second, and 50% after the fifth. All cracks were removed, time 6 hours. Capping beads ground.	A. None B. None	1 2	1098 1100 est.	5° R 1½° R		7½° U 6½° D	Imp Imp	I II III V III	2½° 2½° 1° 15½° 1° 1½° 15½°	Passed radiograph
A. AD-714 B. 6/29/43 C. 21 D. Sivyer Castings Corp. E. Crucible Steel Co. F. Ilco Ordnance Corp.	A. 1-1/2" B. C-1 (.94Mn,.57Si, .42Cr,.46Ni, .43Mo) C. .32 D. Face 269 Back 269 E. B.O.H. F. 1650°F. 4 hrs. Air 1600°F. 4 hrs. Water 1150°F. 4 hrs. Furnace	A. A-I (.13C,1.82 Mn,.36Si, 19.50Cr, 10.37Ni, 2.32Mo) B. Armorlac C. Titanium D. DC REV	A. 54°DV B. 7/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 1/4" 1a 270 - 30 1/4" 1a 280 - 30 2. III 5/16" 1a 2b 380 - 32 5/16" 1a 280 - 30 1/4" 4b 300 - 30 5/16" 2b 400 - 29 3. III 1/4" 4b 280 - 30 5/16" 2b 370 - 30 C. 8 hrs. 70° - 210°F. D. Capping beads ground.	A. None B. None	1 2	1108 1129	5° R 5° L		9½° U 6½° D	Imp Imp O	II III V III	7½° 1° 12° 2° 4° 1° 6½° 1½° 3½°	Passed radiograph Scattered slag lm. lions throughout the welds
A. AD-761 B. 7/27/43 C. 33 D. Sivyer Castings Corp. E. Crucible Steel Co. F. Ilco Ordnance Corp.	A. 1-1/2" B. C-1 (.86Mn,.42Si, .42Cr,.46Ni, .37Mo) C. .26 D. Face 255 Back 255 E. B.O.H. F. 1400°F. 4 hrs. Air 1600°F. 4 hrs. Water 1150°F. 8 hrs. Furnace	A. A-I (.06-.13C, 1.78-1.96 Mn,.22-.39 Si,18.9- 19.56Cr, 9.22-10.12 Ni,1.78- 2.10Mo) B. Rockstal C. Titanium D. DC REV	A. 54°DV B. 5/16" C. Flame Cutting Grinding	A. Copper chill B. 1. II 3/16" 1a 175 - 28 1/4" 1a 275 - 28 2. III 5/16" 1a 365 - 32 5/16" 1A 1b 375 - 30 1/4" 4b 275 - 28 5/16" 3b 375 - 31 3. III 3/16" 4b 175 - 27 5/16" 2b 375 - 31 C. 7 hrs. 70° - 212°F. D. 3" crack removed after first pass.	A. None B. None	1 2 3 4	1122 1208 1236 1270	5° L 1° R 1½° R 5° R		7½° U 7½° U 13½° U 6½° U	Imp Imp Imp	V V III V	1° 2° 7° 14° 11½°	Passed radiograph Cast plate containing moderate amount of slag and sand inclusions Some porosity in crossbar 56
		Weld Metal																

		A. A-I (.07-.17C, 3.30-3.75 Mn,.40Si, 18.0-20.5 Cr,9.0- 10.7Ni 1.10Mo)* B. Armoreare C. Lime D. DC REV	A. 60°BV B. 3/16" C. Machining	A. 1/4" Mild steel B. 1. II 5/32" 3a 140 - 30 2. II 5/32" 3b 140 - 30 3/16" 3b 180 - 30 5/16" 3b 260 - 30 1/4" 4b 180 - 30 3. III 5/16" 4b 250 - 30 3/16" 3b 180 - 30 C. 1-1/2 hrs. 700° - 1300°F. D. Backing removed after first pass.	A.None 1 1075 B.None		1" L	9⅛" U	Imp	I II V	17" 3" 3" 23"	Passed radiograph Small amount of porosity throughout all the welds
		*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. AMPS TYPE AMPS V C ROOT TYPE D BODY TYPE E GROOVE TYPE F TOTAL WELDING TIME & INTER PASS TEMPERATURE G REMARKS	HEAT A PRE B. POST	H	VEL. F/S	BALLISTIC RESULTS LOCATION OF H L.L	E.L	S.S	CRACKING LOC	TYPE	Amt	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 468 B. 6/12/43 C. 38 D. Union Steel Castings Co. E. Crucible Steel Co. F. Pressed Steel Car Company	A. 1¼" B. C III 1.46-1.59Mn .34-.38Si .53-.55Mo C. .28-.30C D. Face 247 Back 242 E. --- F. 1700°F 4 hrs water 1700°F 4 hrs water 1225°F 4 hrs water	A. A I .14C 1.90Mn .27Si 17.09 Cr 8.67Ni 1.64Mo .08Cu* B. Rezistal C. Titanium D. DC-REV	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 150 25 3/16" 1a 160 25 2. III 5/16" 4a 4b 280 25 3. II 5/16" 8b 280 25 C. 18 hours 150-200°F. D. Chipping and grinding after first and fourth passes, time 6 hours. Three more passes in left leg, four in crossbar.	A. 70°F B. None	1 2	1048 1099	1" °L 1½" °R		41" °U 14" °D	IMP IMP	II III V II III V	8½" 2½" 1½" 1" 3" 14½" 31"	Passed radiograph 1"cracking in a crossbar. Scattered slag, porosity and shrinkage throughout.
A. AD 468 B. 6/12/43 C. 41 D. Union Steel Castings Co. E. Crucible Steel Corp. F. Pressed Steel Car Company	A. 1¼" B. C III 1.53-1.59Mn .34-.39Si .54-.56Mo C. .27-.30C D. Face 267 Back 267 Face 265 Back 265 Face 255 Back 255 E. --- F. 1700°F 4 hrs oil 1650°F 4 hrs water 1225°F 4 hrs water	A. A I .18C 1.80Mn .31Si 18.53Cr 8.55Ni 1.57Mo* B. Rezistal C. Slag D. AC STR	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 100 - 3/16" 1a 140 - 2. III 5/16" 4a 4b 300 - 3. II 5/16" 7b 300 - C. 15 hours --- D. Chipping and grinding after fourth pass, time 5 hours. Six more passes in crossbar.	A. 70°-100°F B. None	1 2 3	1073 1036 1055	2" °L 1" L 2" L		17" U 71" °D 4" U	IMP IMP	II V II V	14" 6" 2" 25½" 34½"	Passed radiograph Large amount of shrinkage and porosity throughout the welds.
		*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. ANS 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. POSITION SIZE EL. NO. TYP 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	Ast	REMARKS OR DRAWING RADIOGRAPHIC RESULTS, ETC.
A. AD 760 B. 7/27/43 C. 52 D. Continental Roll & Steel Foundry Co. General Steel Castings Co. E. Hollup Corp. F. Pressed Steel Car Company	A. 11" B. C I C R 1.32Mn .358i .58Cr .51Ni .47Mo C II C S 1.56Mn .428i .44Cr .35Mo C. .28C .31C D. Face 253 Back 254 Face 264 Back 270 E. --- F. C R 1625°F 3 hrs. air 1575°F 3 hrs sol. oil 1220°F 3 hrs water C S 1600°F 4 hrs. water 1125°F 4 hrs air	A. A I .14C 1.26 Mn .515i 19.78Cr 9.72Ni .74Mo* B. Armorod C. --- D. DC-REV	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 3a 180 25 2. III 1/4" 3a 220 26 5/16" 3a 3b 300 27 3. III 5/16" 6b 300 27 C. 14 hours --- D. Root pass ground out. Chipping and grinding, time 5½ hrs. Both center sections welded by General Steel Castings; left and right sections by Continental Roll & Steel Co.	A. 100° F B. None	1 2 3	1050 1080 1078	1" °L 21" °R 41" °L	7" U 6" D 41" °U	IMP IMP	I II V II V II III	12" 1" 7" 4" 7" 15½" 15" 47½"	Passed radiograph. Small amount of inclusions. 5/8" imperfect fusion at right junction.
A. AD 760 B. 7/27/43 C. 55 D. Continental Roll & Steel Foundry Co. General Steel Castings Co. E. Crucible Steel Corp. F. Pressed Steel Car Company.	A. 11" B. C I C S 1.32Mn .358i .58Cr .51Ni .47Mo C II C S 1.56Mn .428i .44Cr .35Mo C. .28C .31C D. Face 257 Back 257 Face 275 Back 277 E. --- F. C R 1625°F 3 hrs. air 1575°F 3 hrs sol. oil 1220°F 3 hrs water C S 1600°F 4 hrs. water 1125°F 4 hrs air	A. A I .11C 1.86Mn .195i 20.18Cr 9.98Ni 1.66Mo* B. Rexietal C. Titanium D. DC-REV *Weld metal	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 150 25 3/16" 1a 160 25 2. III 1/4" 2a 220 26 5/16" 1a 290 27 5/16" 1a 4b 300 27 3. III 5/16" 6b 300 27 C. 15 hours --- D. Root pass ground out. Center sections welded by General Steel Castings Co; left and right sections by Continental Roll and Steel Foundry Co.	A. 100° F B. None	1 2	1040 1100 est.	X 1" °R	5" U 6½" °U	IMP IMP	I II I V	3" 6" 13½" 8" 28½"	Passed radiograph. Small amount of shrinkage.

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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 SEQUENCE NO. TYPE AMP V PASSES 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 H LL	AL	GB	CRACKING LOC	TYPE	AMT	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD 769 B. 7/31/43 C. 54 D. Symington Gould. Union Steel Castings Co. E. Hollup Corp. F. Pressed Steel Car Company.	A. 11" B. C II S 3 1.57Mn .468i .32Cr .30Mo C II U S 1.70Mn .345i .43Cr .36Mo C. .33C .33C D. Face 270 Back 270 Face 260 Back 267 E. --- F. S G 1700°F 5½ hrs water U S 1625°F 4 hrs water	A. A I .14C 4.26Mn .51Si 19.78Cr 9.72Ni .74Mo* B. Armorod C. Lime D. AC STR	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 2a 150 3. III 1/4" 2a 230 5/16" 2a 4b 300 3. III 5/16" 6b 300 C. 17 hours --- D. Root pass ground out. Chipping and grinding after first, second, eighth and seventh passes, time 6 hrs. Center sections welded by Union Steel Castings and left and right sections by Symington Gould.	A. 100° F B. None	1 2 3 4	1063 1053 1058 1052	1½" R 2" L	1" L 11" L 2" L	124" U 111" D 16½" D 141" U	IMP IMP O IMP	I II I II V II V I II V	11½" 2" 14" 21" 5" 12½" 14½" 8½" 5½" 3" 77½"	Failed radiograph 1/4" crack at both junctions of cross bar. Excessive incomplete penetration. Moderate amount of shrinkage in cast plate.
A. AD 774 B. 8/3/43 C. 53 D. Union Steel Castings Co. Symington Gould. E. McKay Company F. Pressed Steel Car Company.	A. 14" B. C 11 U S 1.78Mn .418i .43Cr .34Mo C II S 3 1.57Mn .468i .32Cr .30Mo C. .32C .33C D. Face 287 Back 277 Face 262 Back 262 E. --- F. ---	A. A 1 .13C 3.08Mn .61Si 20.30Cr 10.85Ni .16Mo .07 V .110Cu* B. A 5 C. Lime D. DC-REV	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. 11 3/16" 2a 16C 25 2. 111 1/4" 2a 230 26 5/16" 2a 4b 300 27 3. 111 5/16" 6b 300 27 C. 17 hours. --- D. Root pass ground out. Chipping and grinding after first pass, time 6 hours. Center sections welded by Symington Gould; left and right sections by Union Steel Castings Co. Two more passes in crossbar.	A. 100° F B. None	1 2 3	1067 1079 1077	X	21" L 14" R	81" D 71" U 41" U	IMP	III V	5" 5½" 10½"	Passed radiograph Small amount of shrinkage and inclusions in the plate.
		*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 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 FPS	BALLISTIC RESULTS LOCATION OF H LL RL CB	CRACKING LOC TYPE AMT	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC
A. AC 774 B. 6/3/43 C. 6C D. General Steel Castings Co. Continental Roll & Steel Foundry Co. E. Crucible Steel Corp. F. Pressed Steel Car Company.	A. 11" B. C II S S 1.56Mn .4031 .44Cr .35Mo C II C M 1.18Mn .3431 .55Cr .60Ni .47Mo C. .31C .38C D. Face 2HB Back 2HB Face 2SB Back 2SB E. --- F. ---	A. A I .14C 4.26Mn .31Si 19.78Cr 9.72Ni B. Austenite C. Titanium D. AC 57B	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 3/16" 1a 100 - 3/16" 1a 150 - 2. III 1/4" 2a 350 - 5/16" 2a 4b 350 - 3. II 5/16" 6b 350 - C. 15 hours. --- D. Root pass ground out. Chipping and grinding after first, twelveth and 15th passes, time 5 hours. Center sections welded by Continental Roll & Steel Co. left and right sections General Steel Castings Co.	A. 100° F B. None 1 2 1098	1092	1" 5/8" 5MP II X 7/8" 5MP II	7" 3/4" V 3/4" 16" 3/4" 20 1/4"	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 PASSES 1 ROOT TYPE 2 BODY TYPE 3 GROVE TYPE C TOTAL WELDING TIME & INTER PASS TEMPERATURE D REMARKS	HEAT A PRE B POST	N	VEL FS	BALLISTIC RESULTS LOCATION OF R LI	EL	OB	CRACKING LOC	TYPE	ANG	REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC
A. AD 840 B. 9/20/42 C. 64 D. Continental Roll & Steel Foundry Co. General Steel Castings Co. E. Crucible Steel Corp. F. Pressed Steel Car Company.	A. 11" B. C .31 Mn 1.03Mn .3351 .31Cr .59Ni .40Mo C .31 Mn 1.56Mn .44Cr .35Mo C. .30C .31C D. Face 235 Back 238 Face 272 Back 270 E. --- F. C R 1625°F 3 hrs. air 1575°F 3 hrs. oil 1325°F 3 hrs water	A. A 1 .09C .93Mn .1581 .18.89Cr 11.85Ni .7340° B.Metalwel C.Titanium D. 90-KeV	A. 75° DV B. 3/16" C. Flame Cutting Grinding	A. None B. 1. II 5/32" 1a 130 24 5/32" 1a 140 25 2. II 5/32" 6b 140 35 3/16" 1b 160 25 3/16" 35b 170 25 3. II 3/16" 17b 170 25 C. 34 hours. --- D. Root pass ground out. Center sections welded by General Steel Castings Co. and right and left sections by Continental Roll & Steel Foundry Company.	A.100°F B.None	1 2 3 4	1063 1051 1056 1058	1°L 21°R 21°L X	6°L 41°R 41°L 6°L 15°L	54°U 6°U	MP IMP IMP IMP	I II V V I II	91° 4° 4° 6° 5° 384°	Passed radiograph.
A. AD 840 B. 9/20/43 C. 65 D. Continental Roll & Steel Foundry Co. General Steel Castings Co. E. Crucible Steel Corp. F. Pressed Steel Car Company.	A. 11" B. C .31 Mn 1.03Mn .3351 .31Cr .59N1 .40Mo C .31 Mn 1.56Mn .44Cr .35Mo C. .30C .31C D. Face 232 Back 232 Face 257 Back 257 E. --- F. C R 1625°F 3 hrs. air 1575°F 3 hrs. oil 1325°F 3 hrs water	A. A I .11C 1.46 Mn .1981 .10.18Cr 9.98N1 1.88Mo* B.Hezlewal C.Titanium D.90-KeV	A. 75° DV B. 3/16" C.Flame Cutting Grinding	A.None B. 1. II 5/32" 1a 130 24 5/32" 1a 140 24 2. II 5/32" 6b 140 24 3/16" 1b 170 25 3/16" 36b 170 25 3. II 3/16" 17b 170 25 C. 30 hours. --- D. Root pass ground out. Center sections welded by General Steel Castings Co. and right and left sections by Continental Roll & Steel Foundry Co. Eleven less passes in cross bar.	A.100°F B.None	1 2 3	1068 1057 1058	11°R 1°L 11°L	54°U 9°D 6°U	MP IMP IMP	I II II Y II III II	34° 64° 54° 9° 14° 11° 8° 394°	Passed radiograph 62
		**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 CARBON	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. ROOT TYPE 3. GROOVE TYPE C. TOTAL WELDING TIME & INTER PASS TEMPERATURE D.	HEAT TREAT A. PWHT B. POST	BALLISTIC RESULTS # / VEL. / F/S / LOCATION OF R: L.L. / R.L. / S.S. / CRACKING: LOC / TYPE / EXT.	REMARKS OR CRACKING RADIOGRAPHIC RESULTS, ETC.
A. AD-739 B. 7/13/43 C. 67 D. Sivyer Castings Corp. E. Hollup Corp. F. Pullman Standard Car Mfg. Co	A. 1-1/2" B. C-I (.94Mn,.57Si, .42Cr,.46Ni, .43Mo) C. .32 D. Face 395 Back 395 E. B.O.H. F. 1900°F. 4 hrs. Air 1600°F 4 hrs water 1150°F 8 hrs furnace	A. A-II (.09-.14C, 3.49-4.24 Mn,.25-.50Si, 19.35-19.76Cr, 9.35-9.76 Ni)* B. 307 C. Lime D. DC REV	A. 45°DV b. 3/8" C. Flame Cutting Grinding Machined	A. Copper B. 1. II 3/16" 2a 160 - 21 2. I 1/4" 4a 300 - 28 5/16" 4a 360 - 31 3. III 1/4" 4b 300 - 28 5/16" 2b 360 - 31 C. 7 hrs. 150° - 170°F. D.	A. None B. None	1 / 1067 / / / 2" L / 6½" U / Imp / II / 1" 2 / 1105 / 3½" R / / 8½" D / / / / 3 / 1108 / / 1½" L / 9" I / / / / 4 / 1115 / 1" R / / 3" U / Imp / II / 5" O / II / 1½" 5 / 1206 / / 2" L / ⅜" D / Imp / I / 1" II / 3½" III / 2⅜" V / 2⅜" 6 / 1253 / X / / ½" D / Imp / I / 31" II / 5" 53"	Passed radiograph 1/2" crack in crossbar Small amount of slag and porosity
		*Weld Metal					

ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	PROCEDURE	HEAT	BALLISTIC RESULTS	REMARKS ON CRACKING
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 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	V50 FPS	LOCATION OF LL RL OB GRADING LOT TYPE AMT	
a. 11" " b. C .17 S . .. Mn .. Mo .65 .84-.88 .84 . 1. .43 Prod c. . Fre Var C d. Face 260 Back 264 Face 277 Back 275 Face 268 Back 264 e. --- f.	Linde Air A. A 1 .17C .1 Mn .65Si 14.01Cr (1.49Ni .49Mo* .34Si H.Oxweld 40 Grade 80 .1" x 300 .40 STH Unstable a. --- b. Unstabl c. --- d. ---	A. 45° .V B. 3/16" C. Plane Cutting Grinding	A. None B. .. If 5/32" 1a 150 35 3/16" 1a 160 35 D. & J. 3/16" 1a 160 35 1/4" 2a 230 36 1/4" 2GM 400 30 C. 10 hours --- D. 1" * hand weld through center for unionmelt back up. Right and lower center sections welded by Symington Gould and left and upper center sections by Union Steel Castings Company.	A.None B.None	1342	14" S" "B 12" 10- "C "D 5/8 20" 32P "B D	Passed radiograph W/crack at right junction. 54" 121 74 2" 161 361

*Weld metal

IDENTIFICATION	ARMOR DATA	ELECTRODE DATA	JOINT DESIGN	WELDING PROCEDURE	HEAT	BALLISTIC RESULTS					REMARKS ON CRACKING RADIOGRAPHIC RESULTS, ETC.
A FIRMS 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. OTHER 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 L ROOT TYPE B BODY TYPE B CROWN TYPE C TOTAL WELDING TIME & INTER PASS TEMPERATURE D REMARKS	H	V/S	LOCATION OF H L.L. R.L. G.S.	CRACKING LOC. TYPE	AMT	
A. AD 756 B. 7/22/43 C. 57 D. Continental Roll & Steel Foundry Co. General Steel Castings Co. E. Crucible Steel Corp. Linde Air Products Co. F. Pressed Steel Car Company.	A. 1¼" C I C B. 1.18Mn .34Si .55Cr .62Ni .47Mo C II & S 1.56Mn .42Si .44Cr .35Mo C. .38C .31C D. Face 255 Back 255 Face 285 Back 288 E. --- F. C 1625°F 3 hrs. air 1575°F 3 hrs. sol oil 1210°F 3 hrs. water S 1300°F 4 hrs. water 1125°F 4 hrs. air	Linde Air A. A I .19C 4.09Mn .69Si 9.35Cr 10.43Ni 1.28Mo .03V 1.25Cu* B. Oxweld 42 C. Grade 80 12 x 300 D. AC STR Crucible A. --- B. Rezistal C. --- D. --- *Weld metal	A. 45° DV B. 3/16" C. Flame Cutting, Grinding.	A. None B. 1. II 5/32" 1a 130 25 3/16" 1a 160 25 2. & 3. 3/16" 2a 160 25 1/4" 3a 220 26 1/4" 2UM 800 37 C. 10 hours --- D. Root pass ground out, time 4 hours. Both center sections welded by General Steel Castings Co., and left and right sections by Continental Roll & Steel. 1" * hand weld through center for unionmelt back up.	A. None B. None	1 1053 11" *L 8" U IMP III 1¼ * 2 1051 24" *L 7¼" *D IMP II 3" * V 4¼" * 3 1043 11" *R 7½" *D IMP I 7¼" * II 10" * V 1" * 4 1051 3" *L 11" *U IMP I 4¼" * II 14¼ * V 1" * III 1" * 47¼ *	Passed radiogra 3/8" crack at the top of left leg weld.