NBSIR 73-293

Fracture Toughness Evaluation of Quenched-and- Tempered Bridge Steels

C. G. Interrante and G. E. Hicho

Mechanical Properties Section
Metallurgy Division
Institute for Materials Research
National Bureau of Standards
Washington, D. C. 20234

October, 1973

Failure Analysis Report

Prepared for
Office of Research
Federal Highway Administration
Department of Transportation
Washington, D. C. 20591

NBSIR 73-293

FRACTURE TOUGHNESS EVALUATION OF QUENCHED-AND-TEMPERED BRIDGE STEELS

C. G. Interrante and G. E. Hicho

Mechanical Properties Section
Metallurgy Division
Institute for Materials Research
National Bureau of Standards
Washington, D. C. 20234

October, 1973

Failure Analysis Report

U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

TABLE OF CONTENTS

TABLES (Continued)

TABLES (Continued)

FIGURES

ABSTRACT

The results of analyses of 25 sets of impact test data representing 8 plates from 7 heats of ASTM type 514 and type 517 steels are given as 43 Figures containing 128 plots and as 90 Tables. The figures and tables give the observed data and the calculated values of the fitted curves based on the available data for energy absorption, energy absorption per unit area, and lateral expansion. The calculations were made using the computer program ITER, created at the National Bureau of Standards (NBS). Sixteen of the data sets, representing 7 heats of steel, were furnished by the Federal Highway Administration (FHWA). The other 9 data sets represented only one of the 7 heats of steel, and these data were obtained in tests conducted at NBS with specimens furnished by FHWA. The results of the NBS tests on one plate are compared with the results of another laboratory's tests on another plate from the same heat of steel.

1. PREFACE

This fracture toughness evaluation of 7 quenched-and-tempered bridge steels involves the computer analyses of a total of 25 sets of specimens of both Charpy V-notch (CVN) and precracked Charpy (PCI) impact tests. Sixteen* of the 25 sets were tested with no assistance from the National Bureau of Standards (NBS). The raw data* from these tests were furnished for computer analysis only. Nine sets* of untested specimens were also delivered to NBS, through FHWA, either in the as-machined (CVN specimens) condition or in the as-machined-and-precracked (PCI specimens) condition; at NBS, these specimens were measured and tested according to ASTM Designation E23-73, and the results were computer analysed by the computer program ITER developed at NBS.

* These data and specimens were sent to NBS on or before 13 April 1973 by Carl E. Hartbower, B.S., M.E., Consultant and at the request of Mr. Orrin F. Finch, Attorney for the State of California Department of Public Works.

2. OBJECTIVE

The objectives of this evaluation were: (1) to perform impact tests at NBS on Charpy V-notch (CVN) and precracked Charpy impact (PCI) specimens taken from a quenched-and-tempered bridge steel, (2) to analyse these test results and (3) to analyse the raw data furnished by FHWA for impact tests of seven heats of steel, and (4) to compare the results of NBS tests on one plate with the results from tests by another laboratory on a second plate from the same heat of steel.

3. EXPERIMENTAL PROCEDURE

3.1 Specimens Not Tested at NBS

The 16 sets of impact test data furnished by FHWA are given in Appendix A. The data are of two types, Charpy V-notch (CVN) and precracked Charpy impact (PCI). These raw data were analyzed by the computer program ITER.

These data, representing four types of ASTM 514 and 517 Steels, were taken from seven plates representing seven heats of steel. Plates A and L are type 517-F; plates A1, Q and Z are type 517-H; plate M is type 514-F; and plate R is type 514-H. For each plate, data is given for one set of CVN specimens and for one set of PCI specimens. However, for plate Q, two sets of data are given for each type (CVN and PCI) of specimens (one set of "surface", and one set of midthickness specimens). Thus, a total of 16 data sets were furnished and analysed.

All of the 16 data sets contained energy-absorption data, whereas only 12 data sets contained lateral-expansion measurements. The four data sets furnished for plate Q did not include lateral-expansion measurements.

In the computer analyses, calculations and graphs were made for both the energy-absorption data, and energy-absorption-per-unit-area data for all 16 data sets. In addition, calculations and graphs were made for the 12 lateral-expansion data sets. For the calculation of the area in the energy-absorption-per-unit-area calculations, the width and thickness dimensions of the specimens were taken, respectively, as 0.394" and 0.315" for the CVN calculations and 0.394" and 0.280" for the PCI calculations.

3.2 Specimens Tested at NBS

In addition to the raw data discussed above, the FHWA furnished NBS with 55 CVN and 25 PCI test specimens for impact tests to be conducted at NBS. Along with these specimens, a test plan (given in Appendix B) was furnished. These specimens were inspected at NBS to assure that they were in compliance with the dimensional requirements of ASTM E23-72, Figure 4 Type A.

The CVN specimens were impact tested in accordance with the requirements of ASTM E23-72, Section 8: the PCI specimens were impact tested in accordance with the Proposed Method of ASTM E23.03.03. These tests were conducted with a Charpy test machine that had been proof tested for the low, middle and high range values on July 21, 1971 and for the low and high range values only on August 1, 1973. The 1972 proof test was in conformance with all of the requirements of ASTM E23-72 Sections 6 and 11. However, for the 1973 proof test, middle-range specimens were not available. In addition, it is to be noted that the Charpy test machine used for the NBS tests was not "instrumented" and energy values are therefore given only to the nearest 1/2 ft-lb.

4. RESULTS AND DISCUSSIONS

4.1 Specimens Not Tested at NBS

The test data and the results of the computer analyses for the raw data furnished by FHWA for the seven heats of steel are presented as Figures 1 through 7 for plates A, A1, L, M, Q, R, and Z, respectively. The results for the PCI and CVN specimens from plate A are given respectively in Tables 1 and 2; for A1 in 3 and 4; for L in 5 and 6; for M in 7 and 8; for Q in 9-12; for R in 13 and 14; and for Z in 15 and 16. After each table and figure number is a letter designation of A, B, or C. Each letter represents one of the fracture criteria used in the analysis: A represents energy absorption, B represents energy absorption/unit area, and C represents lateral expansion. However, Figure 5, has designations of 5A-1, 5A-2, 5B-1 and 5B-2; this was done because the data for the surface and that for the midthickness of plate Q were plotted separately.

On each plot and table are given both the observed values and the calculated values, which are the results of the calculations made with the NBS computer program ITER. The computer program ITER calculates the curve of "best fit" for

the available data using a least-squares method. Both the printed tables and the plotted figures given here are outputs of ITER.

Each of the Figures, 1 through 7, give the observed data and the calculated curves for one of the 7 plates, with the CVN and PCI values being plotted as overlays on the same axes. Figures 8 and 9 are, respectively, overlays of all data and curves for the eight PCI data sets and overlays of all curves and data for the eight CVN data sets. These 8 sets of data represent the 7 heats of steel mentioned above.

4.2 Specimens Tested at NBS

The dimensions of the specimens from plate CK were observed to be within the size requirements of the specifications. Results of measurements taken of all the test specimens are presented as Appendix C. The values given in this Appendix table, for the widths of the specimens (side 2) and for the depths of the uncracked part of the PCI specimens (side 1) and the depths of the metal beneath the notch of the CVN specimens (side 1), were used in calculations of the area for the energy-per-unit-area calculations in the computer analyses.

The results of the impact tests are presented in Figures 10-12 and Tables 17-25. The computer analyses were made as described above for the analyses of raw data furnished by FHWA. However, the plots of CVN and PCI data were not overlayed onto the same set of axes. Rather, on a given set of axes are given the results for three data sets, which represent the three plate thickness locations for specimens of a given orientation with respect to the rolling direction of the plate. Figure 10 (Tables 17-19) gives the results for longitudinal CVN specimens, Figure 11 (Tables 20-22) gives the results for transverse CVN specimens, and Figure 12 (Tables 23-25) gives the results for longitudinal PCI specimens.

4.3 Comparison of NBS Data and FHWA Data from Heat No. C4913-4

Plate CK and plate Q both have the same heat number, C4913-4, and it is presumed that they represent two plates from the same heat. The differences between impact test results of surface (top or bottom) and middle specimens, either from plate Q or from plate CK, were observed to be relatively small in relation to differences between heats for the seven heats of steel analyzed in this report. Therefore, independent

analyses were made, for specimens of similar orientation (longitudinal or transverse) and type (PCI or CVN), but all data for the surface and midthickness locations were grouped for similar specimens from a given plate. The data from the two plates thus resulted in two longitudinal PCI sets, two longitudinal CVN sets, and one transverse CVN set.

In this way, the results from a multiplicity of specimens from each of the plates, CK and Q, could be compared. For this comparison and with statistical methods, the 95 percent confidence limits for each of the five data sets were determined.

Figures 13 and 14 (and Tables 26-30) show the results of this comparison for the 2 PCI data sets and for the 3 CVN data sets, respectively. Each data set is represented by (1) the combined observed data from surface and midthickness locations, and (2) a calculated curve of best fit for all of the data in the set. In addition, the best-fit curves for the longitudinal, CVN and PCI, tests of plate CK are bounded by a series of arrows that point toward the curve of best fit. These arrows define the 95% confidence limits for the CK, LT data. The curve of best fit is plotted as a dotted line for each curve that represents plate Q data.

It is observed on these overlay plots that each of the dotted lines, representing data from plate Q tested at another laboratory, falls close to the corresponding solid line for longitudinal specimens of plate CK tested at NBS. Some of the data for plate Q falls outside the 95 percent confidence limits given for plate CK, but generally the data for Q is within these limits and the differences between the two plates are in our judgment small and within the limits expected for variations in impact characteristics from plate to plate within a heat. Furthermore, the data for transverse specimens from plate CK are not substantially different from the data for longitudinal specimens, except at elevated temperatures. There, the transverse data are lower than the longitudinal data, indicating that at these temperatures the upper shelf is being approached. However, it appears that the upper shelf was not attained within the temperature range of these tests.

4.4 Comments on the Calculations

The calculated curves given in this report are results of least-squares regression analyses made with an equation of the form:

$$Y = Y_{\alpha}+Ke^{A(X-X_{\alpha})^{C}}$$

This equation provides an abundant variety of curves of the type commonly found in transition data of the form normally observed in impact tests conducted with temperature as a variable. However, a linear fit to the data is not obtainable with this equation, and we observe that some data appear to us to be linear in form.

Our qualitative assessment of this indicates that for some of the data obtained from plates Q, R, and CK, a linear fit may be nearly as good as or possibly slightly better than the fit given by the calculated curves of ITER. This is believed to be true for the following cases:

		Plate Q			Plate R	Plate CK*
		Surface	Midthickness	All	Surface	All
En.	CVN				x	x
En.	PCI	x	x	x		x
En/A	CVN				x	x
En/A	PCI	x	x	x		x
L.E.	CVN				x	x
L.E.	PCI				x	

* Data sets representing the top, center, and bottom of plate CK were not individually assessed for linearity due to the limited number of test points available.

Thus, for each of the x's marked in the above table, a linear fit appears to us to be better than the fit obtained and presented in this report.

5. ACKNOWLEDGMENT

The authors would like to thank Messrs. T. P. Royston and D. E. Harne for their assistance in taking measurements on and performing impact tests on the impact specimens and in the preparation of the tables and figures used in this report. Special thanks are due to Ms. D. Chessick for her valued assistance with computer program ITER.

Figure 1A

IMPACT TEST RESULTS FOR PLATE A.

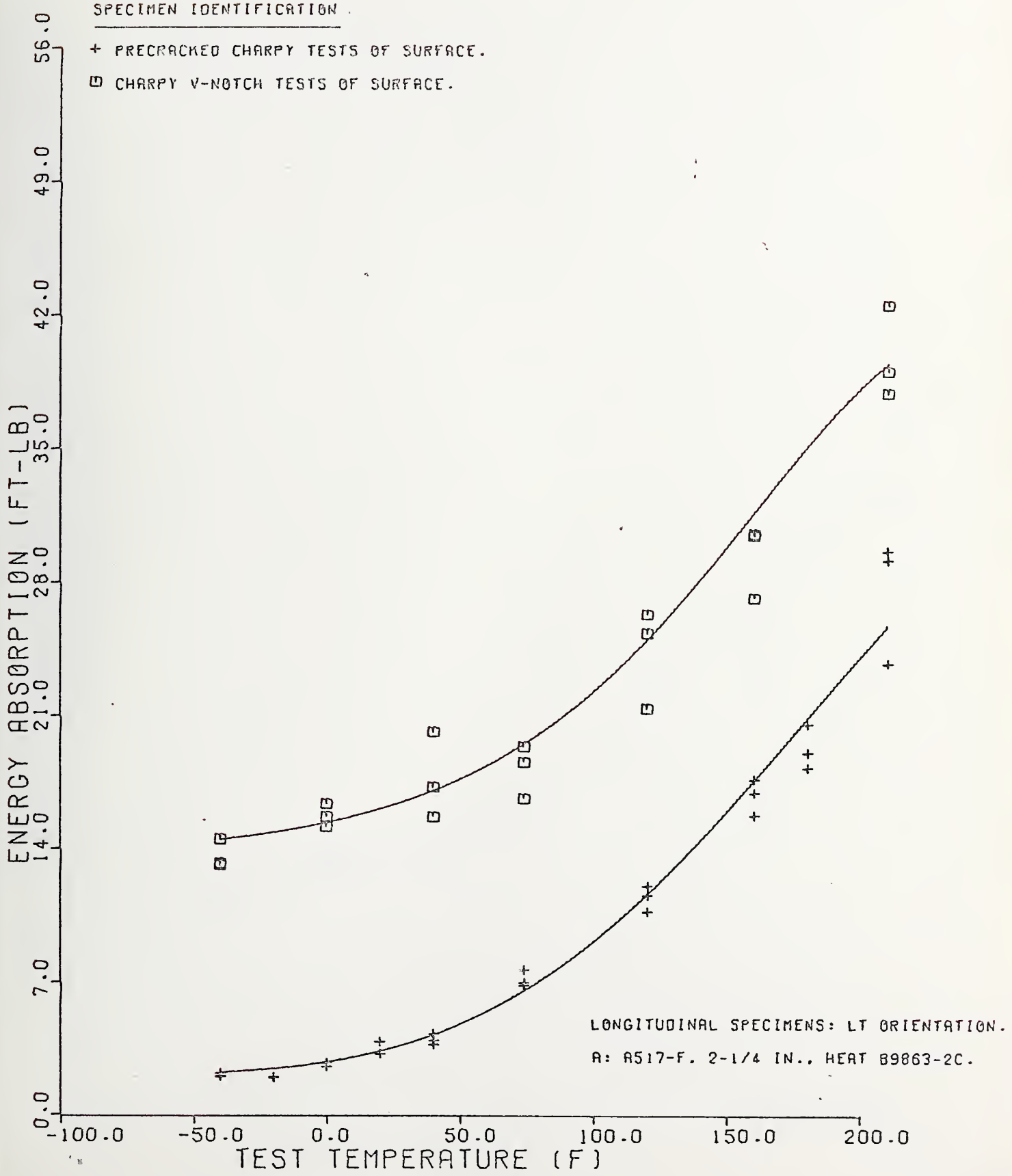

Figure 1B

IMPACT TEST RESULTS FOR PLATE A.

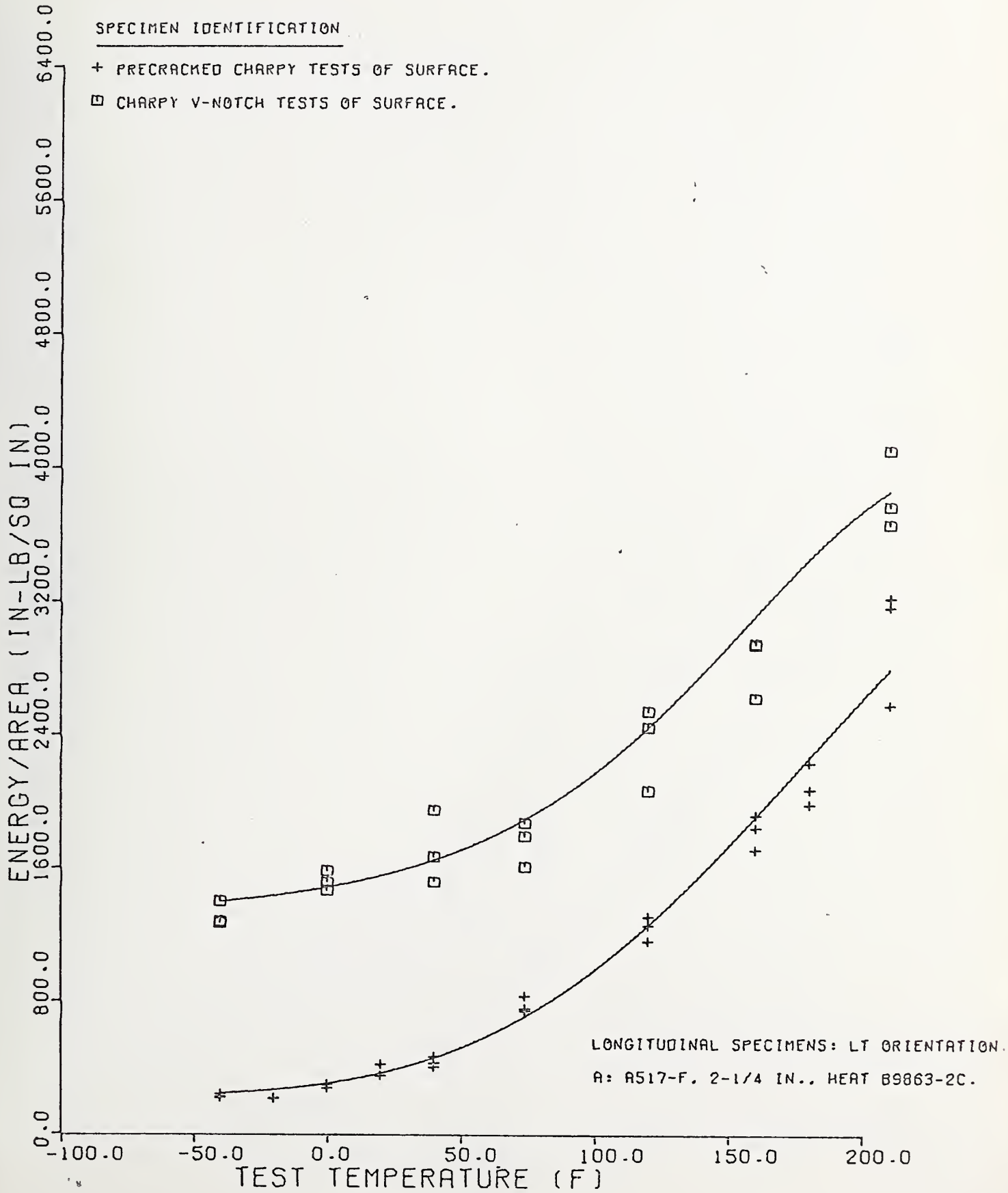

Figure 1C
IMPACT TEST RESULTS FOR PLATE A.

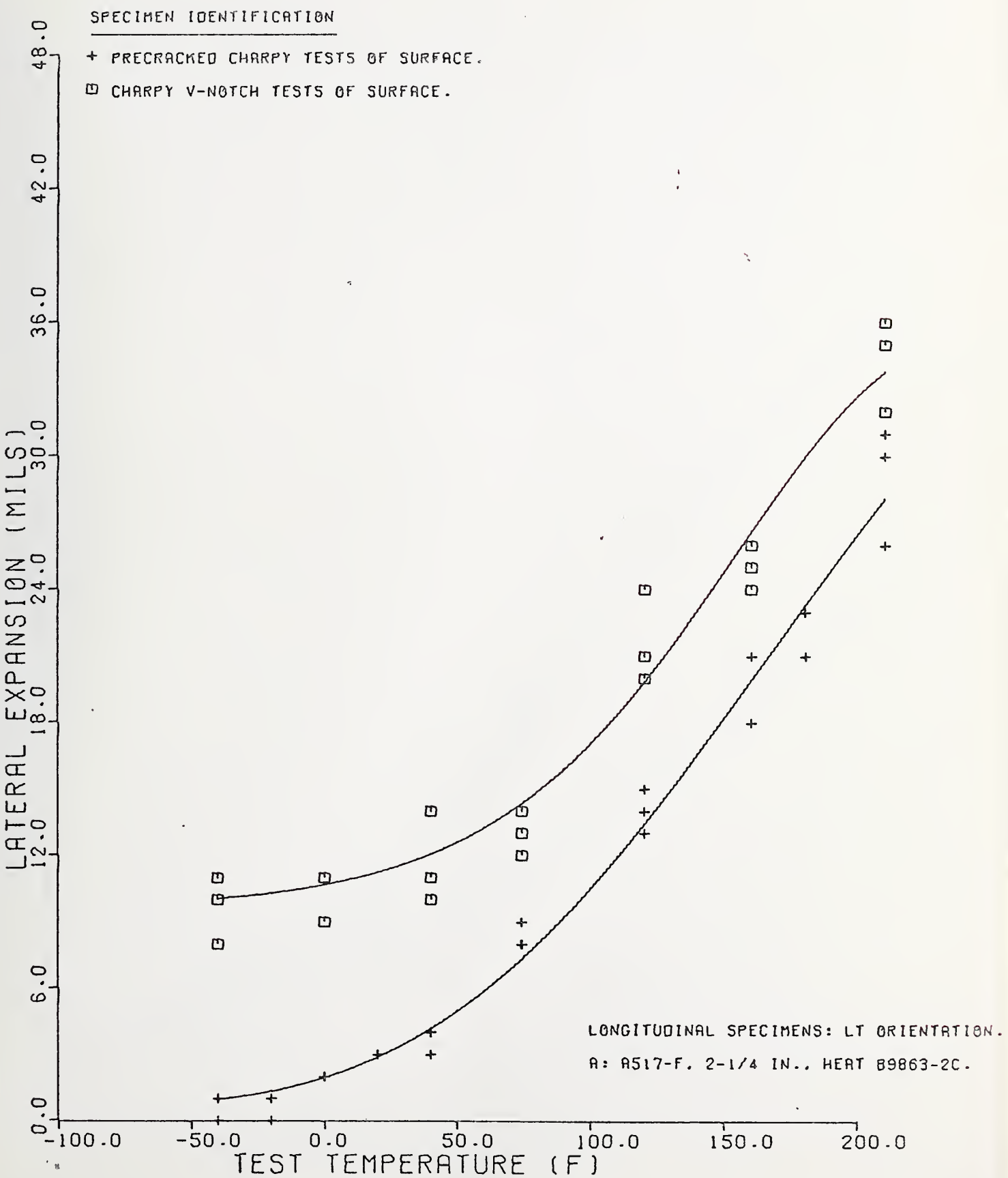

Figure 2A
IMPACT TEST RESULTS FOR PLATE AL.

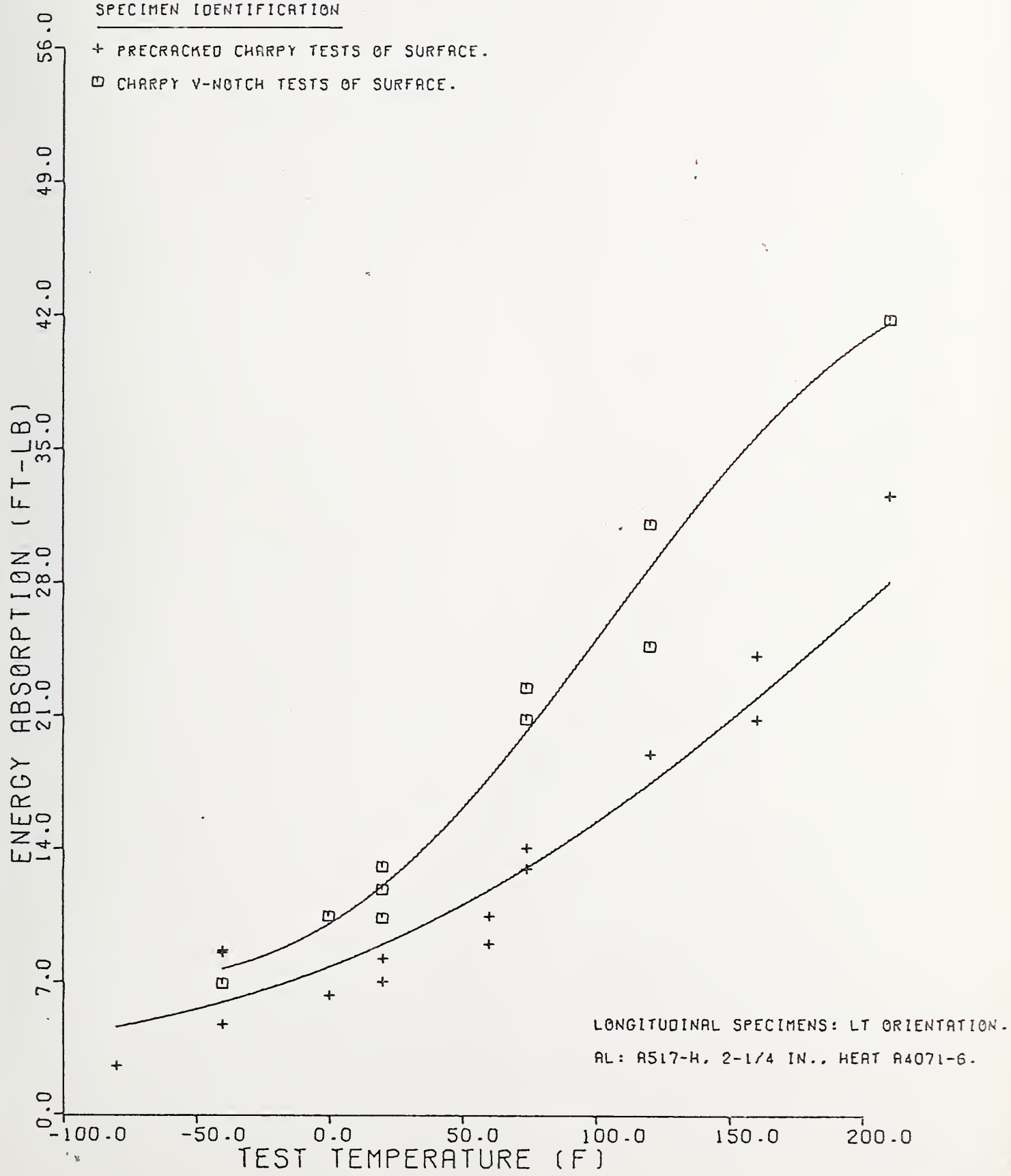

Figure 2B
IMPACT TEST RESULTS FOR PLATE AL.

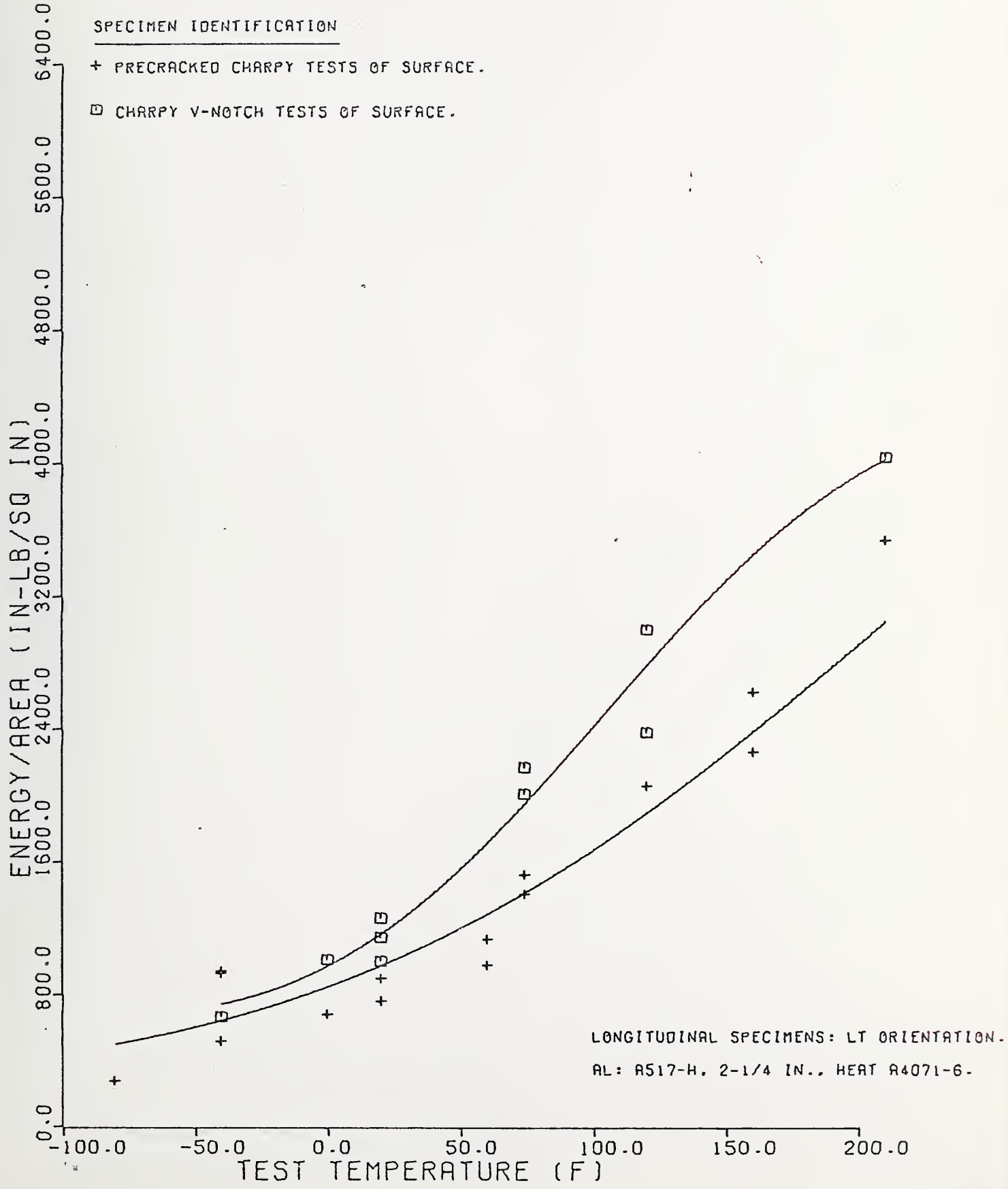

Figure 2C
IMPACT TEST RESULTS FOR PLATE AL.

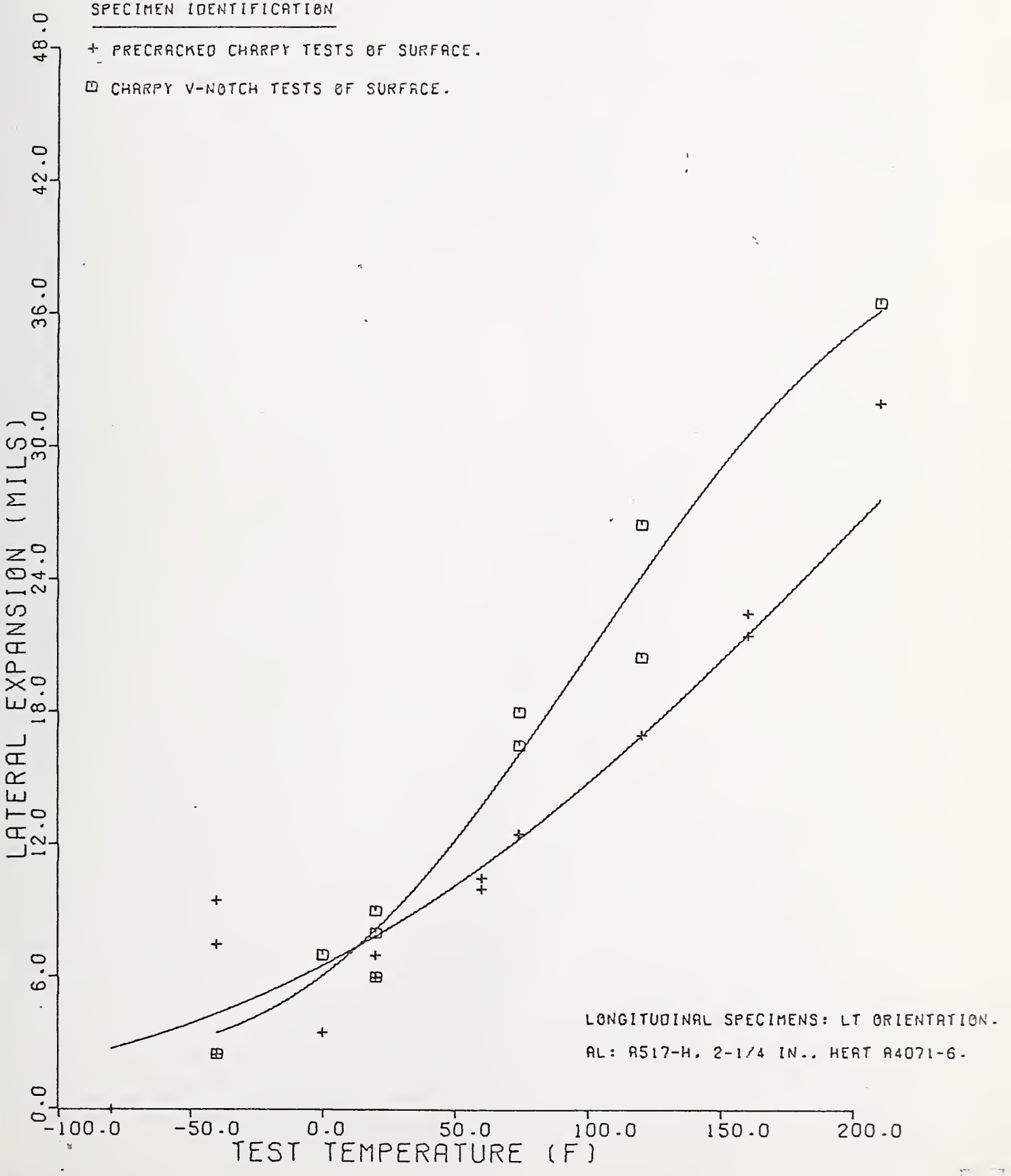

Figure 3A
IMPACT TEST RESULTS FOR PLATE L.

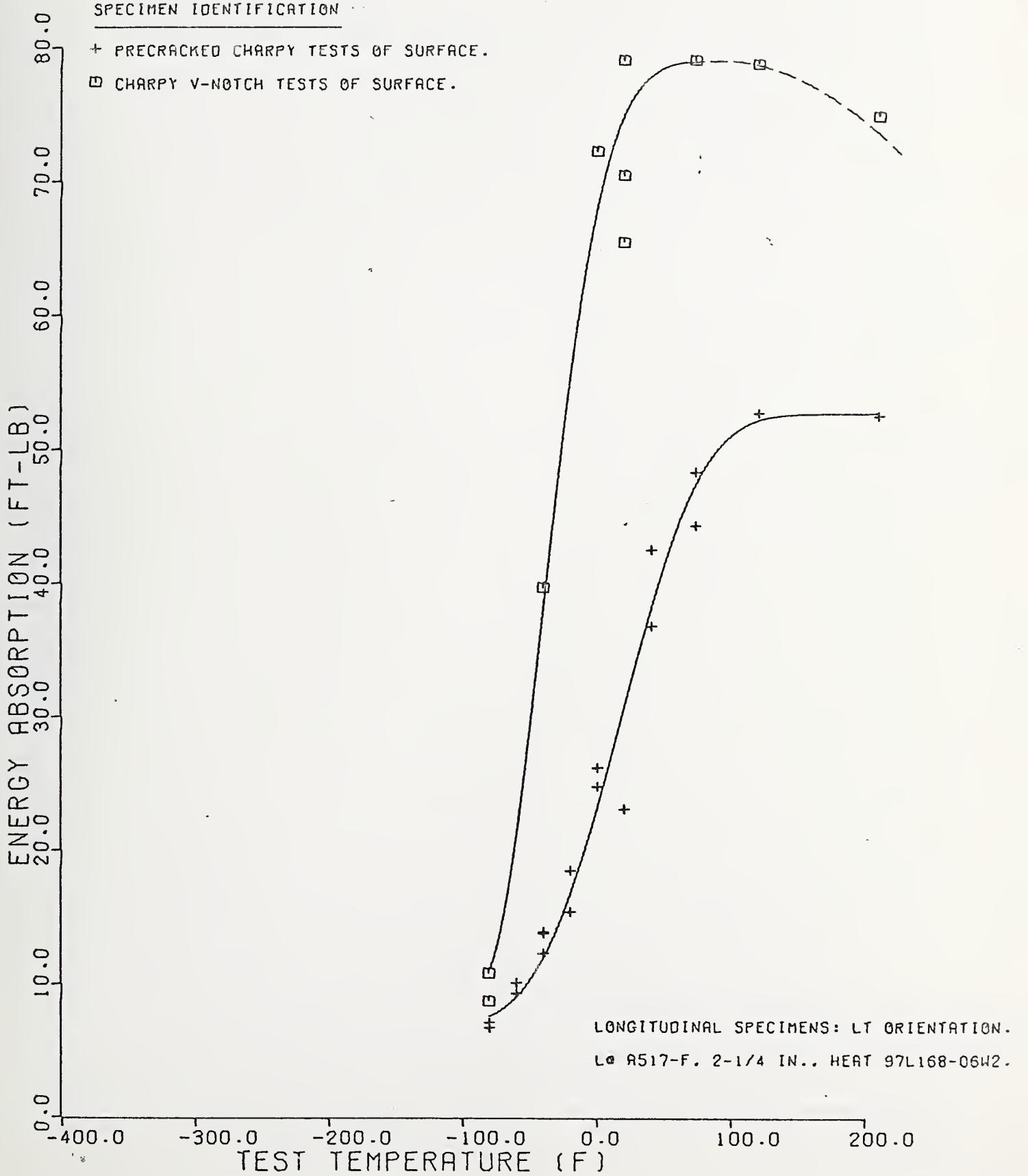

Figure 3B
IMPACT TEST RESULTS FOR PLATE L.

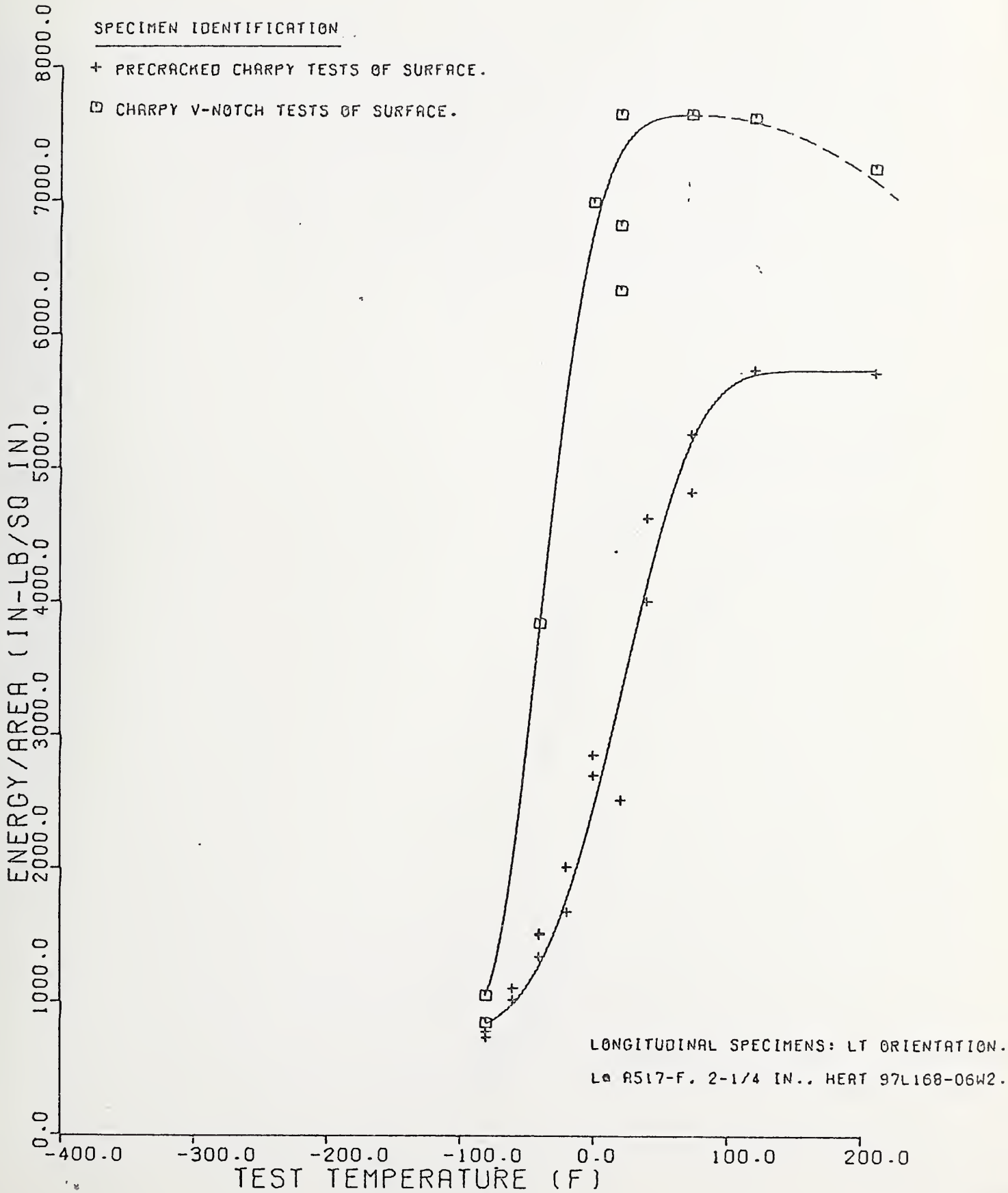

Figure 3C
IMPACT TEST RESULTS FOR PLATE L.

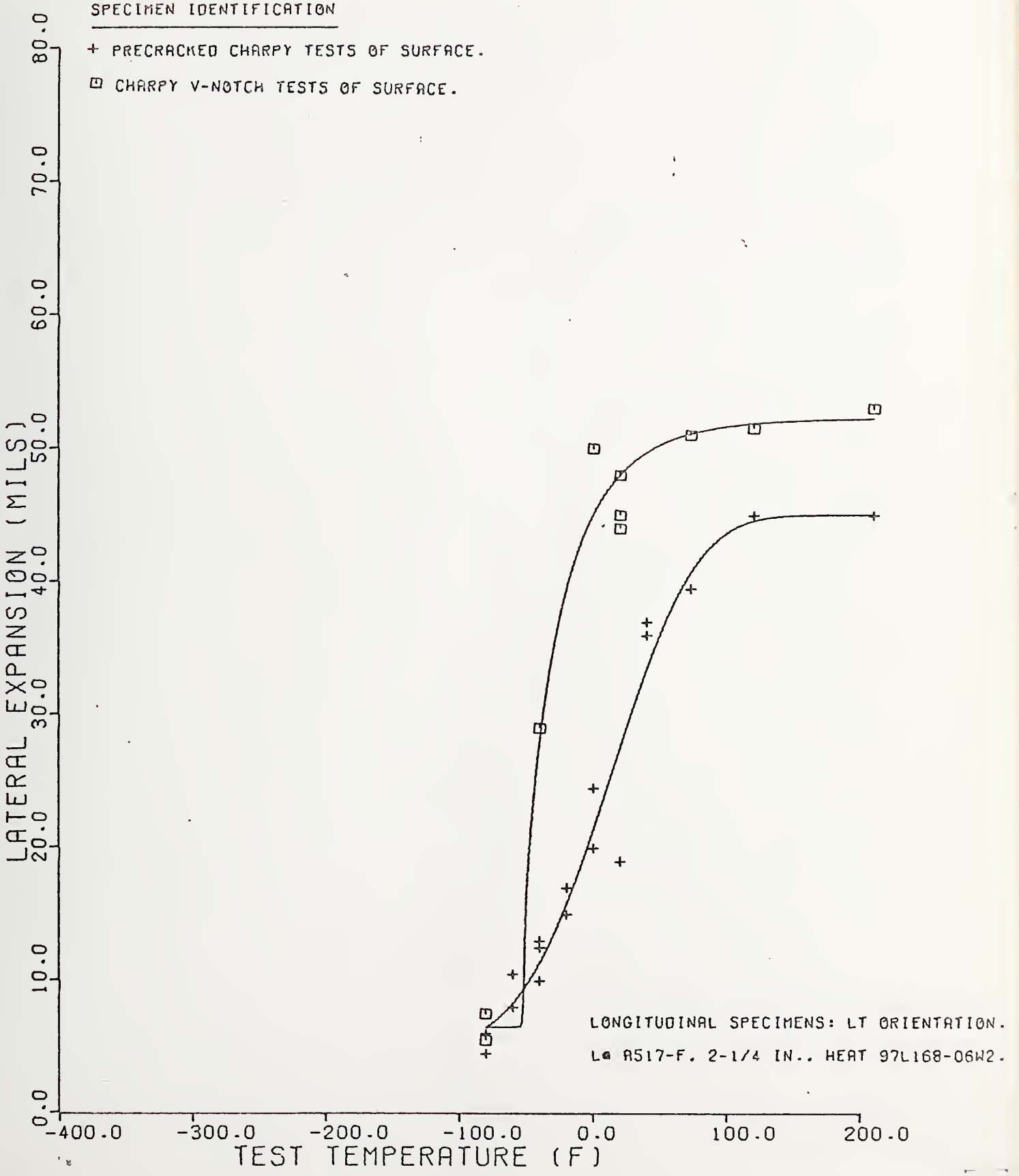

Figure 4A
IMPACT TEST RESULTS FOR PLATE M.

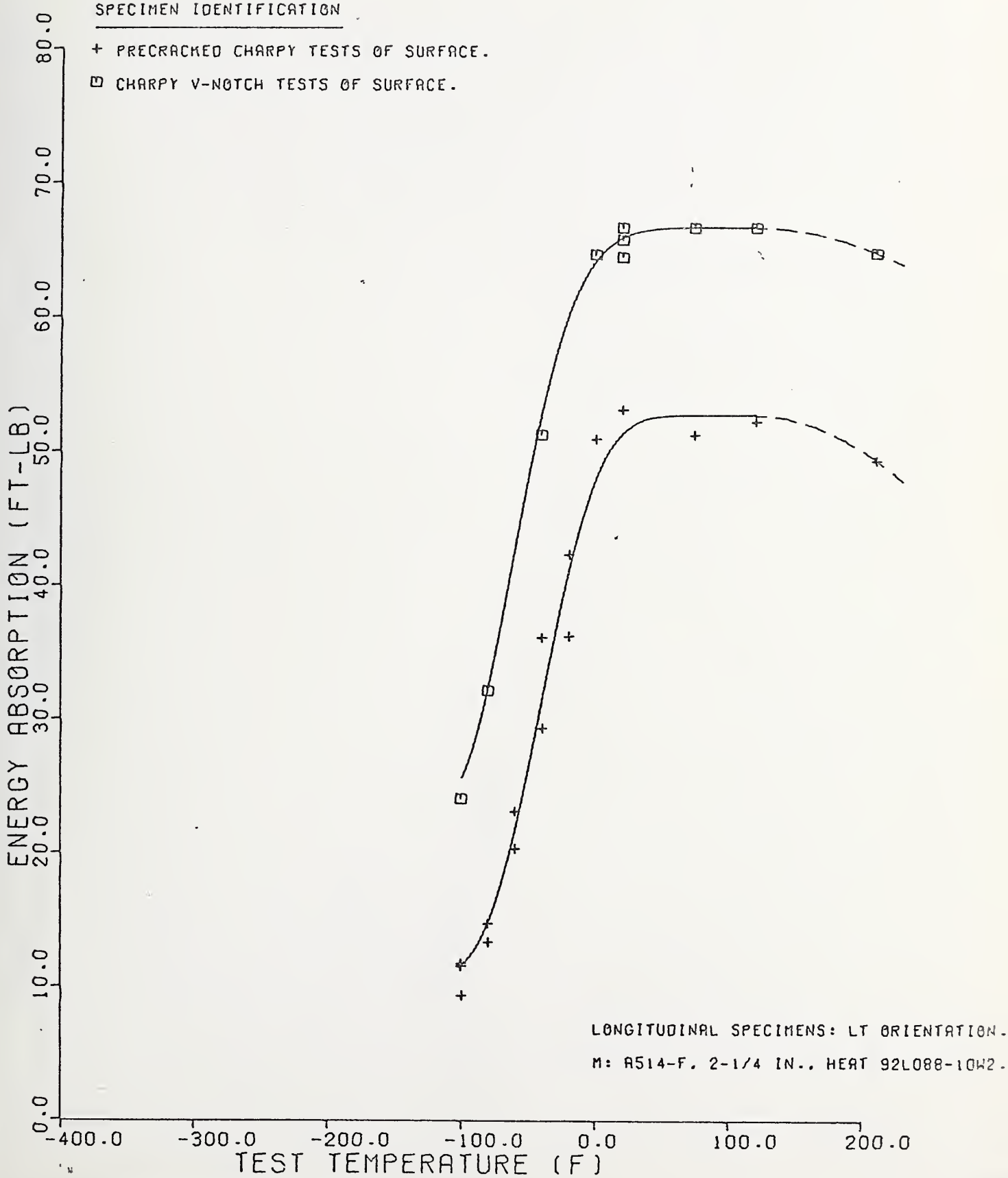

Figure 4B
IMPACT TEST RESULTS FOR PLATE M.

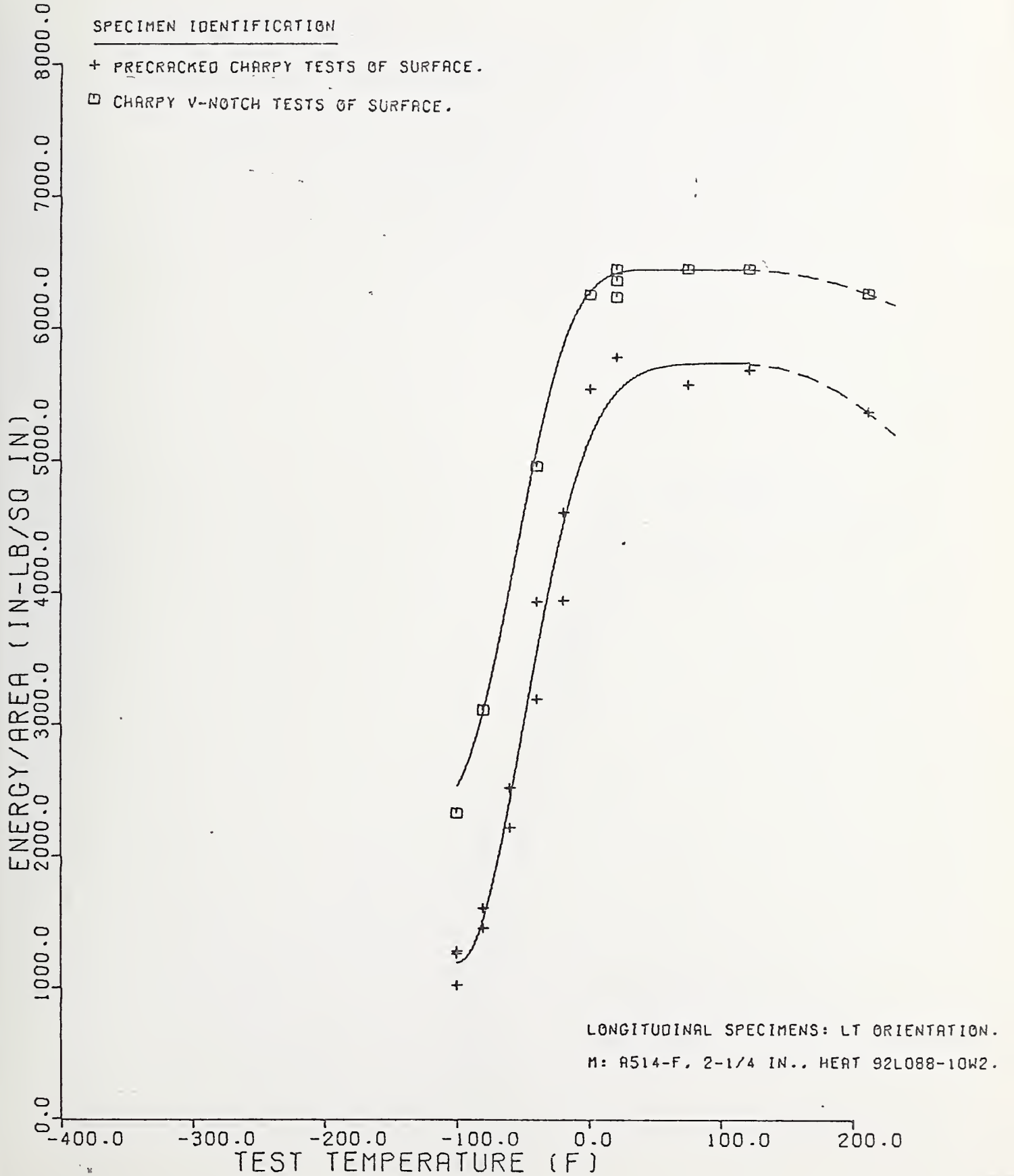

Figure 4C
IMPACT TEST RESULTS FOR PLATE M.

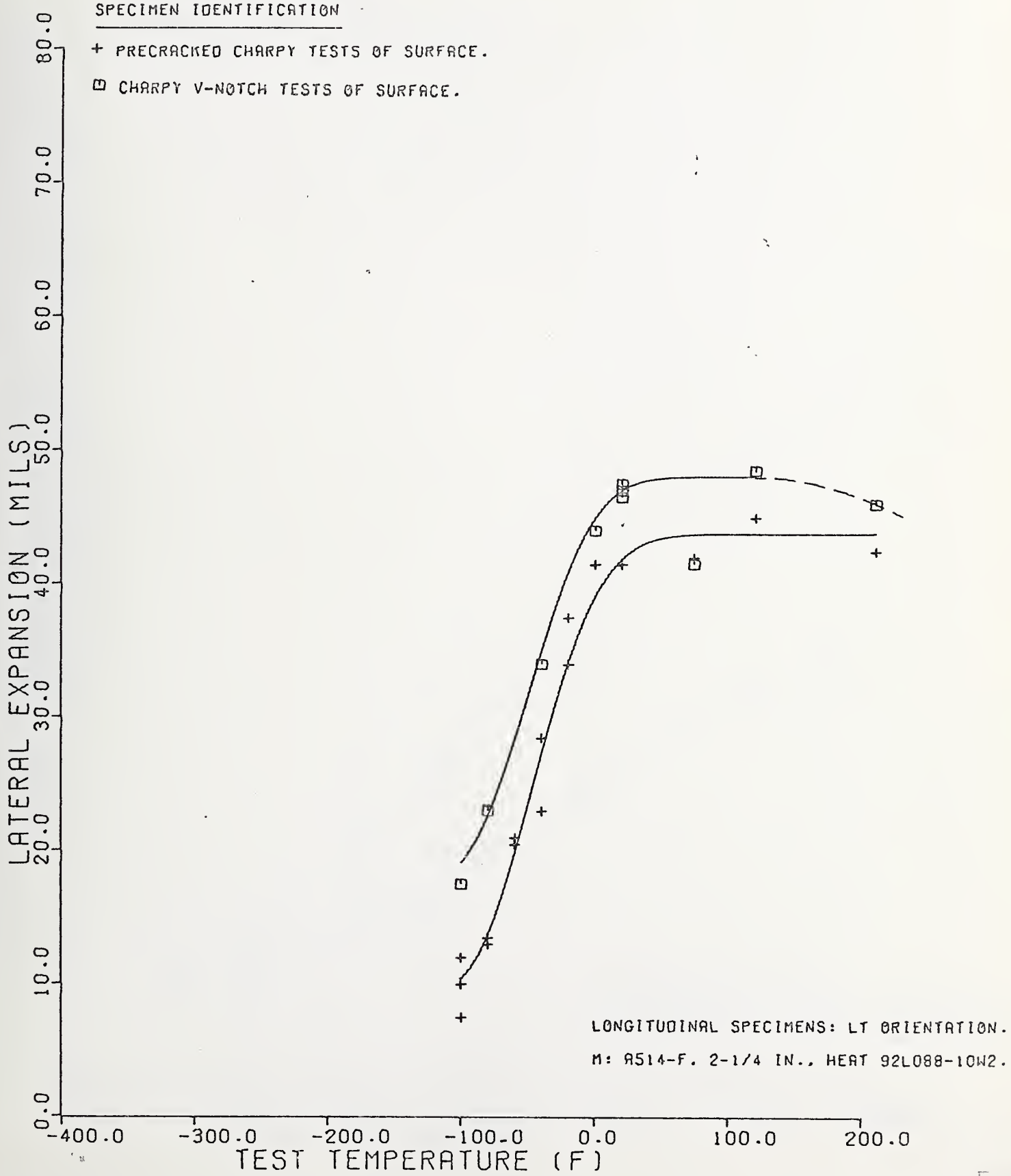

Figure 5A-1

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

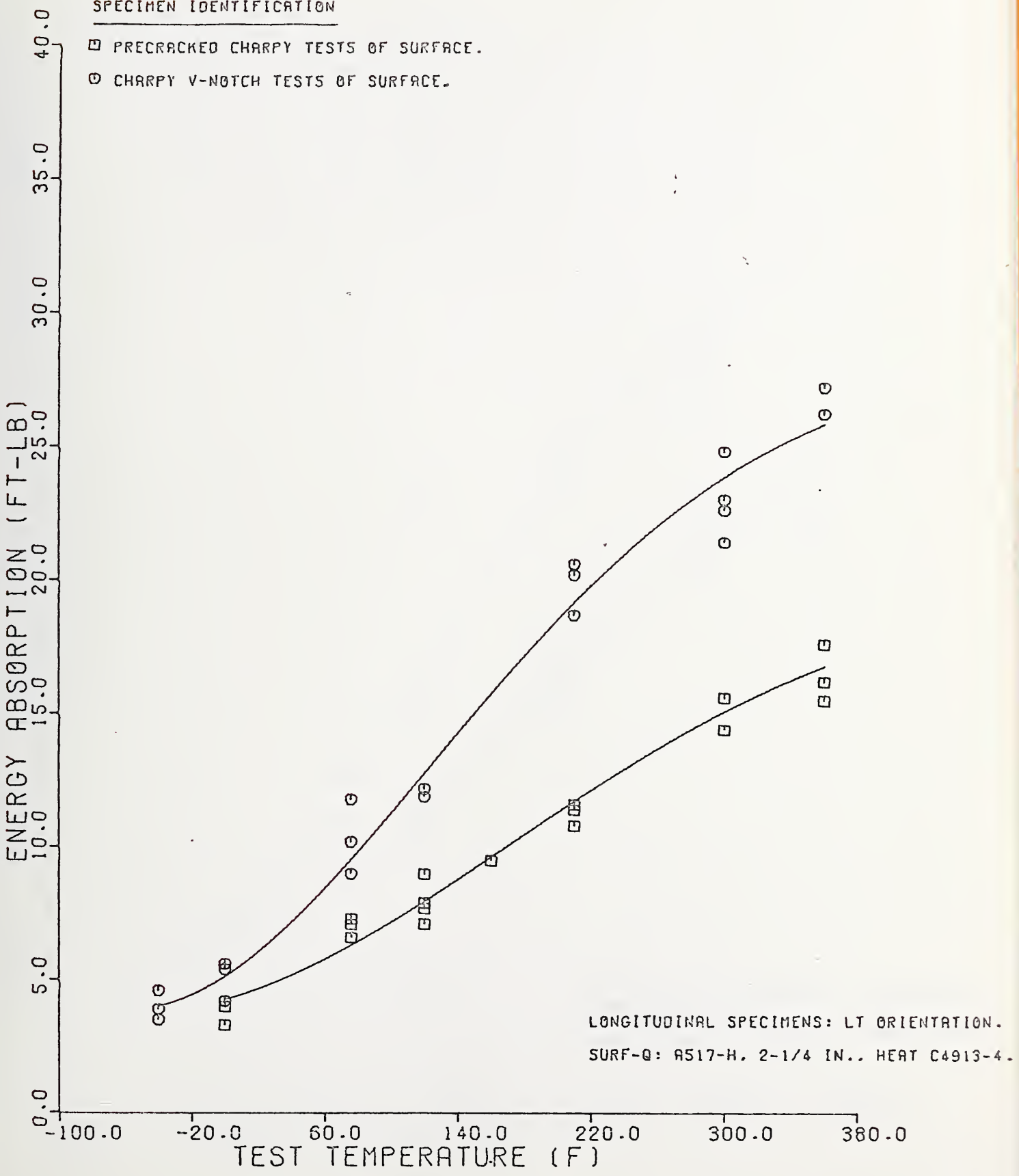

Figure 5B-1

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

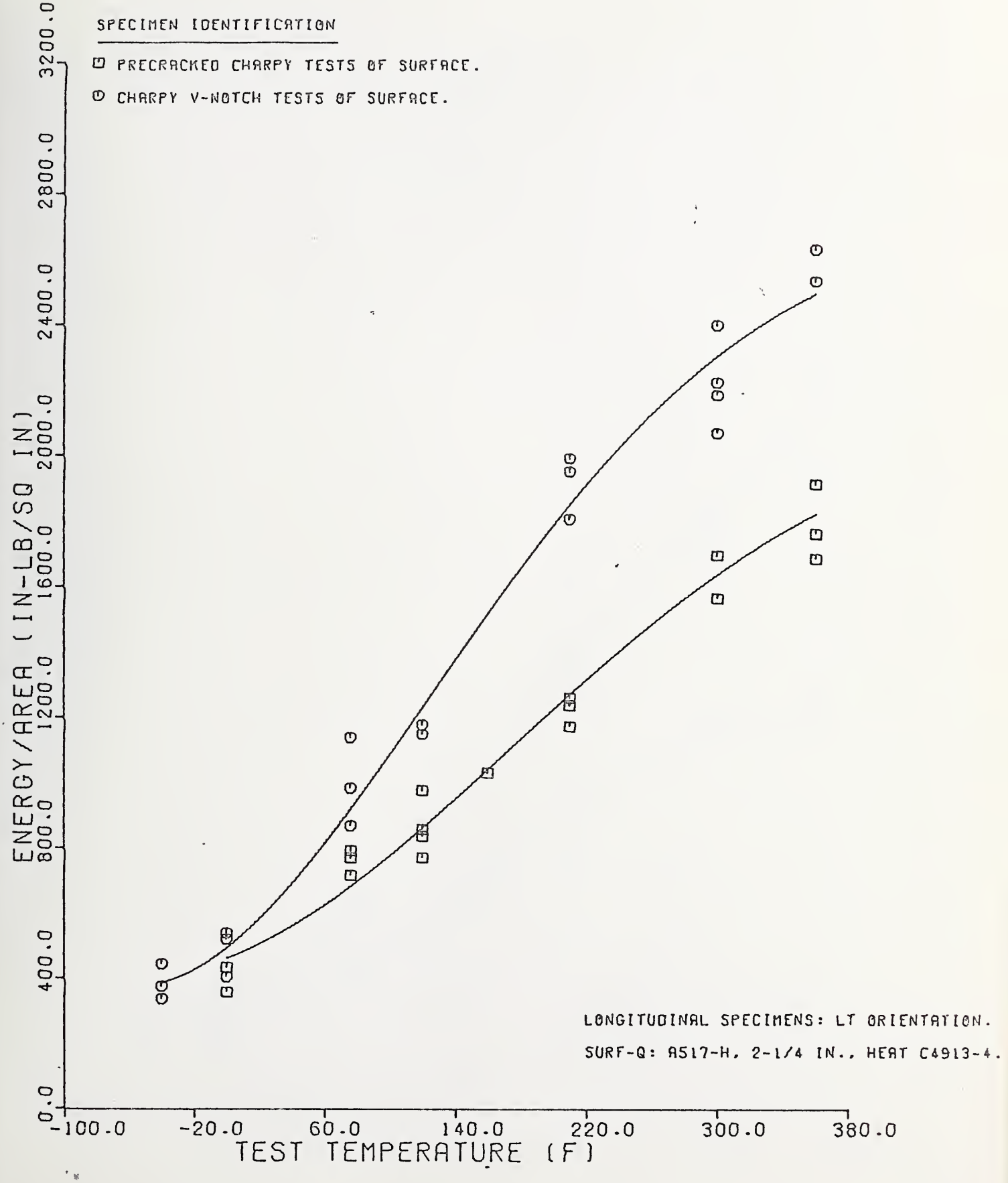

Figure 5A-2

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

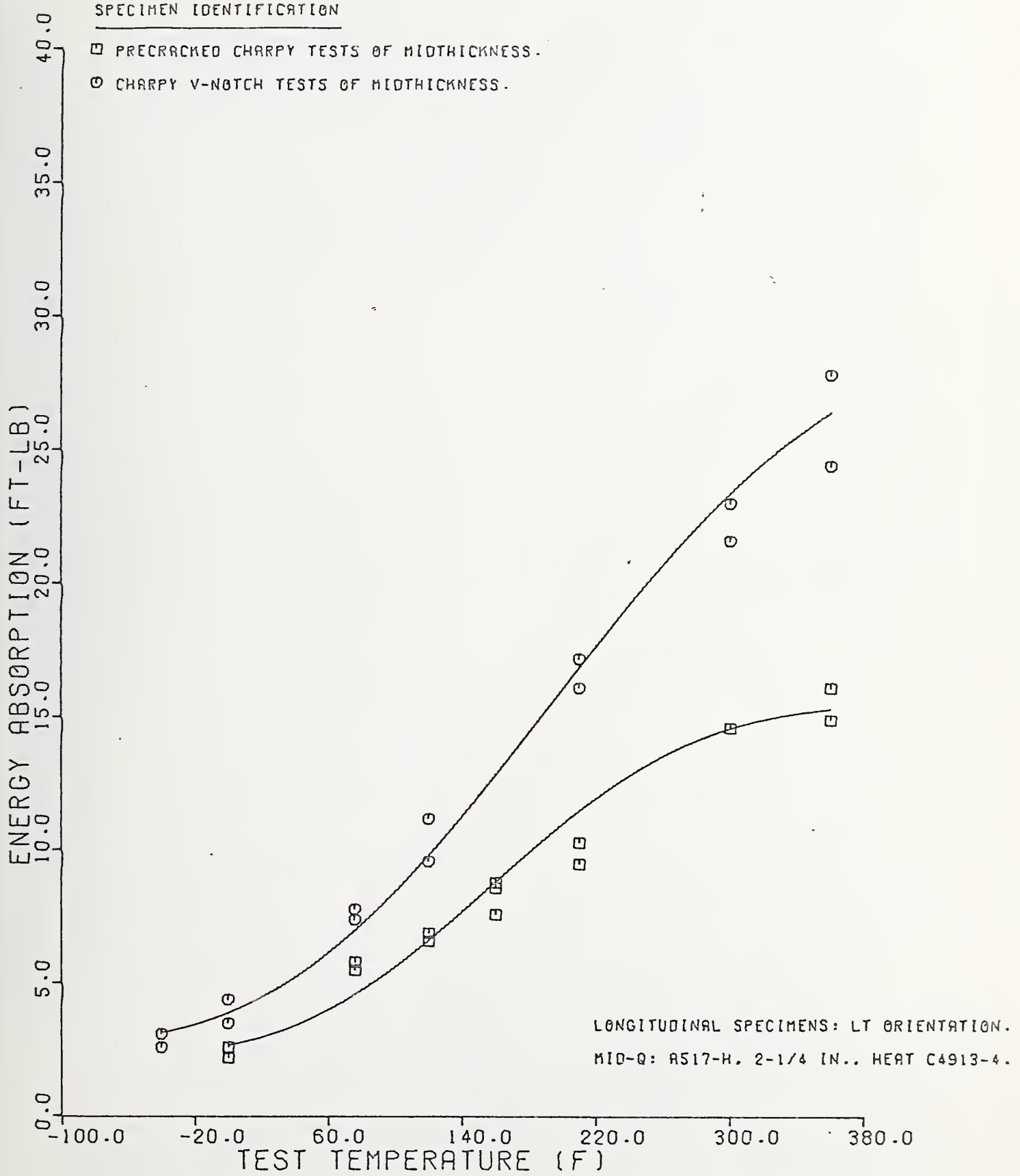

Figure 5B-2

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

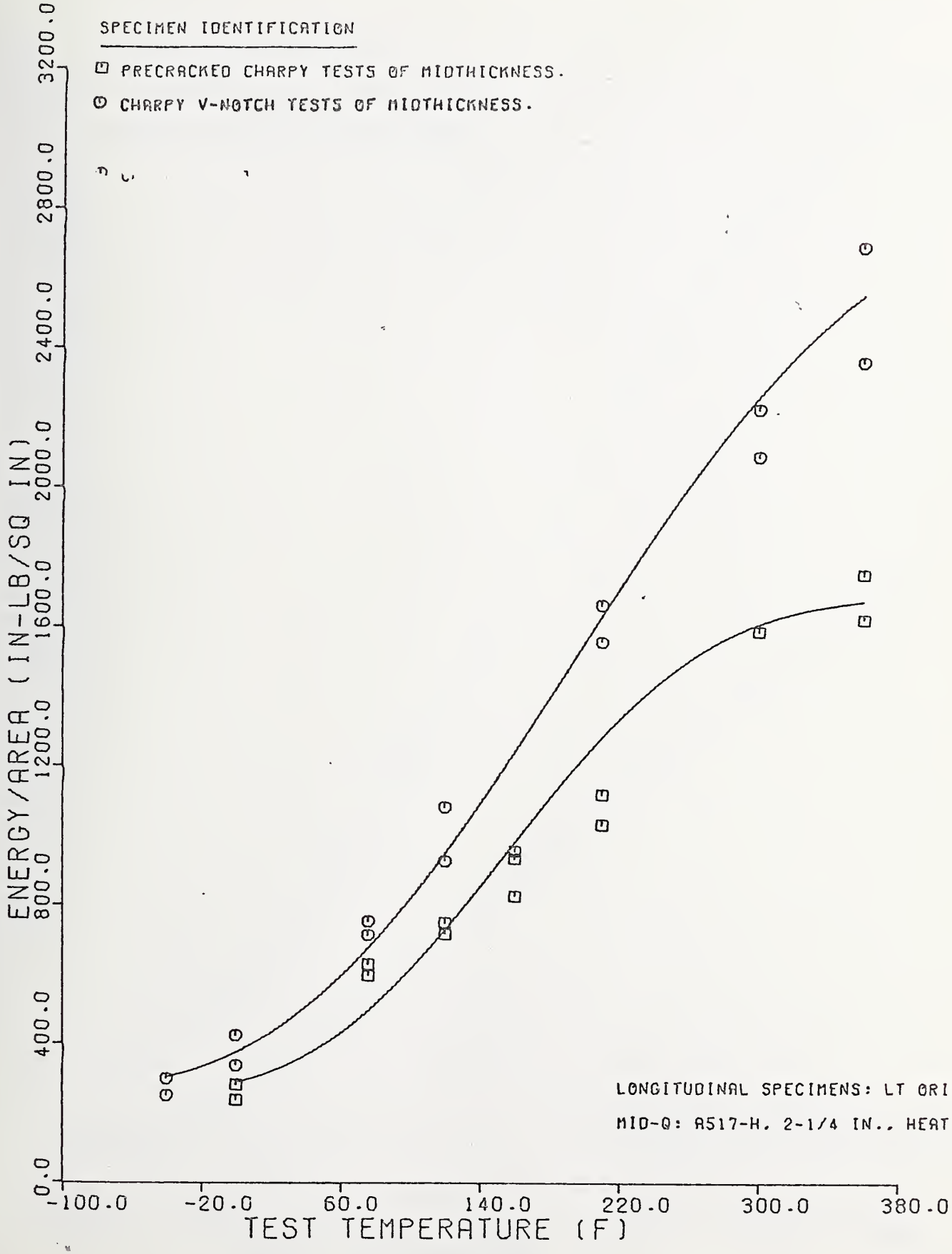

Figure 6A
IMPACT TEST RESULTS FOR PLATE R.

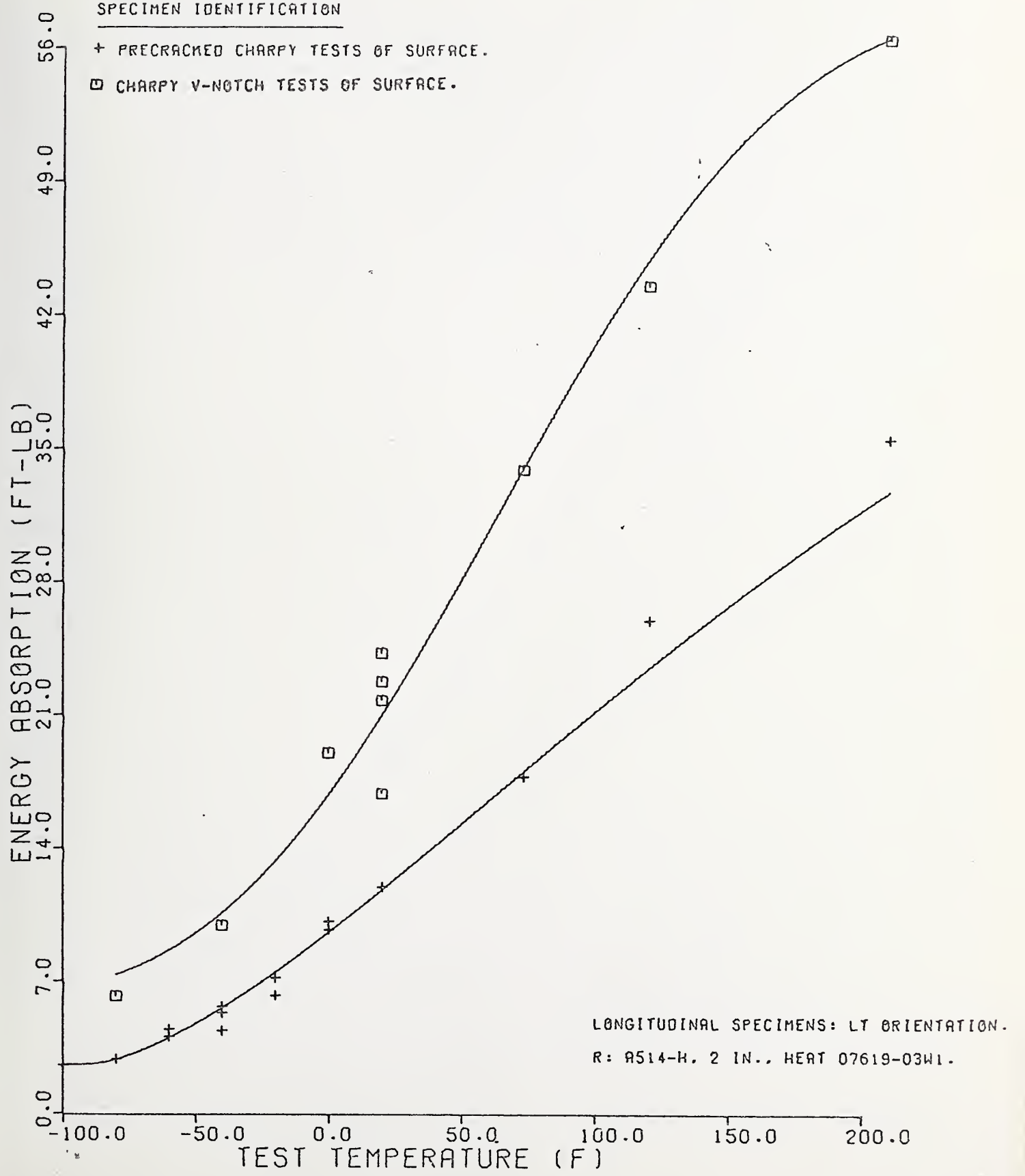

Figure 6B
IMPACT TEST RESULTS FOR PLATE R.

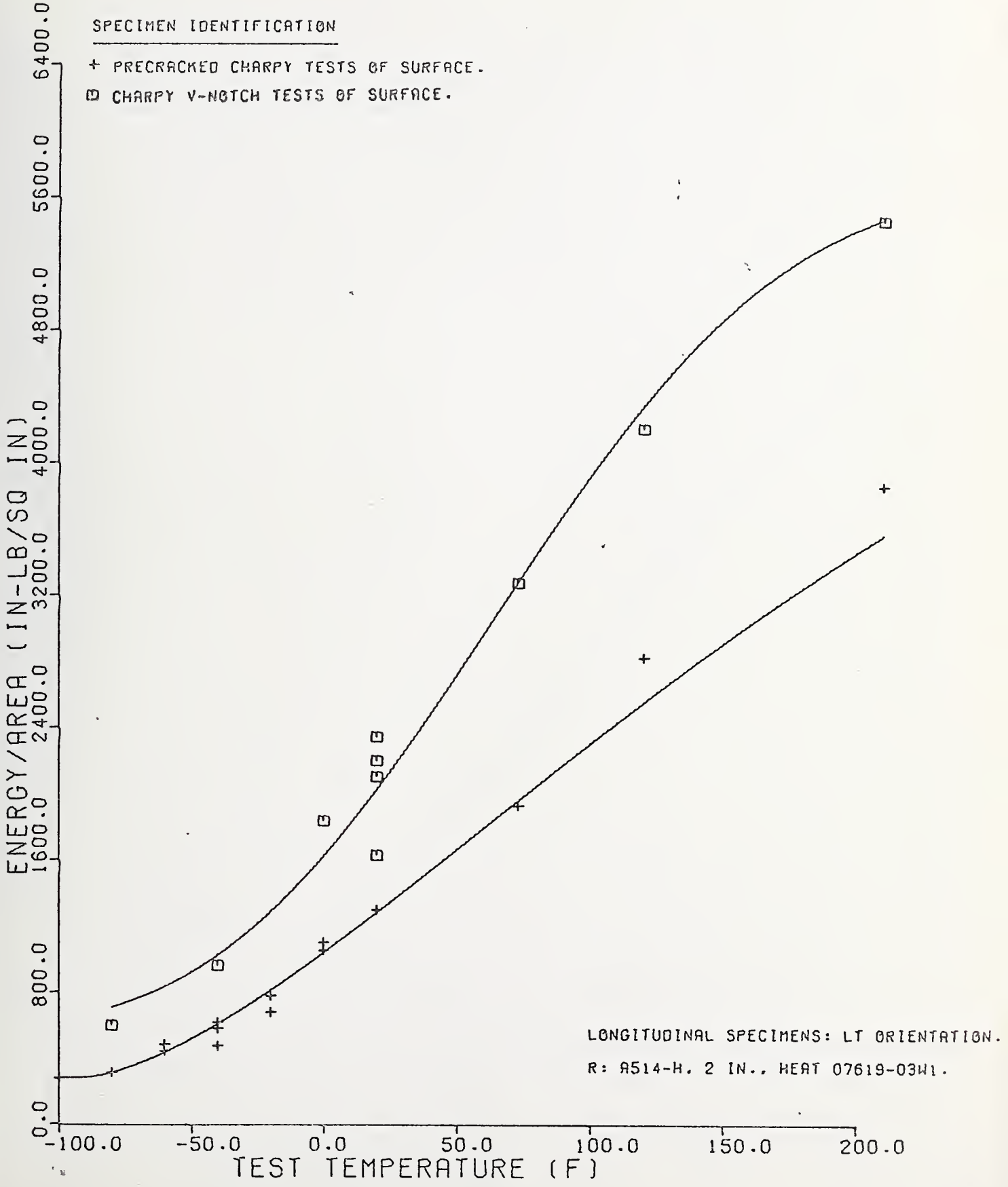

Figure 6C
IMPACT TEST RESULTS FOR PLATE R.

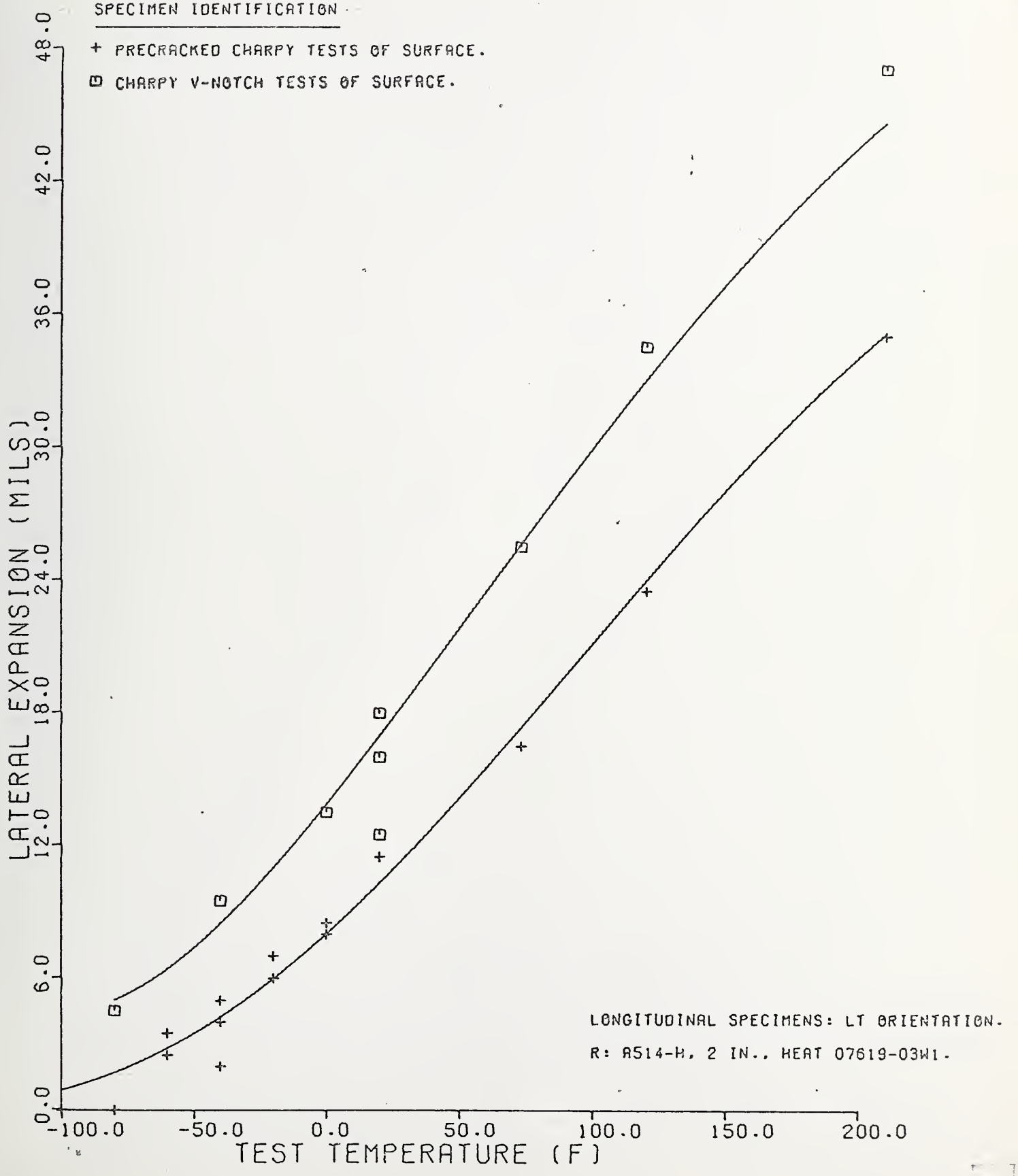

Figure 7A
IMPACT TEST RESULTS FOR PLATE Z.

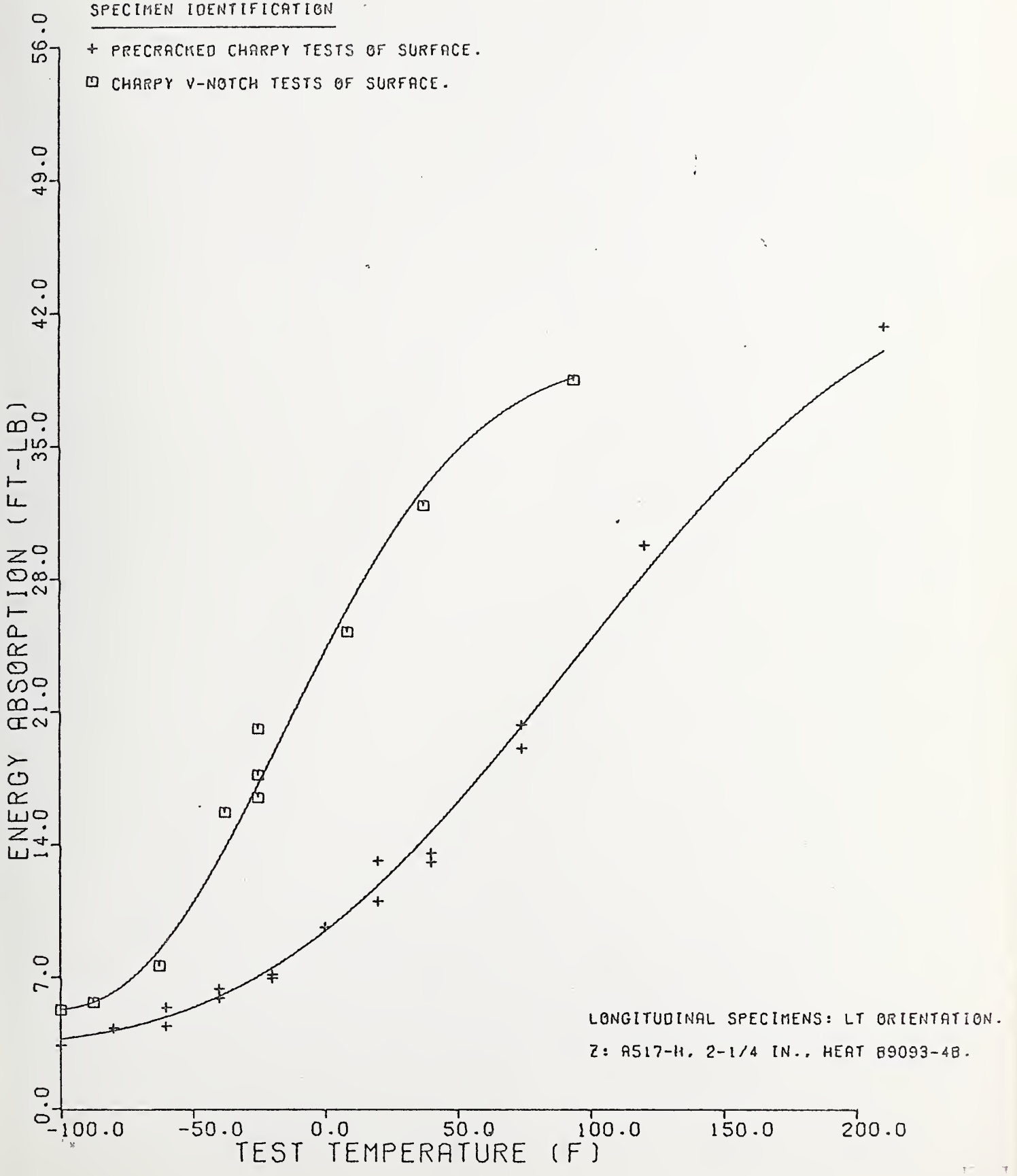

Figure 7B
IMPACT TEST RESULTS FOR PLATE Z.

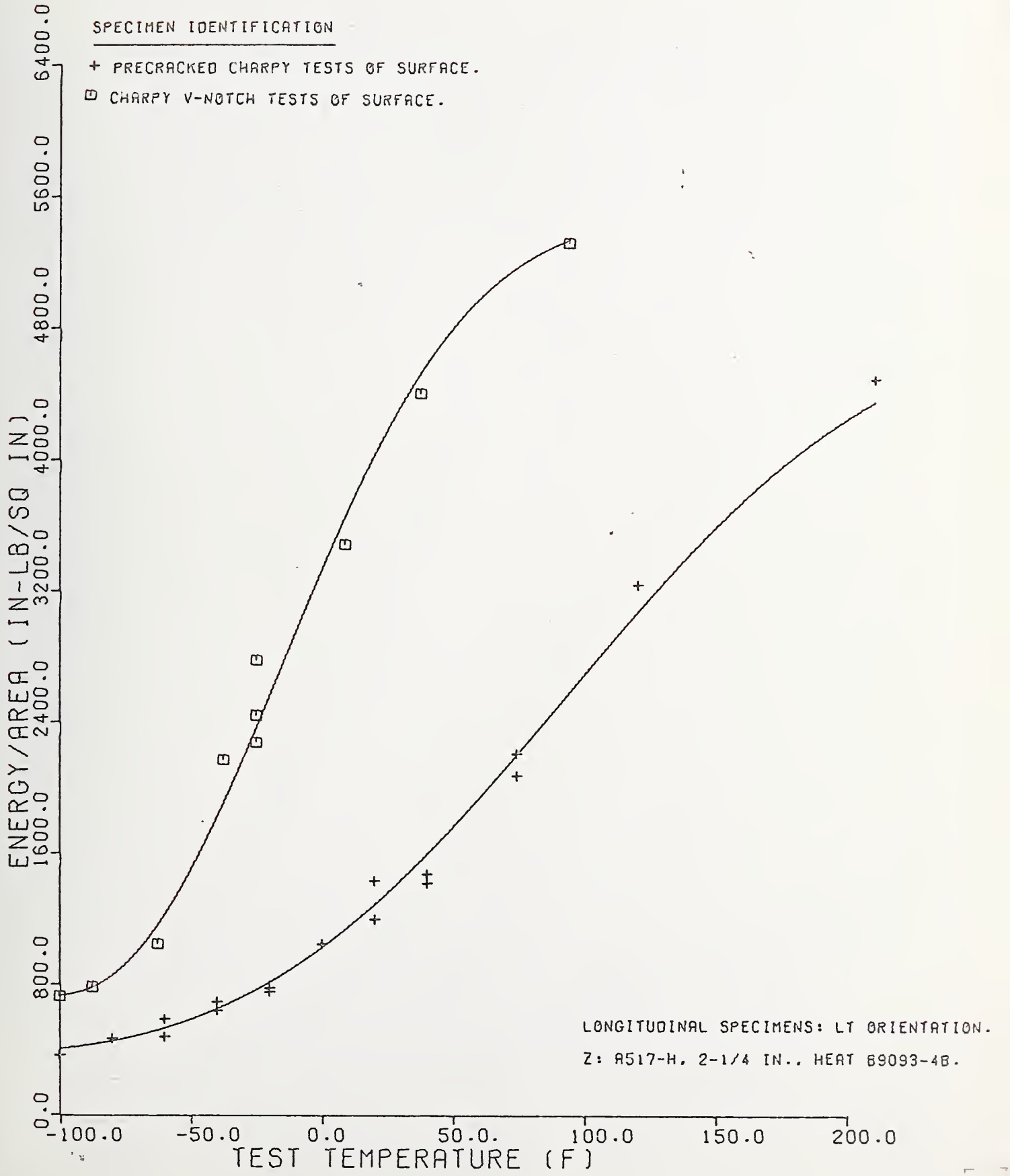

Figure 7C
IMPACT TEST RESULTS FOR PLATE Z.

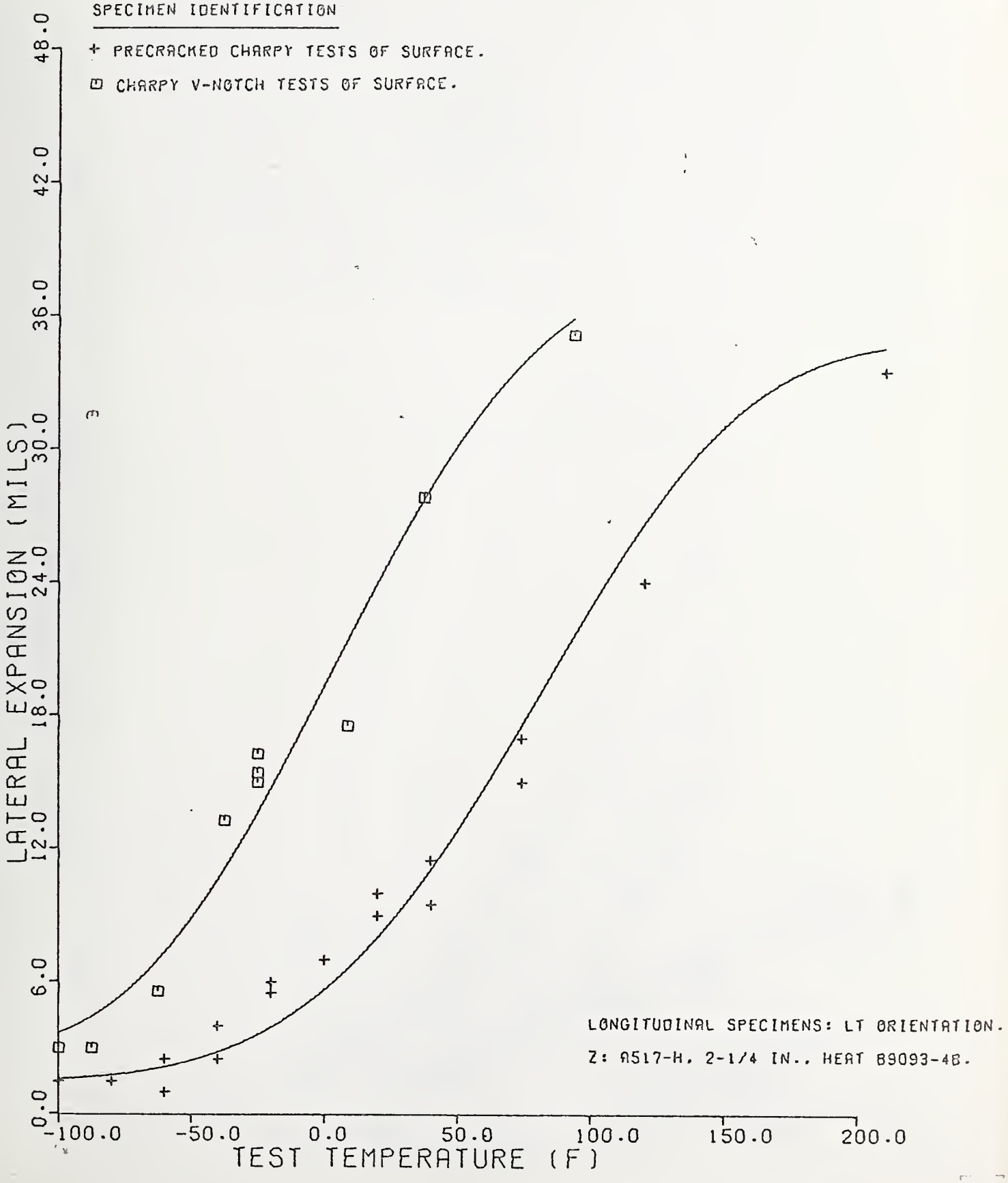

Figure 8A
PRECRACKED CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

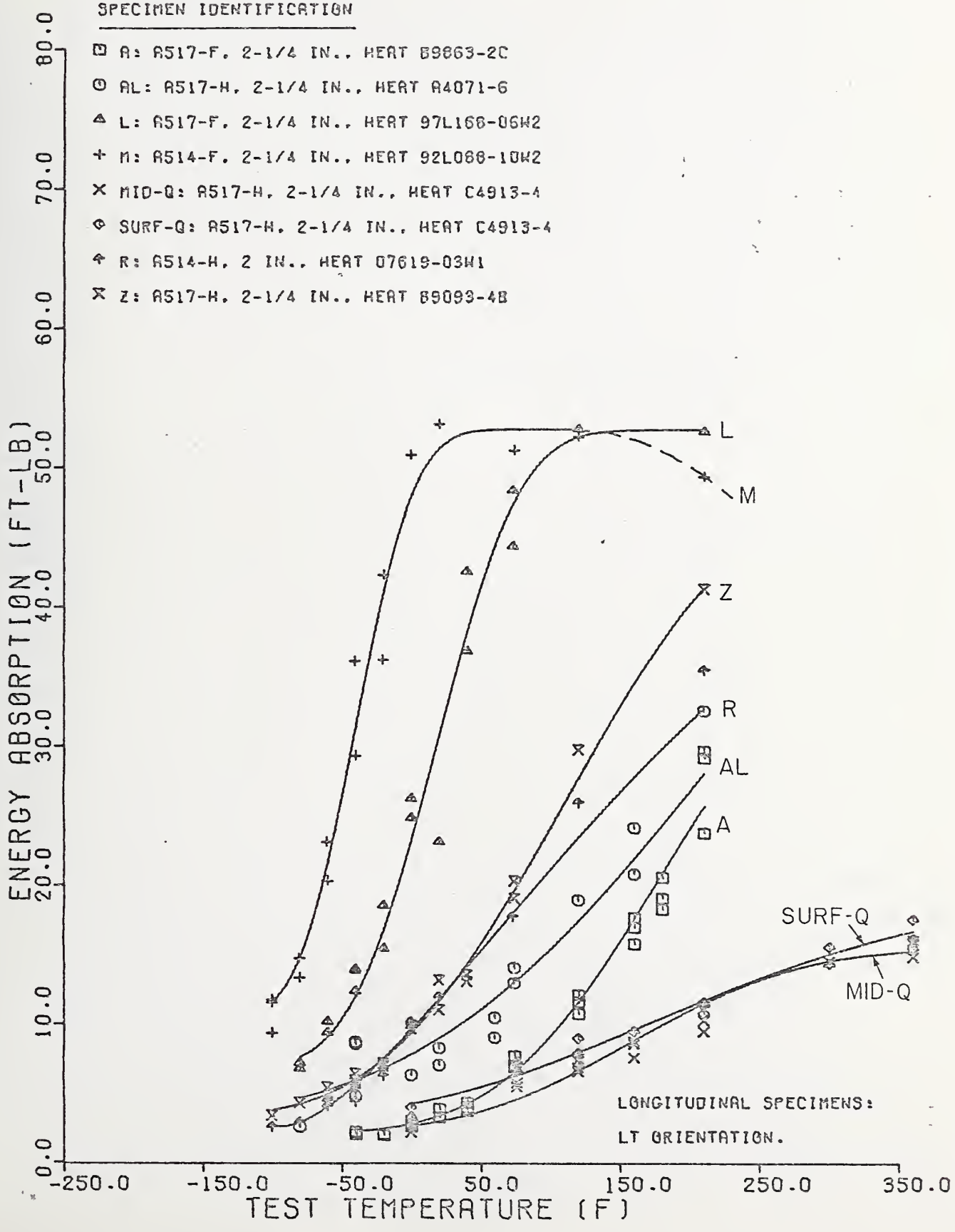

Figure 8B
PRECRACKED CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

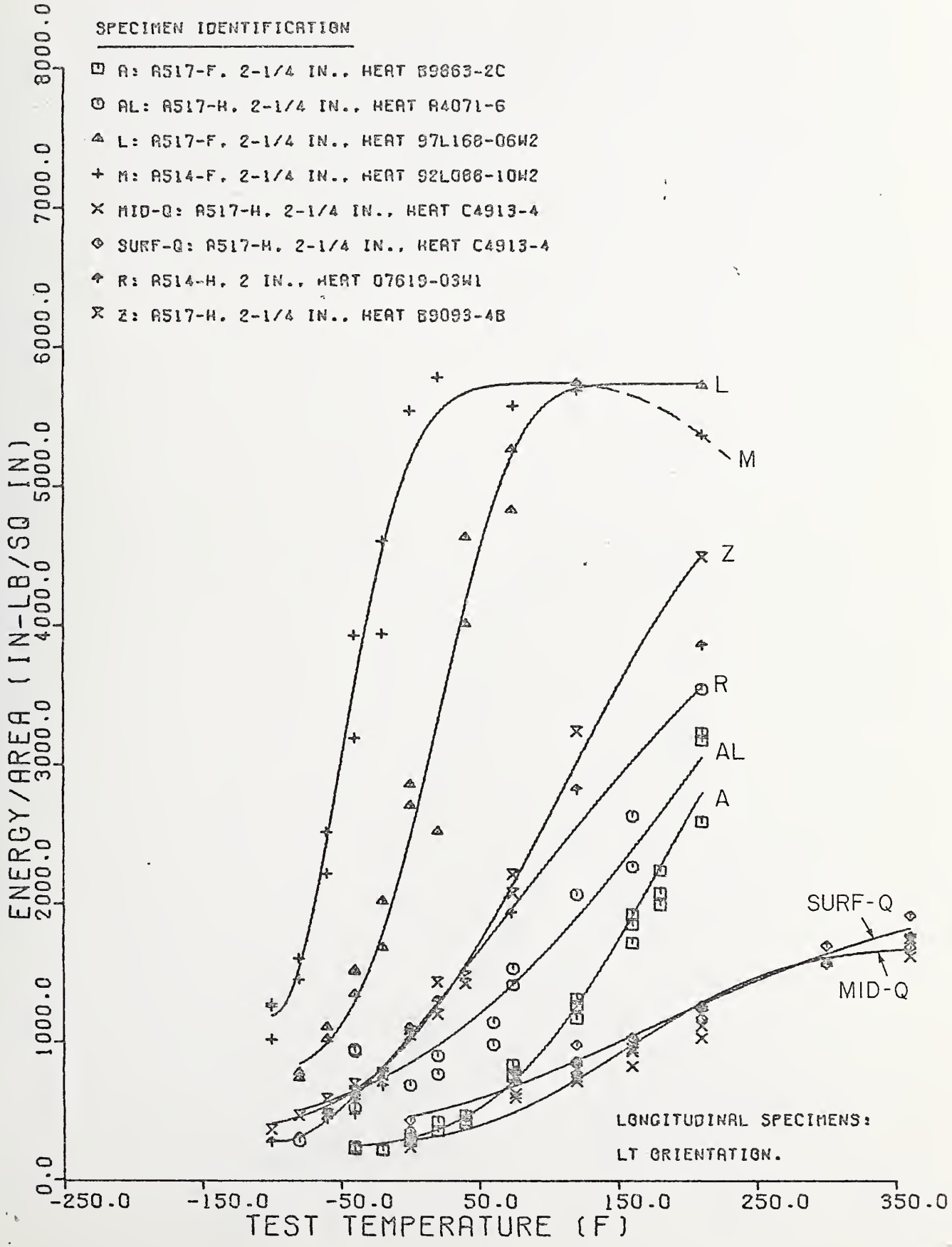

Figure 8C

PRECRACKED CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

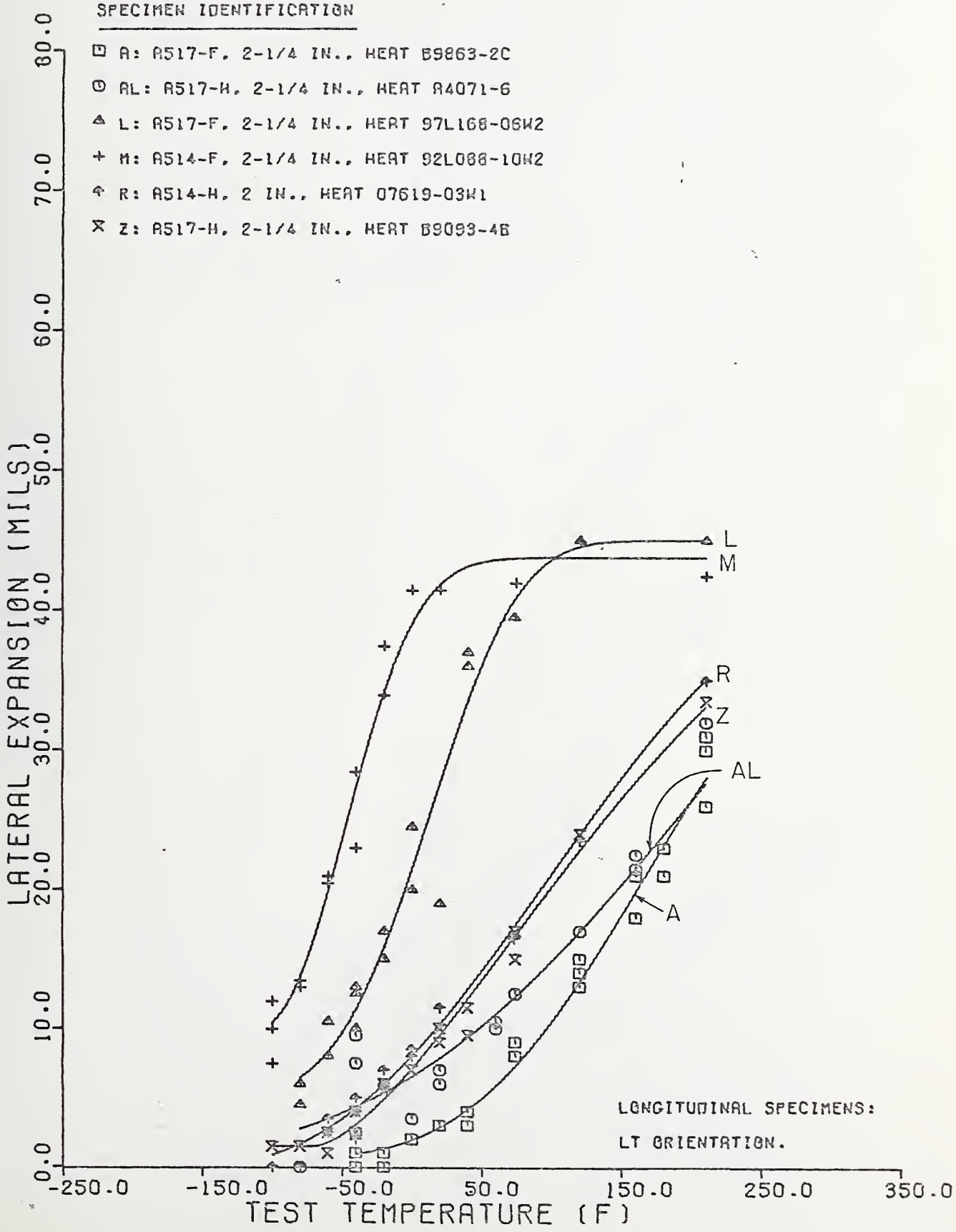

Figure 9A
CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

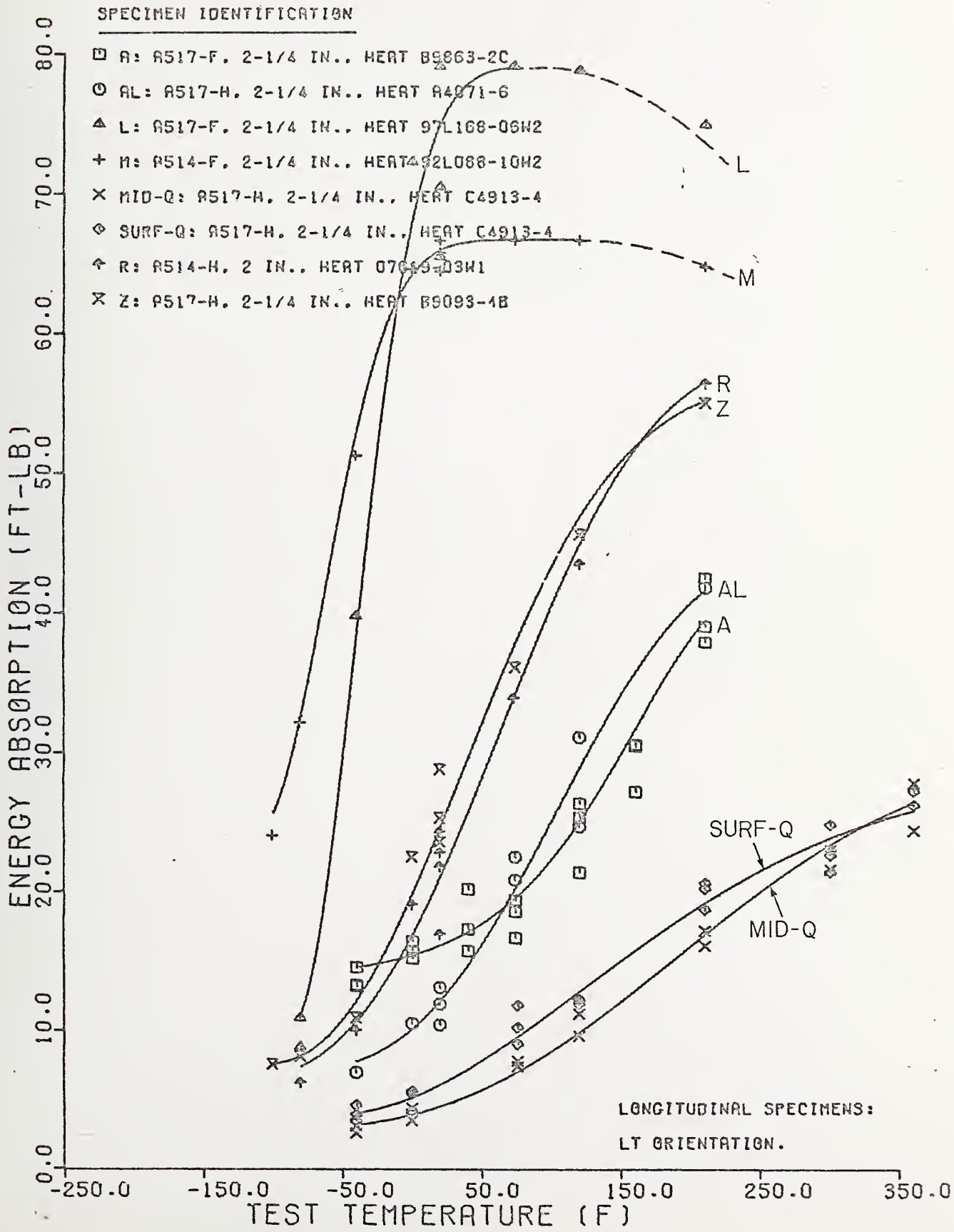

Figure 9B
CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

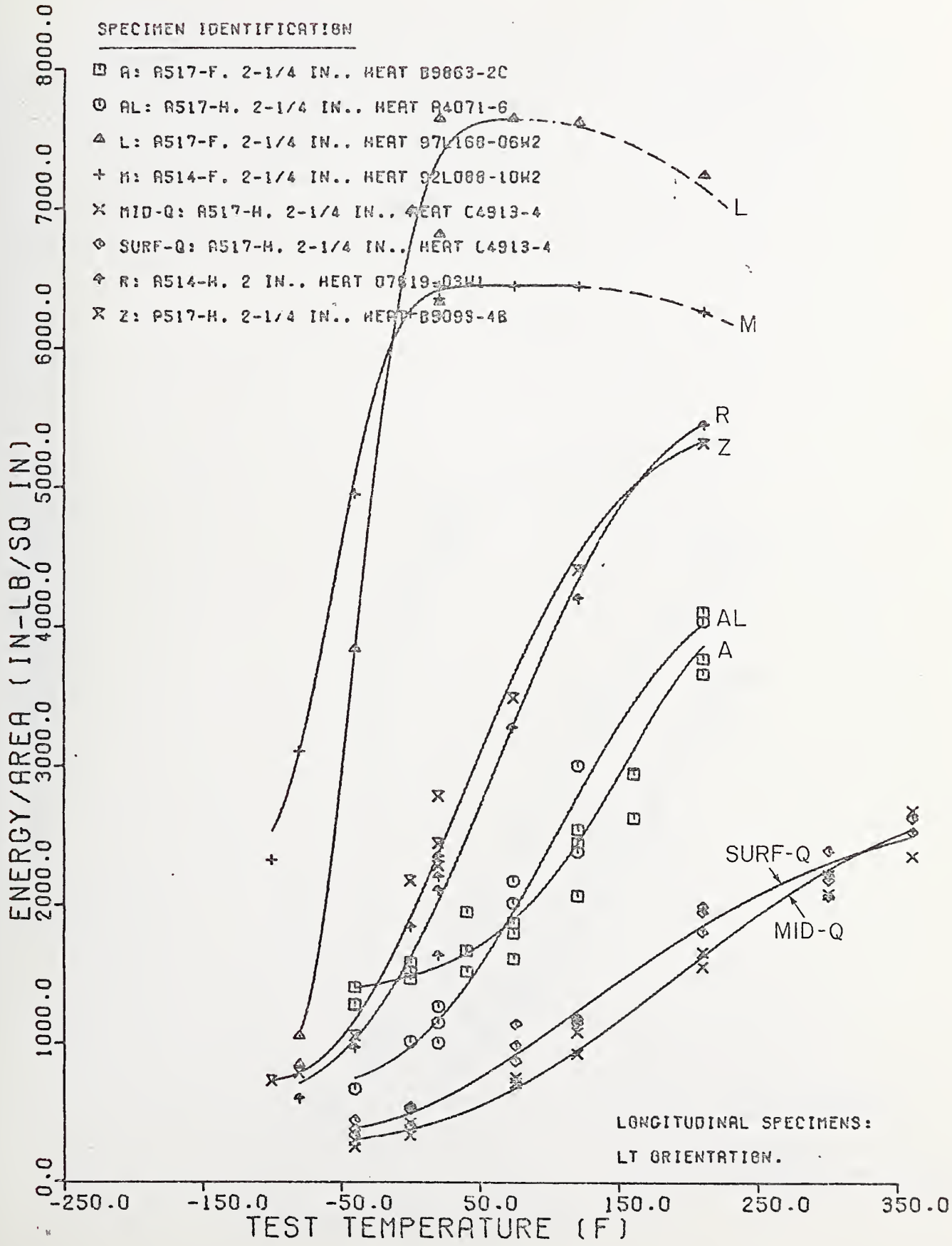

Figure 9C

CHARPY IMPACT TEST RESULTS FOR ASTM A514/517 STEELS.

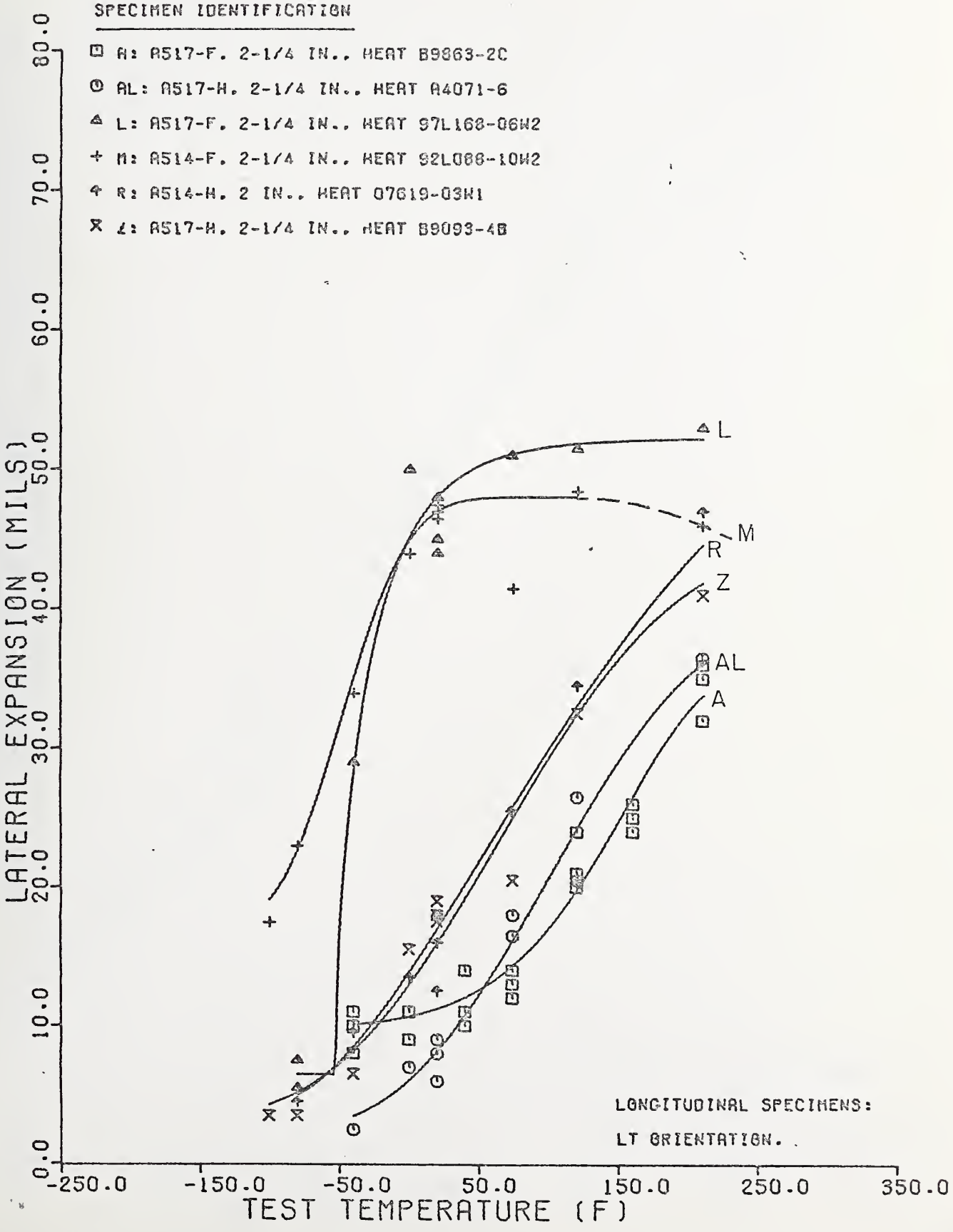

Figure 10A

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK. HEAT C4913-4 OF A517-H STEEL.

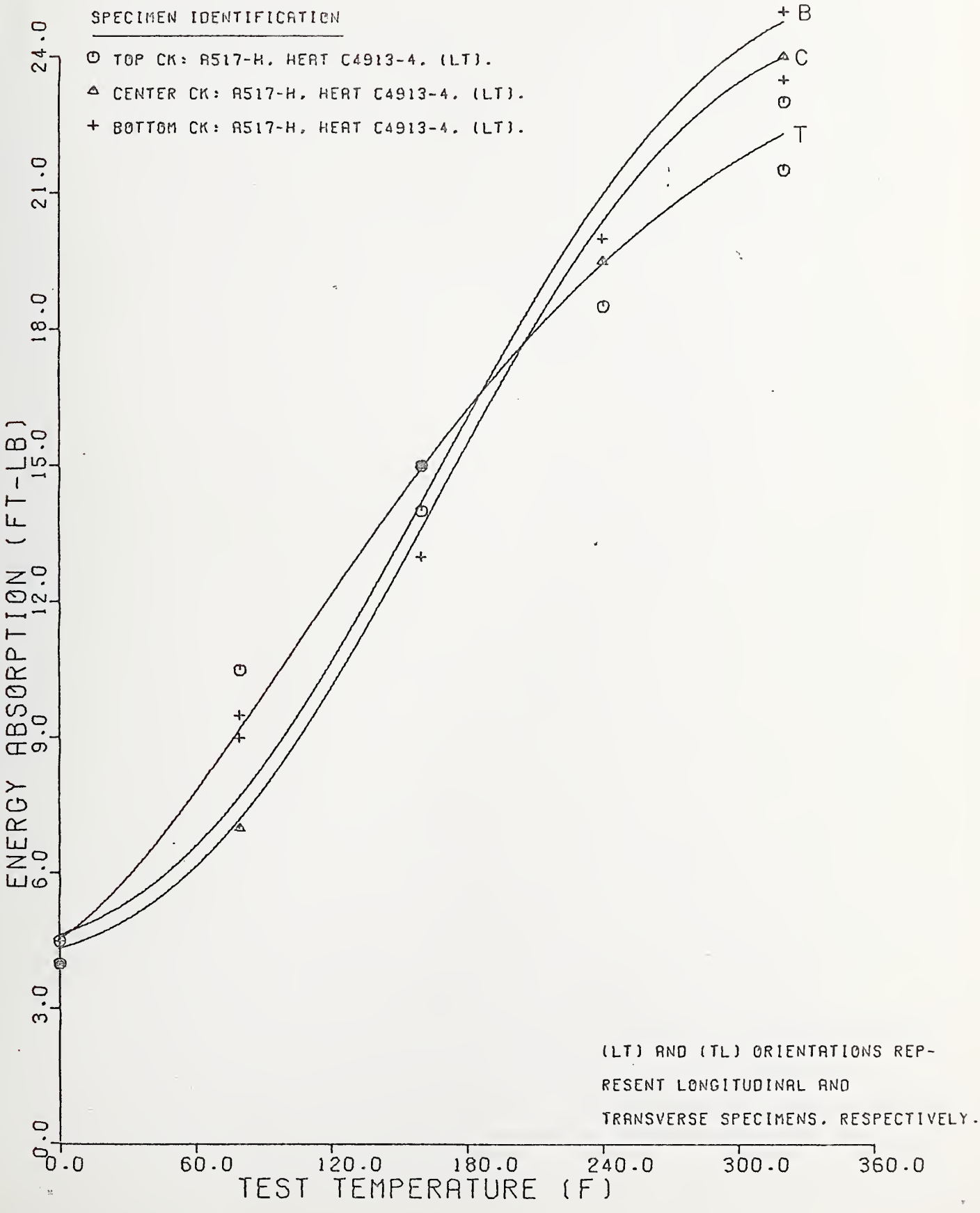

Figure 10B

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

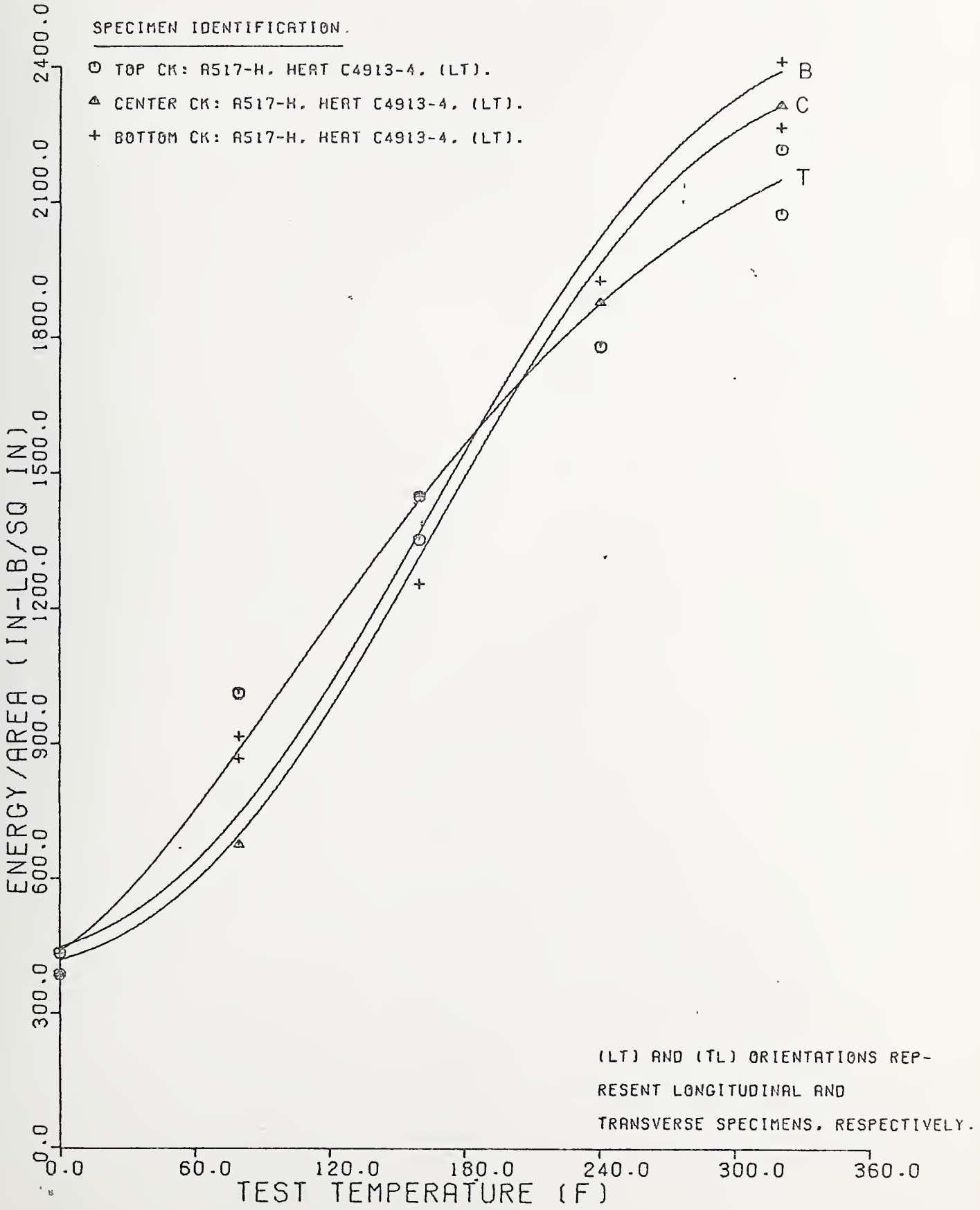

Figure 10C

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

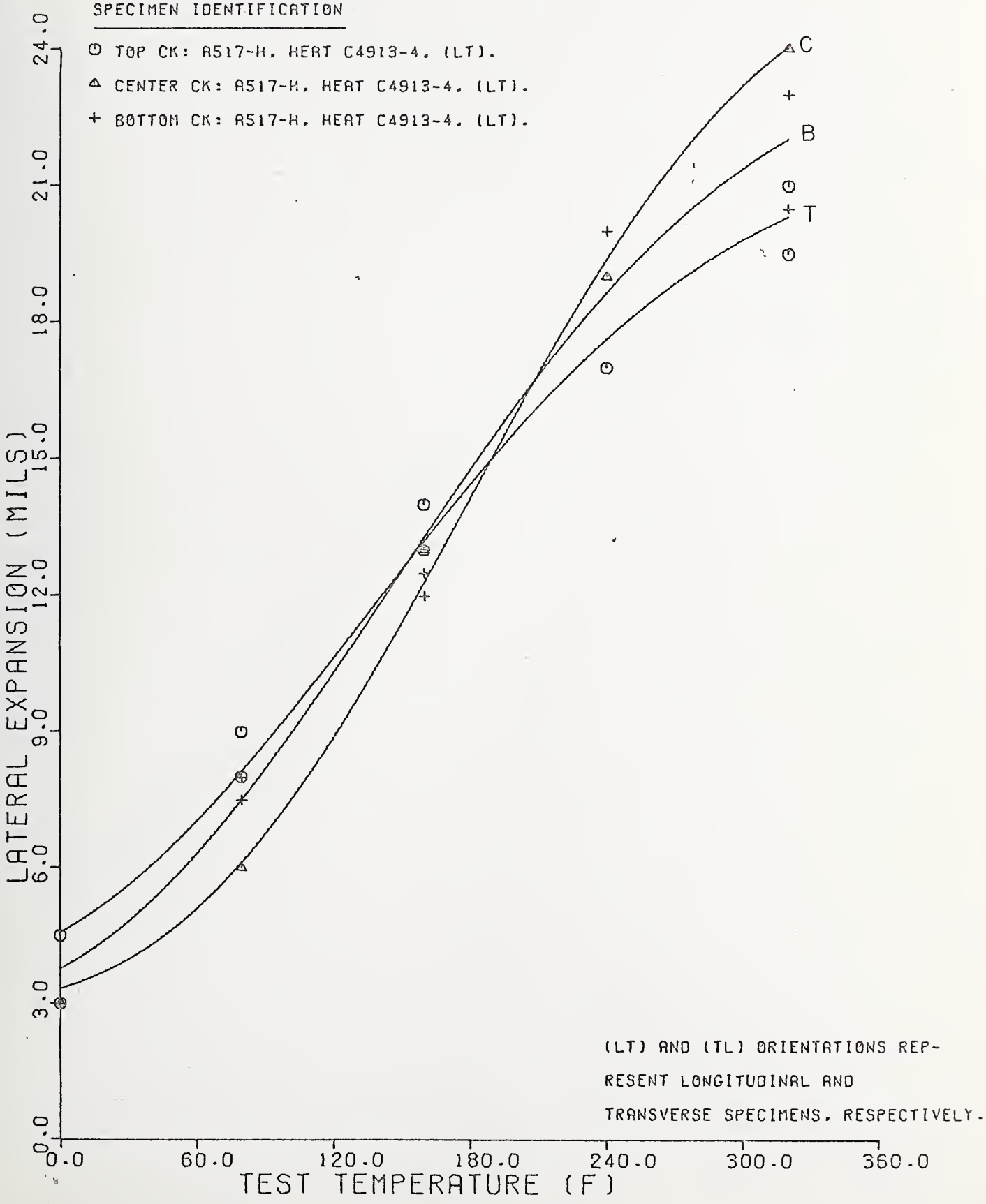

Figure 11A

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

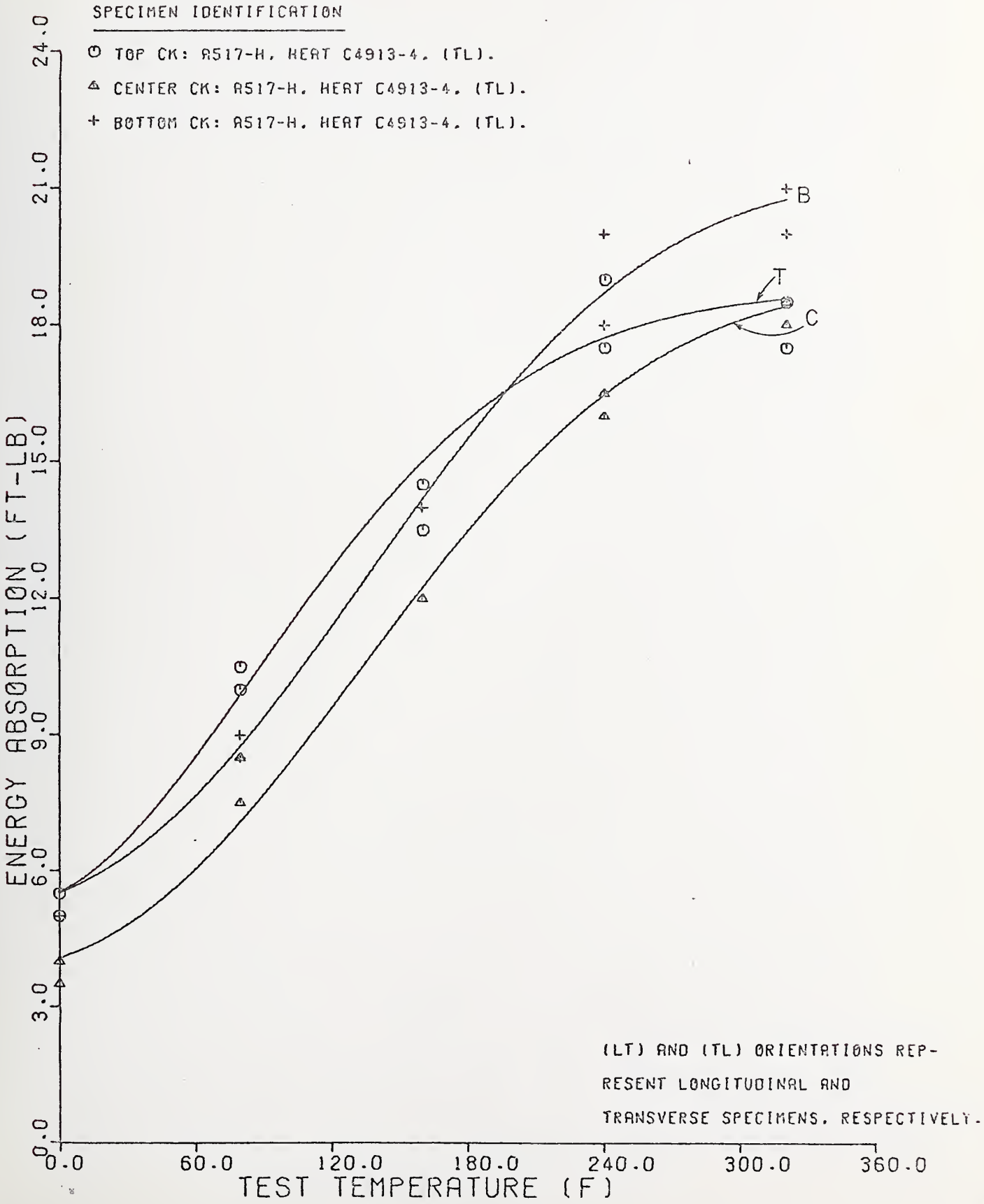

Figure 11B

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK. HEAT C4913-4 OF A517-H STEEL.

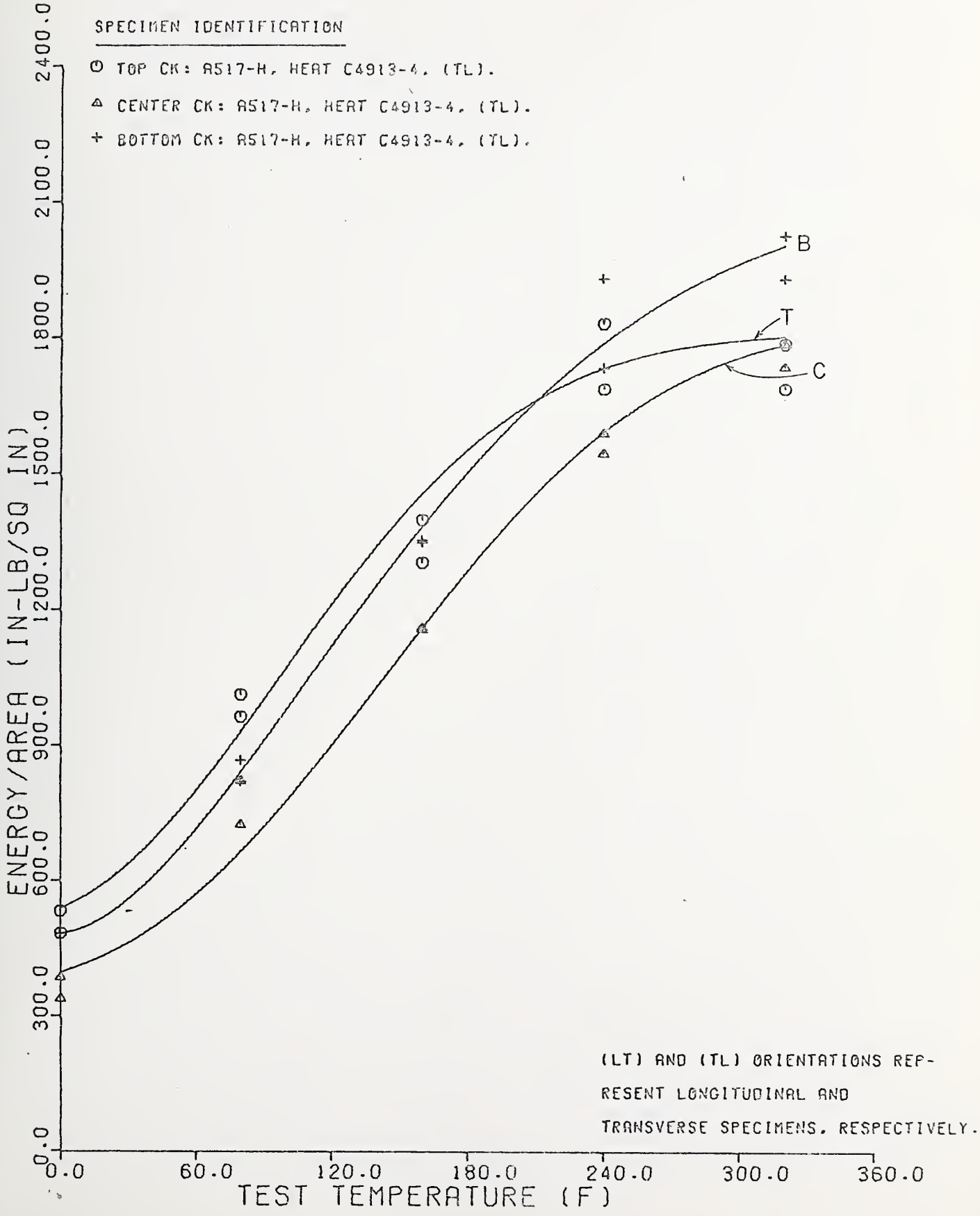

Figure 11C

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

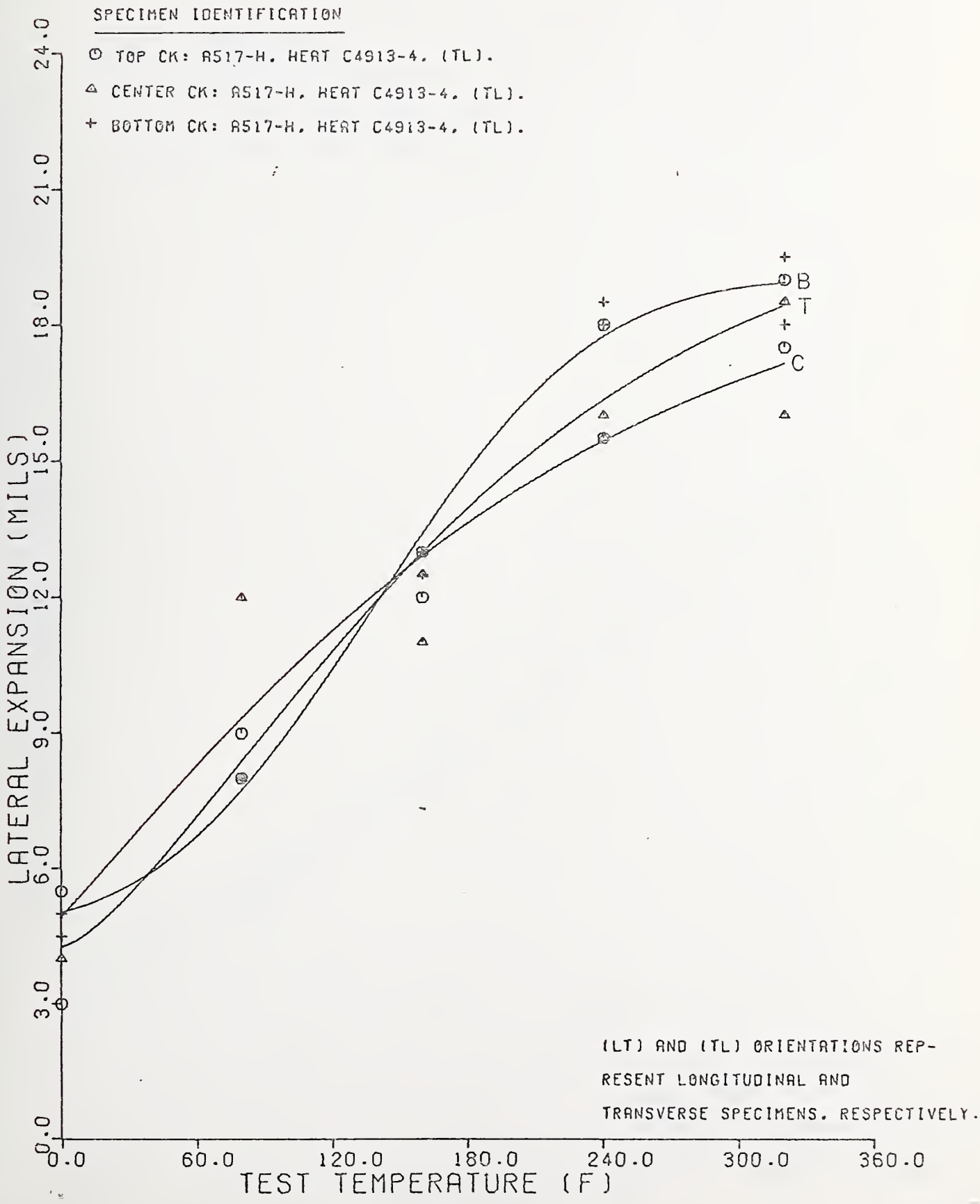

Figure 12A

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

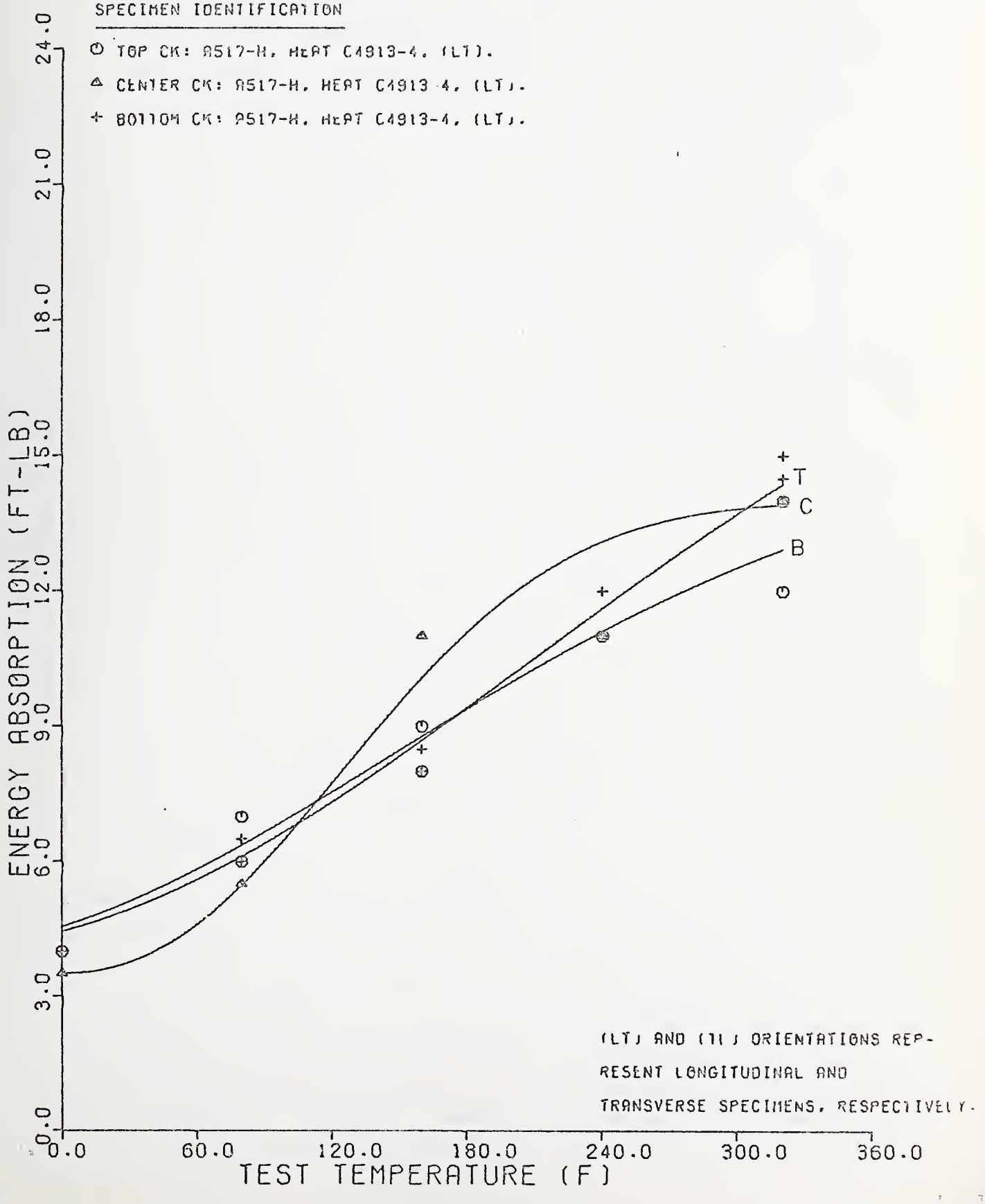

Figure 12B

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.

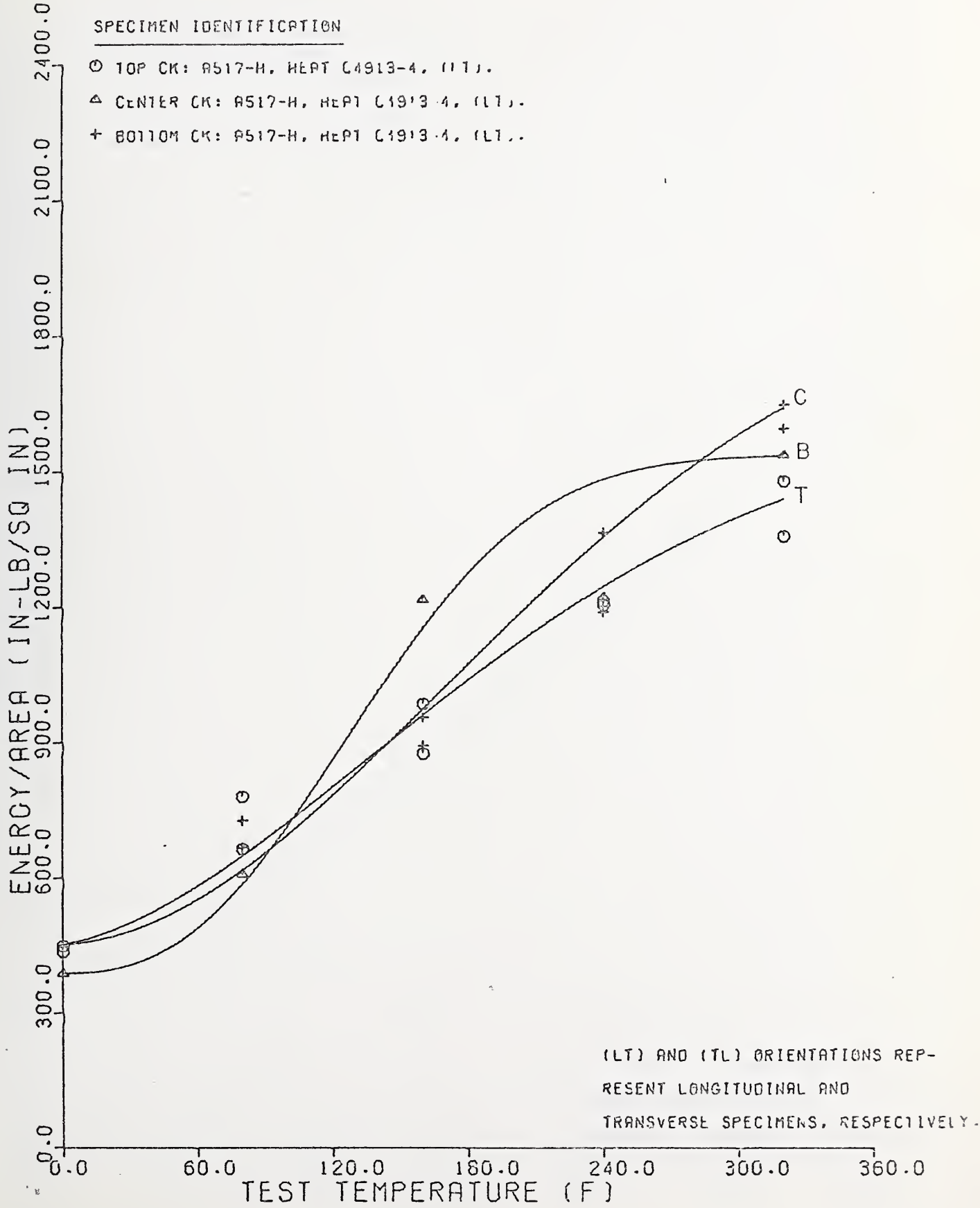

Figure 12C

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913 4 OF A517-H STEEL.

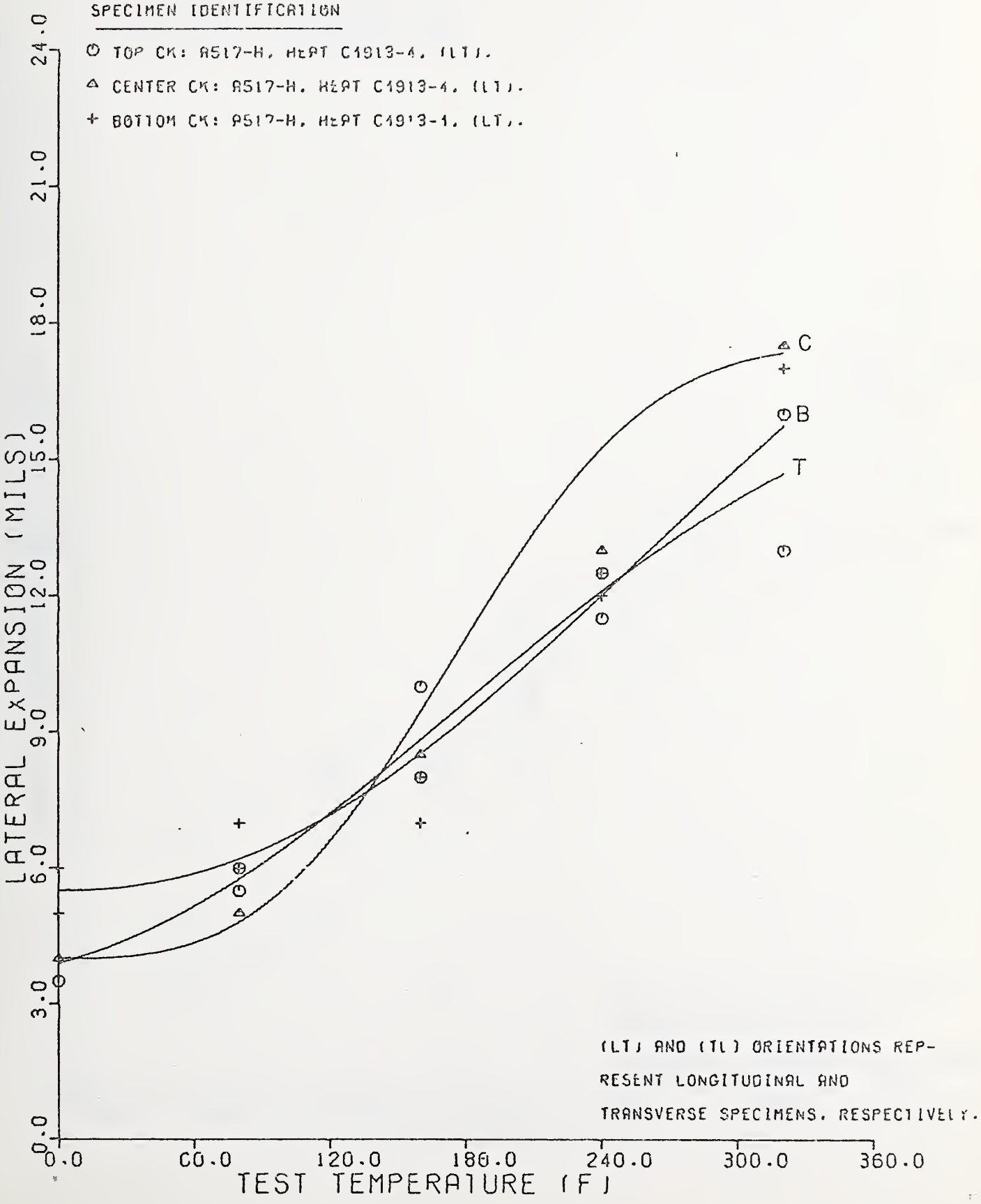

Figure 13A

RESULTS OF TESTS OF PCI
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

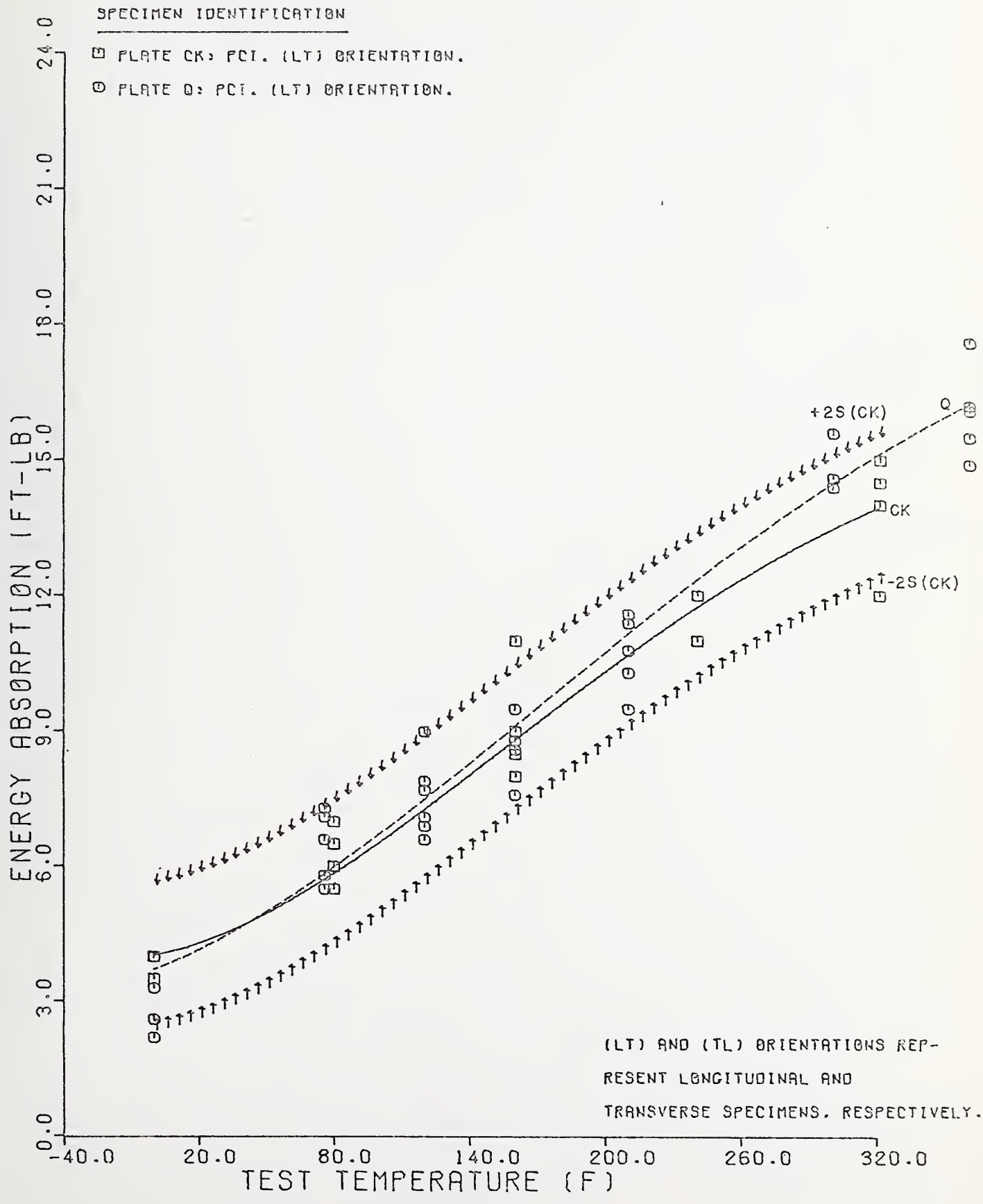

Figure 13B

RESULTS OF TESTS OF PCI
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

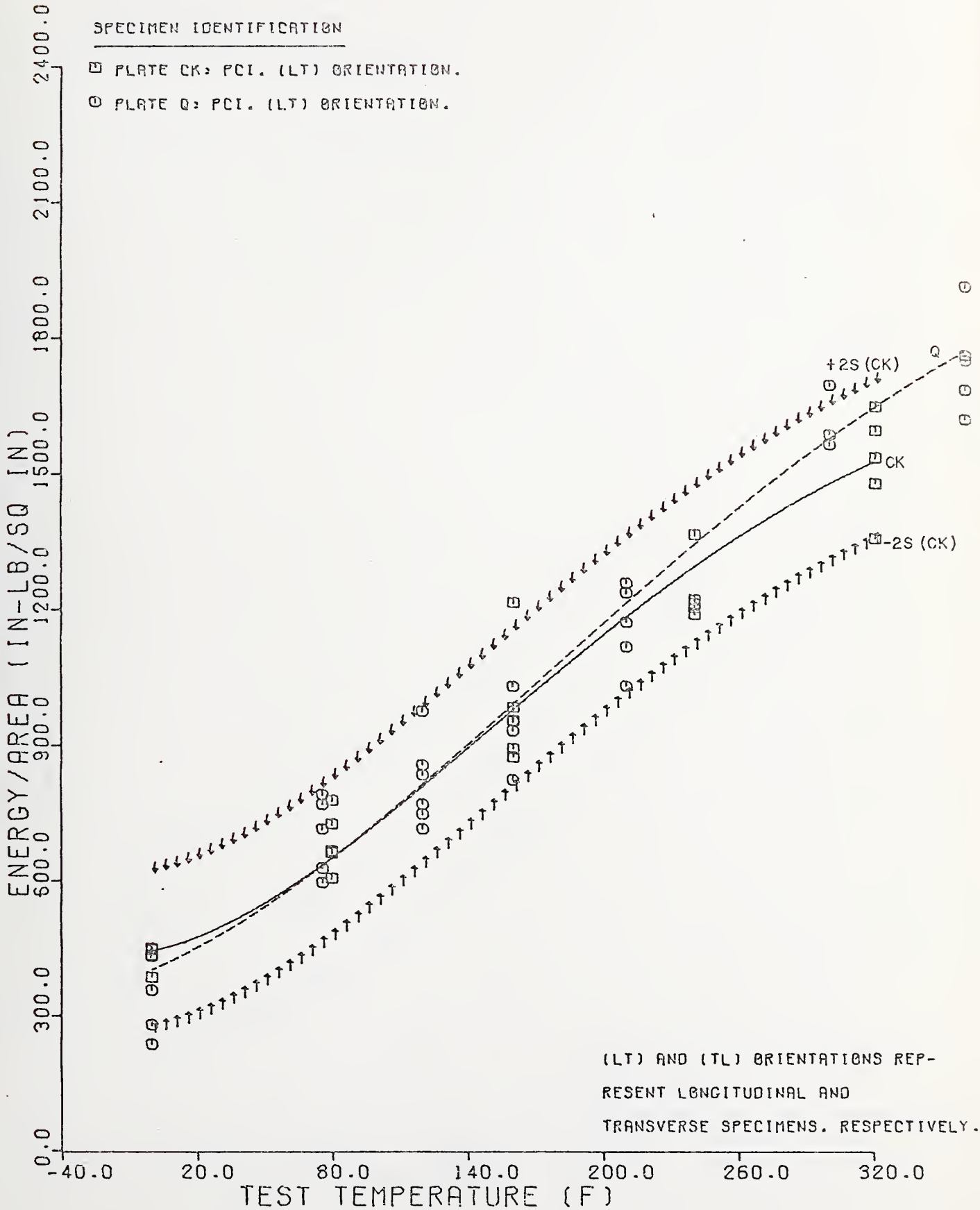

Figure 13C

RESULTS OF TESTS OF PCI
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

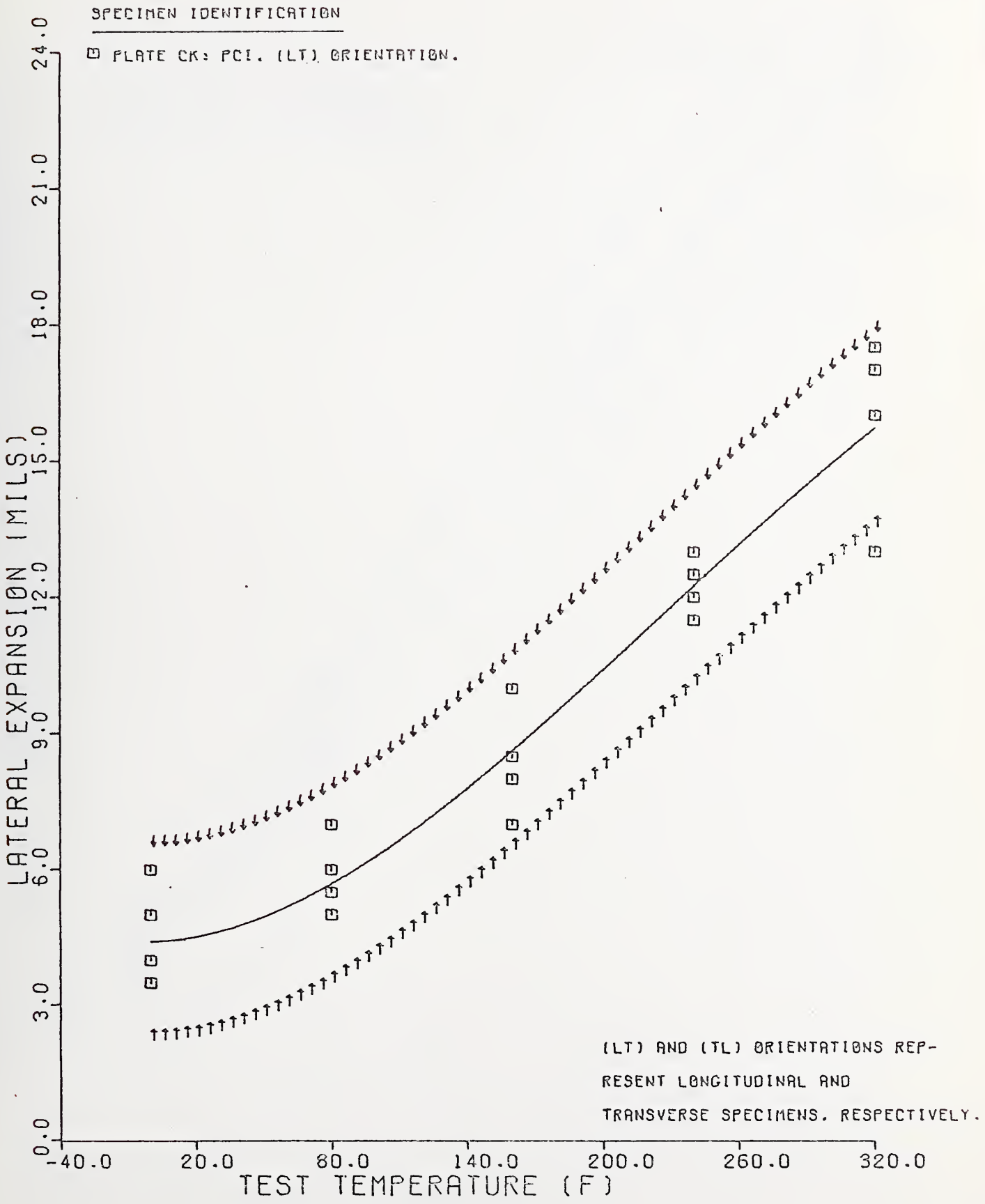

Figure 14A

RESULTS OF TESTS OF CVN
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

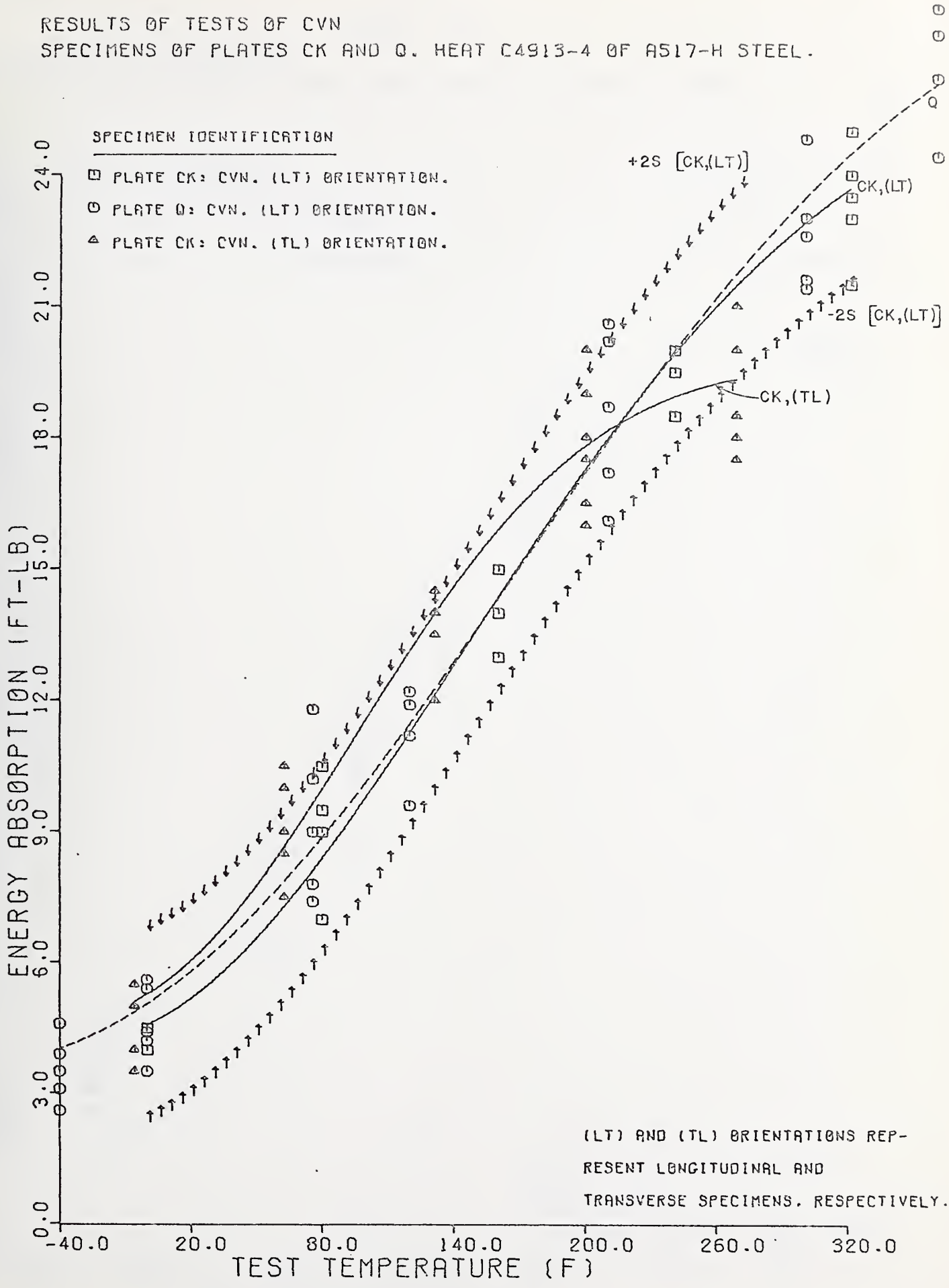

Figure 14B

RESULTS OF TESTS OF CVN
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

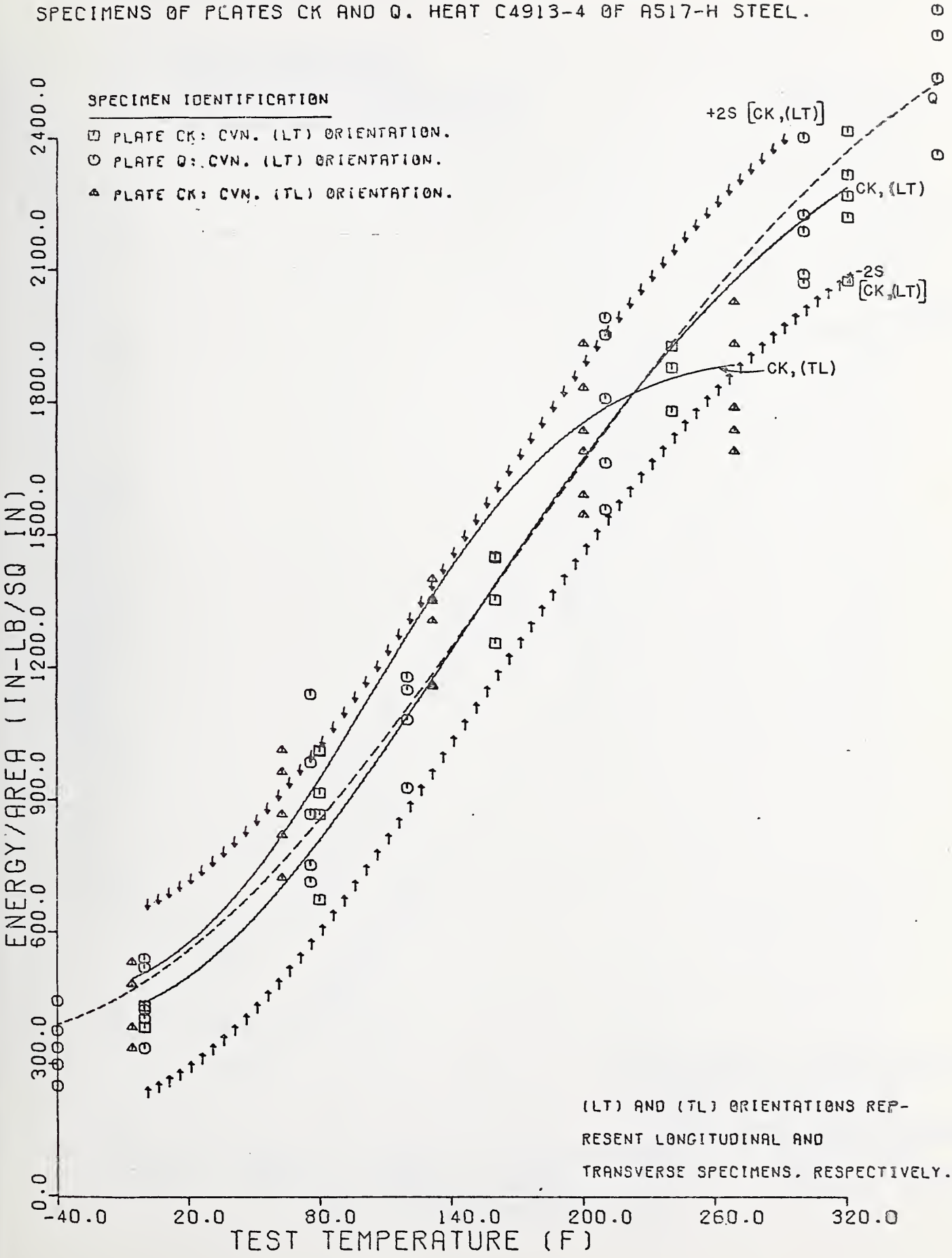

Figure 14C

RESULTS OF TESTS OF CVN
SPECIMENS OF PLATES CK AND Q. HEAT C4913-4 OF A517-H STEEL.

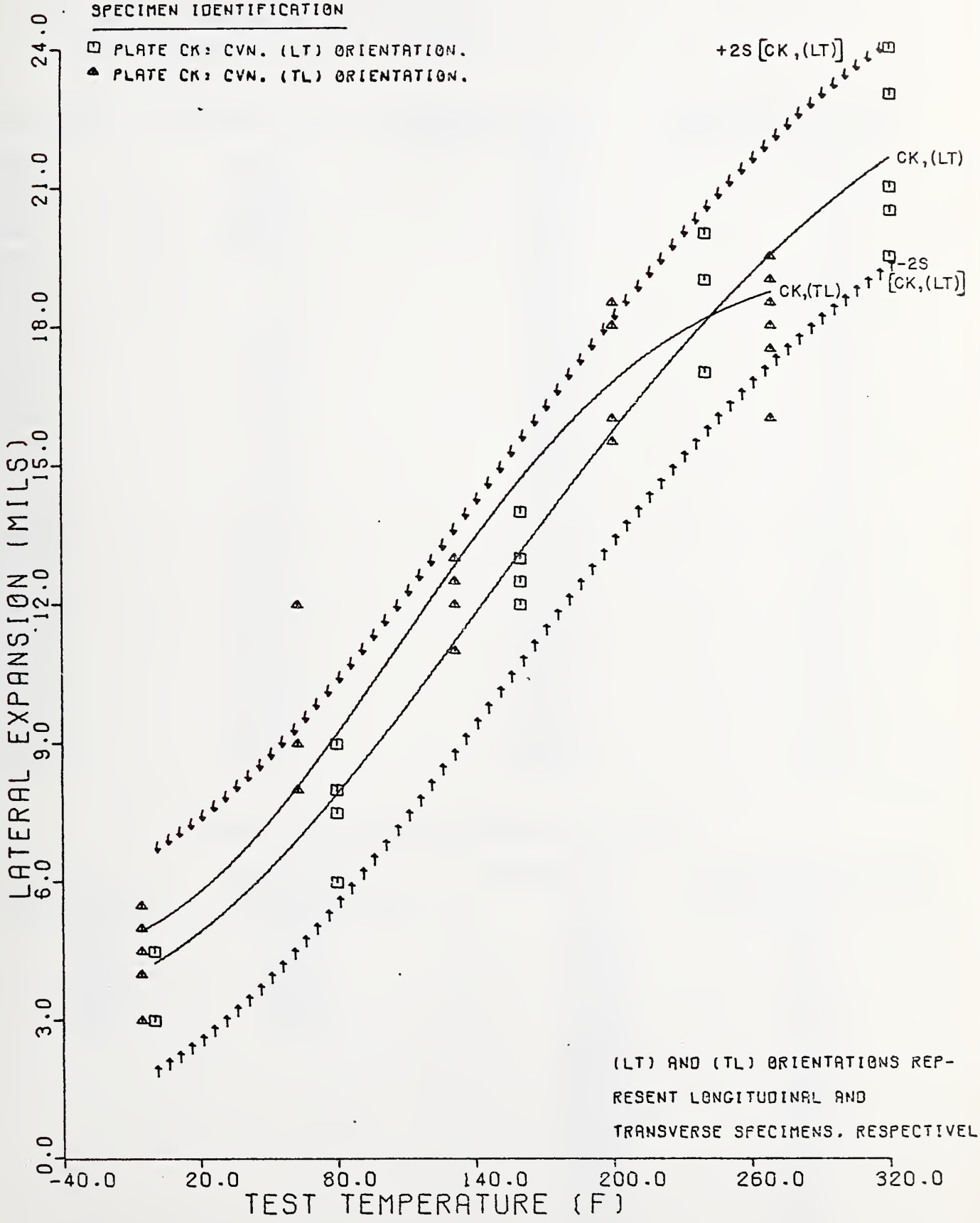

Table 1A

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
5A1	-40.0	2.06	2.2
5A2	-40.0	2.10	2.2
5A3	-40.0	2.26	2.2
A-1	-20.0	2.01	2.4
A-2	-20.0	2.05	2.4
A-3	.0	2.80	2.8
A-4	.0	2.59	2.8
A-5	20.0	3.28	3.4
A-6	20.0	3.90	3.4
5A7	40.0	3.76	4.2
5A8	40.0	3.98	4.2
5A9	40.0	4.32	4.2
5A10	74.0	7.69	6.5
5A11	74.0	6.87	6.5
5A12	74.0	7.01	6.5
5A13	120.0	10.75	11.6
5A14	120.0	11.60	11.6
5A15	120.0	12.09	11.6
5A16	160.0	15.30	17.6
5A17	160.0	17.00	17.6
5A18	160.0	17.70	17.6
5A4	180.0	20.60	20.9
5A5	180.0	18.30	20.9
5A6	180.0	19.10	20.9
5A19	210.0	23.80	25.7
5A20	210.0	29.20	25.7
5A21	210.0	29.70	25.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	53.4	/	60.0	5.4
10.0	107.3	/	65.0	5.8
15.0	143.4	/	70.0	6.2
20.0	174.7	/	75.0	6.6
25.0	205.5	/	80.0	7.1
		/	85.0	7.6
		/	90.0	8.1
		/	95.0	8.6
		/	100.0	9.1
		/	105.0	9.7
		/	110.0	10.3
		/	115.0	11.0
		/	120.0	11.6
		/	125.0	12.3
		/	130.0	13.0

Table 1B

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
5A1	-40.0	224.08	244.5
5A2	-40.0	228.43	244.5
5A3	-40.0	245.93	244.5
A-1	-20.0	218.64	264.5
A-2	-20.0	222.99	264.5
A-3	.0	304.57	302.3
A-4	.0	281.73	302.3
A-5	20.0	356.78	364.7
A-6	20.0	424.22	364.7
5A7	40.0	408.99	459.3
5A8	40.0	432.92	459.3
5A9	40.0	469.91	459.3
5A10	74.0	836.48	712.1
5A11	74.0	747.28	712.1
5A12	74.0	762.51	712.1
5A13	120.0	1169.33	1264.6
5A14	120.0	1261.78	1264.6
5A15	120.0	1315.08	1264.6
5A16	160.0	1718.64	1915.1
5A17	160.0	1849.17	1915.1
5A18	160.0	1925.31	1915.1
5A4	180.0	2240.75	2271.0
5A5	180.0	1990.57	2271.0
5A6	180.0	2077.59	2271.0
5A19	210.0	2588.83	2795.9
5A20	210.0	3176.21	2795.9
5A21	210.0	3230.60	2795.9

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
245.0	-39.3	/	-30.0	252.7
405.0	29.5	/	-20.0	264.5
565.0	56.3	/	-10.0	280.8
720.0	74.8	/	.0	302.3
880.0	90.3	/	10.0	329.9
1040.0	103.6	/	20.0	364.7
1200.0	115.5	/	30.0	407.6
1360.0	126.4	/	40.0	459.3
1520.0	136.6	/	50.0	520.8
1680.0	146.3	/	60.0	592.7
1840.0	155.7	/	70.0	675.7
2000.0	164.8	/	80.0	770.3
2160.0	173.8	/	90.0	876.5
2320.0	182.7	/	100.0	994.5
2480.0	191.7	/	110.0	1124.1

Table 1C

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
5A1	-40.0	1.00	.9
5A2	-40.0	.00	.9
5A3	-40.0	1.00	.9
A-1	-20.0	1.00	1.3
A-2	-20.0	.00	1.3
A-3	.0	2.00	1.9
A-4	.0	2.00	1.9
A-5	20.0	3.00	2.9
A-6	20.0	3.00	2.9
5A7	40.0	3.00	4.2
5A8	40.0	4.00	4.2
5A9	40.0	4.00	4.2
5A10	74.0	8.00	7.3
5A11	74.0	9.00	7.3
5A12	74.0	8.00	7.3
5A13	120.0	13.00	13.4
5A14	120.0	15.00	13.4
5A15	120.0	14.00	13.4
5A16	160.0	18.00	19.9
5A17	160.0	18.00	19.9
5A18	160.0	21.00	19.9
5A4	180.0	23.00	23.2
5A5	180.0	23.00	23.2
5A6	180.0	21.00	23.2
5A19	210.0	26.00	28.0
5A20	210.0	31.00	28.0
5A21	210.0	30.00	28.0

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	50.5	/	60.0	5.9
10.0	96.1	/	65.0	6.4
15.0	130.3	/	70.0	6.9
20.0	160.7	/	75.0	7.4
25.0	190.7	/	80.0	8.0
		/	85.0	8.6
		/	90.0	9.2
		/	95.0	9.9
		/	100.0	10.5
		/	105.0	11.2
		/	110.0	11.9
		/	115.0	12.7
		/	120.0	13.4
		/	125.0	14.2
		/	130.0	14.9

Table 2A

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
6A1	-40.0	13.20	14.5
6A2	-40.0	14.55	14.5
6A3	-40.0	13.28	14.5
6A4	.0	15.20	15.4
6A5	.0	15.73	15.4
6A6	.0	16.42	15.4
6A7	40.0	17.29	17.1
6A8	40.0	20.19	17.1
6A9	40.0	15.73	17.1
6A10	74.0	19.40	19.5
6A11	74.0	18.58	19.5
6A12	74.0	16.68	19.5
6A13	120.0	21.40	25.0
6A14	120.0	25.36	25.0
6A15	120.0	26.35	25.0
6A16	160.0	30.57	31.7
6A17	160.0	30.48	31.7
6A18	160.0	27.19	31.7
6A19	210.0	37.93	39.4
6A20	210.0	39.06	39.4
6A21	210.0	42.53	39.4

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
15.0	-14.4	/	-10.0	15.1
20.0	79.0	/	-5.0	15.2
25.0	119.8	/	.0	15.4
30.0	150.3	/	5.0	15.5
35.0	179.0	/	10.0	15.7
		/	15.0	15.9
		/	20.0	16.1
		/	25.0	16.3
		/	30.0	16.5
		/	35.0	16.8
		/	40.0	17.1
		/	45.0	17.4
		/	50.0	17.7
		/	55.0	18.0
		/	60.0	18.4
		/	65.0	18.8
		/	70.0	19.2
		/	75.0	19.6
		/	80.0	20.1
		/	85.0	20.6

Table 2B

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
6A1	-40.0	1276.29	1400.0
6A2	-40.0	1406.82	1400.0
6A3	-40.0	1284.02	1400.0
6A4	.0	1469.66	1484.3
6A5	.0	1520.91	1484.3
6A6	.0	1587.62	1484.3
6A7	40.0	1671.74	1649.6
6A8	40.0	1952.14	1649.6
6A9	40.0	1520.91	1649.6
6A10	74.0	1875.76	1896.3
6A11	74.0	1796.47	1896.3
6A12	74.0	1612.76	1896.3
6A13	120.0	2069.13	2452.1
6A14	120.0	2452.02	2452.1
6A15	120.0	2547.74	2452.1
6A16	160.0	2955.76	3122.7
6A17	160.0	2947.06	3122.7
6A18	160.0	2628.96	3122.7
6A19	210.0	3667.39	3862.6
6A20	210.0	3776.65	3862.6
6A21	210.0	4112.16	3862.6

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
1555.0	20.3	/	30.0	1597.8
1715.0	50.8	/	35.0	1622.7
1875.0	71.6	/	40.0	1649.6
2030.0	87.4	/	45.0	1678.7
2190.0	101.1	/	50.0	1710.0
2350.0	113.0	/	55.0	1743.7
2510.0	123.8	/	60.0	1780.0
2670.0	133.8	/	65.0	1819.0
2830.0	143.3	/	70.0	1860.8
2990.0	152.5	/	75.0	1905.5
3150.0	161.6	/	80.0	1953.3
3310.0	170.8	/	85.0	2004.2
3470.0	180.5	/	90.0	2058.3
3630.0	191.0	/	95.0	2115.7
3790.0	203.3	/	100.0	2176.4
		/	105.0	2240.4
		/	110.0	2307.8
		/	115.0	2378.4
		/	120.0	2452.1
		/	125.0	2528.8

Table 2C

IMPACT TEST RESULTS FOR PLATE A.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
A: A517-F, 2-1/4 IN., HEAT B9863-2C.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
6A1	-40.0	10.00	10.0
6A2	-40.0	11.00	10.0
6A3	-40.0	8.00	10.0
6A4	.0	9.00	10.6
6A5	.0	11.00	10.6
6A6	.0	11.00	10.6
6A7	40.0	11.00	12.0
6A8	40.0	14.00	12.0
6A9	40.0	10.00	12.0
6A10	74.0	13.00	14.3
6A11	74.0	14.00	14.3
6A12	74.0	12.00	14.3
6A13	120.0	21.00	19.8
6A14	120.0	20.00	19.8
6A15	120.0	24.00	19.8
6A16	160.0	26.00	26.6
6A17	160.0	25.00	26.6
6A18	160.0	24.00	26.6
6A19	210.0	32.00	33.8
6A20	210.0	35.00	33.8
6A21	210.0	36.00	33.8

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
15.0	81.3	/	90.0	15.9
20.0	121.1	/	95.0	16.5
25.0	151.0	/	100.0	17.1
30.0	180.3	/	105.0	17.7
		/	110.0	18.4
		/	115.0	19.1
		/	120.0	19.8
		/	125.0	20.6
		/	130.0	21.4
		/	135.0	22.2
		/	140.0	23.1
		/	145.0	24.0
		/	150.0	24.8
		/	155.0	25.7
		/	160.0	26.6
		/	165.0	27.5
		/	170.0	28.3
		/	175.0	29.1
		/	180.0	30.0
		/	185.0	30.7

Table 3A

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
5AL1	-80.0	2.61	4.6
5AL2	-40.0	4.82	5.9
AL-2	-40.0	8.60	5.9
AL-3	-40.0	8.72	5.9
5AL9	.0	6.33	7.8
5AL3	20.0	8.30	9.0
AL-1	20.0	7.05	9.0
AL-4	60.0	9.04	11.8
AL-5	60.0	10.50	11.8
5AL4	74.0	13.00	13.0
5AL8	74.0	14.10	13.0
5AL5	120.0	19.00	17.5
5AL7	160.0	24.20	22.0
AL-6	160.0	20.85	22.0
5AL6	210.0	32.60	28.0

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	-66.6	/	-60.0	5.2
10.0	35.5	/	-50.0	5.6
15.0	95.6	/	-40.0	5.9
20.0	143.0	/	-30.0	6.3
25.0	185.2	/	-20.0	6.8
		/	-10.0	7.3
		/	.0	7.8
		/	10.0	8.4
		/	20.0	9.0
		/	30.0	9.6
		/	40.0	10.3
		/	50.0	11.1
		/	60.0	11.8
		/	70.0	12.7
		/	80.0	13.6
		/	90.0	14.5
		/	100.0	15.4
		/	110.0	16.4
		/	120.0	17.5
		/	130.0	18.5

Table 3B

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
5AL1	-80.0	283.90	502.0
5AL2	-40.0	524.29	645.0
AL-2	-40.0	935.46	645.0
AL-3	-40.0	948.51	645.0
5AL9	.0	688.54	849.3
5AL3	20.0	902.83	976.1
AL-1	20.0	766.86	976.1
AL-4	60.0	983.32	1288.6
AL-5	60.0	1142.13	1288.6
5AL4	74.0	1414.07	1416.3
5AL8	74.0	1533.72	1416.3
5AL5	120.0	2066.71	1900.3
5AL7	160.0	2632.34	2389.3
AL-6	160.0	2267.95	2389.3
5AL6	210.0	3546.05	3049.9

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
505.0	-79.0	/	-70.0	532.8
665.0	-35.4	/	-60.0	566.7
825.0	-4.0	/	-50.0	604.0
980.0	20.6	/	-40.0	645.0
1140.0	42.2	/	-30.0	689.7
1300.0	61.3	/	-20.0	738.4
1460.0	78.6	/	-10.0	791.2
1620.0	94.5	/	.0	848.3
1780.0	109.4	/	10.0	909.9
1940.0	123.4	/	20.0	976.1
2100.0	136.9	/	30.0	1047.0
2260.0	149.8	/	40.0	1122.7
2420.0	162.4	/	50.0	1203.2
2580.0	174.7	/	60.0	1288.6
2740.0	186.8	/	70.0	1378.8
2900.0	198.8	/	80.0	1473.9
		/	90.0	1573.8
		/	100.0	1678.3
		/	110.0	1787.2
		/	120.0	1900.3

Table 3C

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHAPPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
5AL1	-80.0	.00	2.7
5AL2	-40.0	2.50	4.3
AL-2	-40.0	9.50	4.3
AL-3	-40.0	7.50	4.3
5AL9	.0	3.50	6.5
5AL3	20.0	7.00	7.8
AL-1	20.0	6.00	7.8
AL-4	60.0	10.00	11.0
AL-5	60.0	10.50	11.0
5AL4	74.0	12.50	12.3
5AL8	74.0	12.50	12.3
5AL5	120.0	17.00	17.0
5AL7	160.0	22.50	21.5
AL-6	160.0	21.50	21.5
5AL6	210.0	32.00	27.6

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-26.2	/	-20.0	5.3
10.0	48.2	/	-10.0	5.9
15.0	101.7	/	.0	6.5
20.0	146.9	/	10.0	7.1
25.0	188.5	/	20.0	7.8
		/	30.0	8.6
		/	40.0	9.3
		/	50.0	10.1
		/	60.0	11.0
		/	70.0	11.9
		/	80.0	12.8
		/	90.0	13.8
		/	100.0	14.8
		/	110.0	15.9
		/	120.0	17.0
		/	130.0	18.1
		/	140.0	19.2
		/	150.0	20.4
		/	160.0	21.5
		/	170.0	22.7

Table 4A

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
4AL1	-40.0	6.95	7.7
4AL2	.0	10.50	10.1
4AL3	20.0	11.90	12.1
4AL4	20.0	10.40	12.1
4AL5	20.0	13.10	12.1
4AL6	74.0	20.85	20.2
4AL10	74.0	22.50	20.2
4AL7	120.0	24.70	28.9
4AL9	120.0	31.10	28.9
4AL8	210.0	41.80	41.6

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	-.8	/	.0	10.1
15.0	42.2	/	5.0	10.5
20.0	72.7	/	10.0	11.0
25.0	99.6	/	15.0	11.5
30.0	126.1	/	20.0	12.1
35.0	155.2	/	25.0	12.7
40.0	192.9	/	30.0	13.3
		/	35.0	14.0
		/	40.0	14.7
		/	45.0	15.4
		/	50.0	16.2
		/	55.0	17.0
		/	60.0	17.8
		/	65.0	18.6
		/	70.0	19.5
		/	75.0	20.4
		/	80.0	21.3
		/	85.0	22.2
		/	90.0	23.2
		/	95.0	24.1

Table 4B

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
4AL1	-40.0	671.98	745.2
4AL2	.0	1015.23	973.6
4AL3	20.0	1150.59	1169.2
4AL4	20.0	1005.56	1168.2
4AL5	20.0	1266.62	1168.2
4AL6	74.0	2015.95	1955.7
4AL10	74.0	2175.49	1955.7
4AL7	120.0	2388.20	2791.9
4AL9	120.0	3007.01	2791.9
4AL8	210.0	4041.58	4023.8

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
905.0	-8.9	/	.0	973.6
1065.0	10.1	/	10.0	1063.8
1225.0	24.9	/	20.0	1168.2
1380.0	37.2	/	30.0	1286.7
1540.0	48.4	/	40.0	1418.8
1700.0	58.7	/	50.0	1563.8
1860.0	68.4	/	60.0	1720.3
2020.0	77.7	/	70.0	1886.8
2180.0	86.6	/	80.0	2061.2
2340.0	95.4	/	90.0	2241.4
2500.0	104.1	/	100.0	2425.0
2660.0	112.8	/	110.0	2609.3
2820.0	121.6	/	120.0	2791.9
2980.0	130.6	/	130.0	2970.1
3140.0	139.9	/	140.0	3141.6
3300.0	149.7	/	150.0	3304.3
3460.0	160.2	/	160.0	3456.4
3620.0	171.8	/	170.0	3596.5
3780.0	184.8	/	180.0	3723.7
3940.0	200.3	/	190.0	3837.3

Table 4C

IMPACT TEST RESULTS FOR PLATE AL.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
AL: A517-H, 2-1/4 IN., HEAT A4071-6.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
4AL1	-40.0	2.50	3.4
4AL2	.0	7.00	6.0
4AL3	20.0	8.00	8.1
4AL4	20.0	6.00	8.1
4AL5	20.0	9.00	8.1
4AL6	74.0	16.50	16.1
4AL10	74.0	18.00	16.1
4AL7	120.0	20.50	24.2
4AL9	120.0	26.50	24.2
4AL8	210.0	36.50	36.1

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-12.7	/	-10.0	5.2
10.0	34.6	/	.0	6.0
15.0	67.3	/	10.0	7.0
20.0	96.1	/	20.0	8.1
25.0	124.6	/	30.0	9.4
30.0	156.0	/	40.0	10.7
35.0	197.3	/	50.0	12.2
		/	60.0	13.8
		/	70.0	15.4
		/	80.0	17.2
		/	90.0	18.9
		/	100.0	20.7
		/	110.0	22.5
		/	120.0	24.2
		/	130.0	25.9
		/	140.0	27.6
		/	150.0	29.1
		/	160.0	30.6
		/	170.0	31.9
		/	180.0	33.2

Table 5A

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
5L1	-80.0	7.20	7.6
5L10	-80.0	6.80	7.6
L-1	-60.0	10.20	9.1
L-2	-60.0	9.40	9.1
5L2	-40.0	12.40	12.0
L-3	-40.0	13.90	12.0
L-4	-40.0	14.00	12.0
L-5	-20.0	15.50	16.8
L-6	-20.0	18.60	16.8
5L7	.0	26.30	23.3
5L8	.0	24.90	23.3
5L3	20.0	23.20	30.8
L-7	40.0	36.90	38.3
L-8	40.0	42.60	38.3
5L4	73.0	44.40	47.4
5L9	73.0	48.40	47.4
5L5	120.0	52.80	52.2
5L6	210.0	52.60	52.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	-52.4	/	-50.0	10.3
15.0	-26.8	/	-45.0	11.1
20.0	-9.7	/	-40.0	12.0
25.0	4.6	/	-35.0	13.1
30.0	17.8	/	-30.0	14.2
35.0	31.0	/	-25.0	15.5
40.0	45.2	/	-20.0	16.8
45.0	62.2	/	-15.0	18.3
50.0	89.1	/	-10.0	19.9
		/	-5.0	21.6
		/	.0	23.3
		/	5.0	25.2
		/	10.0	27.0
		/	15.0	28.9
		/	20.0	30.8
		/	25.0	32.8
		/	30.0	34.6
		/	35.0	36.5
		/	40.0	38.3
		/	45.0	39.9

Table 5B

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
5L1	-80.0	783.18	839.7
5L10	-80.0	739.67	839.7
L-1	-60.0	1109.50	992.9
L-2	-60.0	1022.48	992.9
5L2	-40.0	1348.80	1294.6
L-3	-40.0	1511.97	1294.6
L-4	-40.0	1522.84	1294.6
L-5	-20.0	1686.00	1790.6
L-6	-20.0	2023.21	1790.6
5L7	.0	2860.77	2487.2
5L8	.0	2708.48	2487.2
5L3	20.0	2523.57	3323.5
L-7	40.0	4013.78	4171.4
L-8	40.0	4633.79	4171.4
5L4	73.0	4829.59	5219.3
5L9	73.0	5264.68	5219.3
5L5	120.0	5743.29	5700.8
5L6	210.0	5721.54	5732.4

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
1155.0	-47.9	/	-40.0	1294.6
1475.0	-31.7	/	-35.0	1399.2
1795.0	-19.9	/	-30.0	1516.6
2110.0	-10.2	/	-25.0	1647.1
2430.0	-1.5	/	-20.0	1790.6
2750.0	6.5	/	-15.0	1947.0
3070.0	14.1	/	-10.0	2115.8
3390.0	21.5	/	-5.0	2296.2
3710.0	28.9	/	.0	2487.2
4030.0	36.5	/	5.0	2687.2
4350.0	44.6	/	10.0	2894.6
4670.0	53.4	/	15.0	3107.5
4990.0	63.8	/	20.0	3323.5
5310.0	77.4	/	25.0	3540.5
5630.0	103.4	/	30.0	3755.7
		/	35.0	3966.9
		/	40.0	4171.4
		/	45.0	4367.0
		/	50.0	4551.7
		/	55.0	4723.5

Table 5C

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHAPPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
5L1	-80.0	6.00	6.5
5L10	-80.0	4.50	6.5
L-1	-60.0	10.50	8.3
L-2	-60.0	8.00	8.3
5L2	-40.0	10.00	11.4
L-3	-40.0	12.50	11.4
L-4	-40.0	13.00	11.4
L-5	-20.0	15.00	15.9
L-6	-20.0	17.00	15.9
5L7	.0	24.50	21.5
5L8	.0	20.00	21.5
5L3	20.0	19.00	27.7
L-7	40.0	36.00	33.6
L-8	40.0	37.00	33.6
5L4	73.0	39.50	40.7
5L9	73.0	39.50	40.7
5L5	120.0	45.00	44.5
5L6	210.0	45.00	45.0

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
10.0	-47.9	/	-40.0	11.4
15.0	-23.5	/	-35.0	12.4
20.0	-5.1	/	-30.0	13.5
25.0	11.3	/	-25.0	14.6
30.0	27.6	/	-20.0	15.9
35.0	45.4	/	-15.0	17.2
40.0	68.6	/	-10.0	18.6
		/	-5.0	20.0
		/	.0	21.5
		/	5.0	23.0
		/	10.0	24.6
		/	15.0	26.1
		/	20.0	27.7
		/	25.0	29.2
		/	30.0	30.7
		/	35.0	32.2
		/	40.0	33.6
		/	45.0	34.9
		/	50.0	36.2
		/	55.0	37.3

Table 6A

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
4L9	-80.0	10.90	11.1
4L10	-80.0	8.80	11.1
4L1	-40.0	39.90	38.6
4L2	.0	72.30	68.2
4L3	20.0	79.10	75.0
4L4	20.0	65.50	75.0
4L5	20.0	70.50	75.0
4L6	73.0	79.10	79.0
4L7	120.0	78.80	78.7
4L8	210.0	74.90	73.6

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
15.0	-70.1	/	-70.0	15.1
20.0	-62.0	/	-65.0	18.0
25.0	-55.5	/	-60.0	21.5
30.0	-49.6	/	-55.0	25.4
35.0	-44.0	/	-50.0	29.6
40.0	-38.5	/	-45.0	34.1
45.0	-33.0	/	-40.0	38.6
50.0	-27.3	/	-35.0	43.2
55.0	-21.1	/	-30.0	47.6
60.0	-14.3	/	-25.0	51.9
65.0	-6.2	/	-20.0	55.8
70.0	4.0	/	-15.0	59.5
75.0	20.0	/	-10.0	62.8
		/	-5.0	65.7
		/	.0	68.2
		/	5.0	70.4
		/	10.0	72.2
		/	15.0	73.8
		/	20.0	75.0
		/	25.0	76.0

Table 6B

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
4L9	-80.0	1053.90	1069.3
4L10	-80.0	850.86	1069.3
4L1	-40.0	3848.20	3891.0
4L2	.0	6990.57	6801.0
4L3	20.0	7648.05	7373.7
4L4	20.0	6333.09	7373.7
4L5	20.0	6816.53	7373.7
4L6	73.0	7648.05	7644.3
4L7	120.0	7619.05	7595.7
4L8	210.0	7241.96	7149.1

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
1385.0	-71.5	/	-70.0	1462.2
1705.0	-65.8	/	-65.0	1759.8
2025.0	-61.2	/	-60.0	2115.6
2340.0	-57.2	/	-55.0	2519.3
2660.0	-53.4	/	-50.0	2958.6
2980.0	-49.8	/	-45.0	3420.3
3300.0	-46.3	/	-40.0	3891.0
3620.0	-42.9	/	-35.0	4357.9
3940.0	-39.5	/	-30.0	4809.3
4260.0	-36.1	/	-25.0	5235.4
4580.0	-32.6	/	-20.0	5628.8
4900.0	-29.0	/	-15.0	5984.0
5220.0	-25.2	/	-10.0	6298.1
5540.0	-21.2	/	-5.0	6570.1
5860.0	-16.8	/	.0	6801.0
6180.0	-12.0	/	5.0	6993.1
6500.0	-6.4	/	10.0	7149.8
6820.0	.5	/	15.0	7275.3
7140.0	9.7	/	20.0	7373.7
7460.0	25.8	/	25.0	7449.5

Table 6C

IMPACT TEST RESULTS FOR PLATE L.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
L: A517-F, 2-1/4 IN., HEAT 97L168-06W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
4L9	-80.0	7.50	6.5
4L10	-80.0	5.50	6.5
4L1	-40.0	29.00	28.6
4L2	.0	50.00	45.2
4L3	20.0	48.00	48.1
4L4	20.0	44.00	48.1
4L5	20.0	45.00	48.1
4L6	73.0	51.00	51.1
4L7	120.0	51.50	51.8
4L8	210.0	53.00	52.2

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
10.0	-53.9	/	-50.0	17.5
15.0	-51.5	/	-45.0	23.9
20.0	-48.2	/	-40.0	28.6
25.0	-43.9	/	-35.0	32.3
30.0	-38.2	/	-30.0	35.3
35.0	-30.5	/	-25.0	37.7
40.0	-19.4	/	-20.0	39.8
45.0	-.9	/	-15.0	41.5
50.0	45.1	/	-10.0	42.9
		/	-5.0	44.1
		/	.0	45.2
		/	5.0	46.1
		/	10.0	46.8
		/	15.0	47.5
		/	20.0	48.1
		/	25.0	48.6
		/	30.0	49.0
		/	35.0	49.4
		/	40.0	49.7
		/	45.0	50.0

Table 7A

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT 92L088-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
M-1	-100.0	11.60	11.6
M-2	-100.0	11.80	11.6
5M9	-100.0	9.40	11.6
5M1	-80.0	14.80	14.9
5M10	-80.0	13.40	14.9
M-3	-60.0	23.20	21.8
M-4	-60.0	20.40	21.8
5M2	-40.0	36.20	31.5
5M9	-40.0	29.40	31.5
M-5	-20.0	36.30	41.2
M-6	-20.0	42.40	41.2
5M8	.0	51.00	48.0
5M3	20.0	53.20	51.4
5M4	74.0	51.30	52.7
5M5	120.0	52.30	52.7
5M6	210.0	49.40	49.4

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
15.0	-79.4	/	-70.0	17.9
20.0	-64.3	/	-65.0	19.7
25.0	-53.0	/	-60.0	21.8
30.0	-43.0	/	-55.0	24.0
35.0	-33.2	/	-50.0	26.5
40.0	-22.7	/	-45.0	29.0
45.0	-10.2	/	-40.0	31.5
50.0	9.4	/	-35.0	34.1
		/	-30.0	36.6
		/	-25.0	39.0
		/	-20.0	41.2
		/	-15.0	43.3
		/	-10.0	45.1
		/	-5.0	46.7
		/	.0	48.0
		/	5.0	49.2
		/	10.0	50.1
		/	15.0	50.8
		/	20.0	51.4
		/	25.0	51.8

Table 7B

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT 92L088-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
M-1	-100.0	1261.78	1189.3
M-2	-100.0	1283.54	1189.3
5M9	-100.0	1022.48	1189.3
5M1	-80.0	1609.86	1542.9
5M10	-80.0	1457.58	1542.9
M-3	-60.0	2523.57	2466.6
M-4	-60.0	2219.00	2466.6
5M2	-40.0	3937.64	3588.3
5M9	-40.0	3197.97	3588.3
M-5	-20.0	3948.51	4549.9
M-6	-20.0	4612.04	4549.9
5M8	.0	5547.50	5186.4
5M3	20.0	5786.80	5523.0
5M4	74.0	5580.13	5730.9
5M5	120.0	5688.90	5737.7
5M6	210.0	5373.46	5373.5

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
1345.0	-86.8	/	-80.0	1542.9
1505.0	-81.1	/	-75.0	1732.6
1665.0	-76.7	/	-70.0	1953.9
1820.0	-72.9	/	-65.0	2200.7
1980.0	-69.4	/	-60.0	2466.6
2140.0	-66.2	/	-55.0	2744.7
2300.0	-63.1	/	-50.0	3028.4
2460.0	-60.1	/	-45.0	3311.5
2620.0	-57.2	/	-40.0	3588.3
2780.0	-54.4	/	-35.0	3854.0
2940.0	-51.6	/	-30.0	4104.7
3100.0	-48.7	/	-25.0	4337.4
3260.0	-45.9	/	-20.0	4549.9
3420.0	-43.1	/	-15.0	4741.0
3580.0	-40.2	/	-10.0	4910.5
3740.0	-37.2	/	-5.0	5058.7
3900.0	-34.1	/	.0	5186.4
4060.0	-30.9	/	5.0	5294.9
4220.0	-27.6	/	10.0	5386.0
4380.0	-24.0	/	15.0	5461.4
4540.0	-20.2	/		
4700.0	-16.1	/		
4860.0	-11.6	/		
5020.0	-6.4	/		
5180.0	-.3	/		
5340.0	7.4	/		

Table 7C

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT 92L068-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
M-1	-100.0	10.00	10.4
M-2	-100.0	12.00	10.4
5M9	-100.0	7.50	10.4
5M1	-80.0	13.50	13.8
5M10	-80.0	13.00	13.8
M-3	-60.0	20.50	20.0
M-4	-60.0	21.00	20.0
5M2	-40.0	28.50	27.4
5M9	-40.0	23.00	27.4
M-5	-20.0	34.00	34.2
M-6	-20.0	37.50	34.2
5M8	.0	41.50	39.1
5M3	20.0	41.50	41.8
5M4	74.0	42.00	43.7
5M5	120.0	45.00	43.7
5M6	210.0	42.50	43.8

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
15.0	-75.3	/	-70.0	16.6
20.0	-59.9	/	-65.0	18.2
25.0	-46.4	/	-60.0	20.0
30.0	-32.9	/	-55.0	21.8
35.0	-17.3	/	-50.0	23.7
40.0	5.3	/	-45.0	25.5
		/	-40.0	27.4
		/	-35.0	29.2
		/	-30.0	31.0
		/	-25.0	32.7
		/	-20.0	34.2
		/	-15.0	35.6
		/	-10.0	36.9
		/	-5.0	38.1
		/	.0	39.1
		/	5.0	40.0
		/	10.0	40.7
		/	15.0	41.3
		/	20.0	41.8
		/	25.0	42.3

Table 8A

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT #2L088-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
4M10	-100.0	24.10	25.6
4M9	-80.0	32.20	32.6
4M1	-40.0	51.30	53.1
4M2	.0	64.70	64.2
4M3	20.0	66.70	65.9
4M4	20.0	64.50	65.9
4M5	20.0	65.80	65.9
4M6	74.0	66.70	66.7
4M7	120.0	66.70	66.7
4M8	210.0	64.80	64.8

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
30.0	-86.0	/	-80.0	32.6
35.0	-75.1	/	-75.0	35.0
40.0	-65.6	/	-70.0	37.6
45.0	-56.3	/	-65.0	40.3
50.0	-46.6	/	-60.0	43.0
55.0	-35.6	/	-55.0	45.7
60.0	-21.1	/	-50.0	48.3
65.0	6.7	/	-45.0	50.8
		/	-40.0	53.1
		/	-35.0	55.2
		/	-30.0	57.1
		/	-25.0	58.8
		/	-20.0	60.3
		/	-15.0	61.6
		/	-10.0	62.6
		/	-5.0	63.5
		/	.0	64.2
		/	5.0	64.8
		/	10.0	65.3
		/	15.0	65.7

Table 8B

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT 92L088-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
4M10	-100.0	2330.19	2531.4
4M9	-80.0	3113.37	3120.9
4M1	-40.0	4960.12	5116.5
4M2	.0	6255.74	6281.4
4M3	20.0	6449.12	6415.3
4M4	20.0	6236.40	6415.3
4M5	20.0	6362.10	6415.3
4M6	74.0	6449.12	6449.1
4M7	120.0	6449.12	6449.1
4M8	210.0	6265.41	6265.4

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2535.0	-99.8	/	-90.0	2771.1
2695.0	-92.7	/	-85.0	2932.5
2855.0	-87.3	/	-80.0	3120.9
3010.0	-82.9	/	-75.0	3333.9
3170.0	-78.8	/	-70.0	3568.1
3330.0	-75.1	/	-65.0	3818.8
3490.0	-71.6	/	-60.0	4080.7
3650.0	-68.3	/	-55.0	4347.6
3810.0	-65.2	/	-50.0	4613.3
3970.0	-62.1	/	-45.0	4871.4
4130.0	-59.1	/	-40.0	5116.5
4290.0	-56.1	/	-35.0	5343.8
4450.0	-53.1	/	-30.0	5549.5
4610.0	-50.1	/	-25.0	5731.3
4770.0	-47.0	/	-20.0	5888.0
4930.0	-43.8	/	-15.0	6019.8
5090.0	-40.6	/	-10.0	6127.9
5250.0	-37.1	/	-5.0	6214.2
5410.0	-33.4	/	.0	6281.4
5570.0	-29.5	/	5.0	6332.3
5730.0	-25.0	/		
5890.0	-19.9	/		
6050.0	-13.7	/		
6210.0	-5.3	/		
6370.0	10.0	/		

Table 8C

IMPACT TEST RESULTS FOR PLATE M.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
M: A514-F, 2-1/4 IN., HEAT 92L088-10W2.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
4M10	-100.0	17.50	19.1
4M9	-80.0	23.00	22.7
4M1	-40.0	34.00	35.1
4M2	.0	44.00	44.9
4M3	20.0	47.00	47.0
4M4	20.0	46.50	47.0
4M5	20.0	47.50	47.0
4M6	74.0	41.50	48.0
4M7	120.0	48.50	48.0
4M8	210.0	46.00	46.0

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
20.0	-93.4	/	-90.0	20.6
25.0	-71.2	/	-85.0	21.6
30.0	-55.3	/	-80.0	22.7
35.0	-40.3	/	-75.0	24.0
40.0	-23.8	/	-70.0	25.4
45.0	.4	/	-65.0	26.9
		/	-60.0	28.4
		/	-55.0	30.1
		/	-50.0	31.8
		/	-45.0	33.4
		/	-40.0	35.1
		/	-35.0	36.7
		/	-30.0	38.2
		/	-25.0	39.7
		/	-20.0	41.0
		/	-15.0	42.2
		/	-10.0	43.2
		/	-5.0	44.2
		/	.0	44.9
		/	5.0	45.6

Table 9A

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
SURF-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
2A19	.0	4.00	4.2
2B14	.0	3.30	4.2
1A1	76.0	7.10	6.3
1B7	76.0	7.10	6.3
2A1	76.0	6.60	6.3
2B7	76.0	7.30	6.3
1A4	120.0	9.00	7.9
1A19	120.0	7.90	7.9
1B10	120.0	7.70	7.9
1B19	120.0	7.10	7.9
2A11	160.0	9.50	9.6
2A12	160.0	9.50	9.6
1A2	210.0	11.40	11.7
1B8	210.0	11.40	11.7
2A2	210.0	11.60	11.7
2B8	210.0	10.80	11.7
1A3	300.0	15.60	15.0
1B9	300.0	14.40	15.0
2A17	360.0	17.60	16.7
2A18	360.0	16.20	16.7
2B12	360.0	15.50	16.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	34.2	/	40.0	5.2
10.0	169.4	/	50.0	5.4
15.0	298.6	/	60.0	5.8
		/	70.0	6.1
		/	80.0	6.4
		/	90.0	6.8
		/	100.0	7.2
		/	110.0	7.5
		/	120.0	7.9
		/	130.0	8.4
		/	140.0	8.8
		/	150.0	9.2
		/	160.0	9.6
		/	170.0	10.0
		/	180.0	10.5
		/	190.0	10.9
		/	200.0	11.3
		/	210.0	11.7
		/	220.0	12.1
		/	230.0	12.5

Table 9B

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
SURF-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2A19	.0	435.10	460.8
2B14	.0	358.96	460.8
1A1	76.0	772.30	683.7
1B7	76.0	772.30	683.7
2A1	76.0	717.91	683.7
2B7	76.0	794.05	683.7
1A4	120.0	978.97	864.3
1A19	120.0	859.32	864.3
1B10	120.0	837.56	864.3
1B19	120.0	772.30	864.3
2A11	160.0	1033.36	1044.7
2A12	160.0	1033.36	1044.7
1A2	210.0	1240.03	1273.1
1B8	210.0	1240.03	1273.1
2A2	210.0	1261.78	1273.1
2B8	210.0	1174.76	1273.1
1A3	300.0	1696.88	1636.4
1B9	300.0	1566.35	1636.4
2A17	360.0	1914.43	1818.8
2A18	360.0	1762.15	1818.8
2B12	360.0	1686.00	1818.8

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
465.0	2.1	/	10.0	481.7
545.0	34.6	/	25.0	518.4
625.0	59.8	/	40.0	560.9
700.0	80.3	/	55.0	608.7
780.0	100.3	/	70.0	661.4
860.0	119.0	/	85.0	718.4
940.0	137.0	/	100.0	779.0
1020.0	154.6	/	115.0	842.5
1100.0	172.0	/	130.0	908.5
1180.0	189.4	/	145.0	976.1
1260.0	207.1	/	160.0	1044.7
1340.0	225.1	/	175.0	1113.7
1420.0	243.8	/	190.0	1182.6
1500.0	263.4	/	205.0	1250.7
1580.0	284.3	/	220.0	1317.5
1660.0	306.9	/	235.0	1382.7
1740.0	331.9	/	250.0	1445.7
		/	265.0	1506.2
		/	280.0	1564.0
		/	295.0	1618.8

Table 10A

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF MIDTHICKNESS.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
MID-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATUPE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
2C13	.0	2.20	2.7
2C16	.0	2.60	2.7
1C8	76.0	5.80	4.6
2C7	76.0	5.50	4.6
1C11	120.0	6.90	6.6
2C10	120.0	6.60	6.6
1C18	160.0	8.60	8.8
1C19	160.0	7.60	8.8
2B10	160.0	8.80	8.8
1C9	210.0	9.50	11.5
2C8	210.0	10.30	11.5
1C10	300.0	14.60	14.6
2C11	360.0	16.10	15.3
2C12	360.0	14.90	15.3

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	86.3	/	90.0	5.2
10.0	181.1	/	100.0	5.6
15.0	329.4	/	110.0	6.1
		/	120.0	6.6
		/	130.0	7.2
		/	140.0	7.7
		/	150.0	8.3
		/	160.0	8.8
		/	170.0	9.4
		/	180.0	9.9
		/	190.0	10.5
		/	200.0	11.0
		/	210.0	11.5
		/	220.0	12.0
		/	230.0	12.4
		/	240.0	12.8
		/	250.0	13.2
		/	260.0	13.5
		/	270.0	13.8
		/	280.0	14.1

Table 10B

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF MIDTHICKNESS.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
MID-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2C13	.0	239.30	287.6
2C16	.0	282.81	287.6
1C8	76.0	630.89	495.9
2C7	76.0	598.26	495.9
1C11	120.0	750.54	728.5
2C10	120.0	717.91	728.5
1C18	160.0	935.46	980.9
1C19	160.0	826.59	980.9
2B10	160.0	957.22	980.9
1C9	210.0	1033.36	1283.0
2C8	210.0	1120.38	1283.0
1C10	300.0	1588.11	1606.3
2C11	360.0	1751.27	1670.1
2C12	360.0	1620.74	1670.1

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
365.0	39.8	/	40.0	365.7
445.0	63.8	/	50.0	395.9
525.0	82.4	/	60.0	430.7
600.0	97.3	/	70.0	470.1
680.0	111.8	/	80.0	514.0
760.0	125.2	/	90.0	562.1
840.0	138.0	/	100.0	614.2
920.0	150.5	/	110.0	669.8
1000.0	163.0	/	120.0	728.5
1080.0	175.6	/	130.0	789.6
1160.0	188.5	/	140.0	852.5
1240.0	202.2	/	150.0	916.5
1320.0	217.0	/	160.0	980.9
1400.0	233.6	/	170.0	1044.8
1480.0	253.3	/	180.0	1107.7
1560.0	279.0	/	190.0	1168.7
1640.0	322.5	/	200.0	1227.4
		/	210.0	1283.0
		/	220.0	1335.2
		/	230.0	1383.5

Table 11A

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
SURF-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
2A16	-40.0	3.90	4.0
2B18	-40.0	3.50	4.0
1A15	-40.0	4.60	4.0
1B17	-40.0	3.50	4.0
1B2	.0	5.60	5.1
2B2	.0	4.20	5.1
3B2	.0	5.40	5.1
1B1	76.0	10.20	9.5
2B1	76.0	9.00	9.5
3B1	76.0	11.80	9.5
1B5	120.0	12.20	12.8
2B5	120.0	11.90	12.8
1B6	210.0	18.70	19.2
2B6	210.0	20.20	19.2
3B8	210.0	20.60	19.2
1A6	300.0	23.00	23.8
2A3	300.0	24.80	23.8
1B11	300.0	22.60	23.8
2B9	300.0	21.40	23.8
1A14	360.0	26.20	25.8
1A18	360.0	27.20	25.8

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	-2.8	/	.0	5.1
10.0	82.6	/	15.0	5.8
15.0	150.0	/	30.0	6.6
20.0	223.7	/	45.0	7.5
25.0	333.1	/	60.0	8.4
		/	75.0	9.5
		/	90.0	10.5
		/	105.0	11.6
		/	120.0	12.8
		/	135.0	13.9
		/	150.0	15.0
		/	165.0	16.1
		/	180.0	17.2
		/	195.0	18.2
		/	210.0	19.2
		/	225.0	20.1
		/	240.0	20.9
		/	255.0	21.8
		/	270.0	22.5
		/	285.0	23.2

Table 11B

IMPACT TEST RESULTS FOR SURFACE OF PLATE Q.

CALCULATIONS FOR ENERGY / AREA DATA OF CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
SURF-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2A16	-40.0	377.08	385.5
2B18	-40.0	338.41	385.5
1A15	-40.0	444.77	385.5
1B17	-40.0	338.41	385.5
1B2	.0	541.46	494.3
2B2	.0	406.09	494.3
3B2	.0	522.12	494.3
1B1	76.0	986.22	921.3
2B1	76.0	870.20	921.3
3B1	76.0	1140.92	921.3
1B5	120.0	1179.60	1233.9
2B5	120.0	1150.59	1233.9
1B6	210.0	1808.07	1851.8
2B6	210.0	1953.11	1851.8
3B8	210.0	1991.78	1851.8
1A6	300.0	2223.83	2302.9
2A3	300.0	2397.87	2302.9
1B11	300.0	2185.16	2302.9
2B9	300.0	2069.13	2302.9
1A14	360.0	2533.24	2491.9
1A18	360.0	2629.93	2491.9

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
465.0	-7.8	/	.0	494.3
545.0	11.8	/	15.0	559.7
625.0	27.9	/	30.0	636.1
700.0	41.3	/	45.0	721.7
780.0	54.5	/	60.0	815.1
860.0	66.9	/	75.0	914.5
940.0	78.7	/	90.0	1018.5
1020.0	90.2	/	105.0	1125.4
1100.0	101.5	/	120.0	1233.9
1180.0	112.6	/	135.0	1342.7
1260.0	123.6	/	150.0	1450.4
1340.0	134.6	/	165.0	1556.1
1420.0	145.7	/	180.0	1658.7
1500.0	157.0	/	195.0	1757.5
1580.0	168.4	/	210.0	1851.8
1660.0	180.2	/	225.0	1941.1
1740.0	192.3	/	240.0	2024.9
1820.0	204.9	/	255.0	2103.1
1900.0	218.0	/	270.0	2175.5
1980.0	231.8	/	285.0	2242.1
2060.0	246.6	/		

Table 12A

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF MIDTHICKNESS.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
MID-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
1C13	-40.0	2.60	3.1
2C19	-40.0	3.10	3.1
1C2	.0	4.40	3.9
2C2	.0	3.50	3.9
1C1	76.0	7.40	7.0
2C1	76.0	7.80	7.0
1C6	120.0	11.20	9.8
2C5	120.0	9.60	9.8
1C7	210.0	17.20	16.9
2C6	210.0	16.10	16.9
1C12	300.0	21.60	23.4
2C9	300.0	23.00	23.4
1C14	360.0	24.40	26.3
2C17	360.0	27.80	26.3

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	34.4	/	40.0	5.2
10.0	122.5	/	50.0	5.7
15.0	186.8	/	60.0	6.1
20.0	250.2	/	70.0	6.7
25.0	329.8	/	80.0	7.2
		/	90.0	7.8
		/	100.0	8.5
		/	110.0	9.1
		/	120.0	9.8
		/	130.0	10.5
		/	140.0	11.3
		/	150.0	12.1
		/	160.0	12.8
		/	170.0	13.6
		/	180.0	14.4
		/	190.0	15.3
		/	200.0	16.1
		/	210.0	16.9
		/	220.0	17.7
		/	230.0	18.5

Table 12B

IMPACT TEST RESULTS FOR MIDTHICKNESS OF PLATE Q.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF MIDTHICKNESS.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
MID-Q: A517-H, 2-1/4 IN., HEAT C4913-4.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
1C13	-40.0	251.39	303.5
2C19	-40.0	299.73	303.5
1C2	.0	425.43	375.1
2C2	.0	338.41	375.1
1C1	76.0	715.49	676.8
2C1	76.0	754.17	676.8
1C6	120.0	1082.91	949.5
2C5	120.0	928.21	949.5
1C7	210.0	1663.04	1631.8
2C6	210.0	1556.68	1631.8
1C12	300.0	2088.47	2258.8
2C9	300.0	2223.83	2258.8
1C14	360.0	2359.20	2547.3
2C17	360.0	2687.94	2547.3

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
305.0	-38.7	/	-30.0	316.4
385.0	-3.9	/	-15.0	341.8
465.0	29.5	/	.0	375.1
540.0	48.2	/	15.0	416.6
620.0	65.2	/	30.0	467.0
700.0	80.2	/	45.0	526.2
780.0	93.9	/	60.0	594.4
860.0	106.6	/	75.0	671.4
940.0	118.6	/	90.0	756.6
1020.0	130.1	/	105.0	849.6
1100.0	141.1	/	120.0	949.5
1180.0	151.9	/	135.0	1055.4
1260.0	162.4	/	150.0	1166.1
1340.0	172.7	/	165.0	1280.4
1420.0	182.9	/	180.0	1397.0
1500.0	193.1	/	195.0	1514.6
1580.0	203.4	/	210.0	1631.8
1660.0	213.6	/	225.0	1747.2
1740.0	224.1	/	240.0	1859.7
1820.0	234.7	/	255.0	1968.0
1900.0	245.5	/		
1980.0	256.7	/		
2060.0	268.3	/		
2140.0	280.5	/		
2220.0	293.4	/		
2300.0	307.2	/		
2380.0	322.3	/		
2460.0	339.0	/		

Table 13A

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
5R9	-100.0	2.60	2.6
5R1	-80.0	2.92	2.9
R-1	-60.0	4.11	4.0
R-2	-60.0	4.49	4.0
5R2	-40.0	4.42	5.6
R-3	-40.0	5.73	5.6
R-4	-40.0	5.38	5.6
R-5	-20.0	7.22	7.5
R-6	-20.0	6.30	7.5
5R7	.0	9.77	9.6
5R8	.0	10.20	9.6
5R3	20.0	12.00	11.8
5R4	73.0	17.80	18.0
5R5	120.0	26.00	23.5
5R6	210.0	35.50	32.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	-47.2	/	-40.0	5.6
10.0	3.6	/	-30.0	6.5
15.0	47.2	/	-20.0	7.5
20.0	89.6	/	-10.0	8.5
25.0	133.6	/	.0	9.6
30.0	181.3	/	10.0	10.7
		/	20.0	11.8
		/	30.0	13.0
		/	40.0	14.2
		/	50.0	15.3
		/	60.0	16.5
		/	70.0	17.7
		/	80.0	18.9
		/	90.0	20.0
		/	100.0	21.2
		/	110.0	22.4
		/	120.0	23.5
		/	130.0	24.6
		/	140.0	25.7
		/	150.0	26.8

Table 13B

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
5R9	-100.0	282.81	282.8
5R1	-80.0	317.62	312.6
R-1	-60.0	447.06	437.3
R-2	-60.0	488.40	437.3
5R2	-40.0	480.78	611.2
R-3	-40.0	623.28	611.2
R-4	-40.0	585.21	611.2
R-5	-20.0	785.35	817.3
R-6	-20.0	685.28	817.3
5R7	.0	1062.73	1045.5
5R8	.0	1109.50	1045.5
5R3	20.0	1305.29	1288.4
5R4	73.0	1936.19	1963.3
5R5	120.0	2828.14	2554.9
5R6	210.0	3861.49	3559.8

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
285.0	-88.2	/	-80.0	312.6
445.0	-59.0	/	-70.0	367.2
605.0	-40.6	/	-60.0	437.3
760.0	-25.3	/	-50.0	519.4
920.0	-10.8	/	-40.0	611.2
1080.0	2.9	/	-30.0	710.9
1240.0	16.1	/	-20.0	817.3
1400.0	28.9	/	-10.0	929.1
1560.0	41.5	/	.0	1045.5
1720.0	54.0	/	10.0	1165.5
1880.0	66.5	/	20.0	1288.4
2040.0	79.0	/	30.0	1413.6
2200.0	91.6	/	40.0	1540.3
2360.0	104.3	/	50.0	1668.1
2520.0	117.2	/	60.0	1796.4
2680.0	130.3	/	70.0	1924.9
2840.0	143.8	/	80.0	2052.9
3000.0	157.6	/	90.0	2180.3
3160.0	171.8	/	100.0	2306.6
3320.0	186.6	/	110.0	2431.6
3480.0	202.1	/		

Table 13C

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
5R9	-100.0	.00	.9
5R1	-80.0	.00	1.7
R-1	-60.0	2.50	2.8
R-2	-60.0	3.50	2.8
5R2	-40.0	2.00	4.2
R-3	-40.0	5.00	4.2
R-4	-40.0	4.00	4.2
R-5	-20.0	7.00	6.0
R-6	-20.0	6.00	6.0
5R7	.0	8.00	8.0
5R8	.0	8.50	8.0
5R3	20.0	11.50	10.3
5R4	73.0	16.50	17.3
5R5	120.0	23.50	24.0
5R6	210.0	35.00	35.1

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-30.6	/	-30.0	5.1
10.0	17.5	/	-20.0	6.0
15.0	56.3	/	-10.0	6.9
20.0	92.0	/	.0	8.0
25.0	127.5	/	10.0	9.1
30.0	165.2	/	20.0	10.3
35.0	209.1	/	30.0	11.5
		/	40.0	12.8
		/	50.0	14.1
		/	60.0	15.5
		/	70.0	16.9
		/	80.0	18.3
		/	90.0	19.7
		/	100.0	21.1
		/	110.0	22.6
		/	120.0	24.0
		/	130.0	25.4
		/	140.0	26.7
		/	150.0	28.0
		/	160.0	29.3

Table 14A

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
4R9	-80.0	6.23	7.3
4R1	-40.0	10.00	10.6
4R2	.0	19.05	16.9
4R10	20.0	24.30	21.1
4R3	20.0	21.80	21.1
4R4	20.0	22.80	21.1
4R5	20.0	16.90	21.1
4R6	73.0	33.90	34.0
4R7	120.0	43.50	44.9
4R8	210.0	56.40	56.5

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	-45.7	/	-40.0	10.6
15.0	-10.3	/	-30.0	11.9
20.0	15.2	/	-20.0	13.4
25.0	36.9	/	-10.0	15.1
30.0	57.1	/	.0	16.9
35.0	76.9	/	10.0	18.9
40.0	97.5	/	20.0	21.1
45.0	120.3	/	30.0	23.4
50.0	147.9	/	40.0	25.7
55.0	189.3	/	50.0	28.2
		/	60.0	30.7
		/	70.0	33.3
		/	80.0	35.8
		/	90.0	38.2
		/	100.0	40.6
		/	110.0	42.8
		/	120.0	44.9
		/	130.0	46.9
		/	140.0	48.7
		/	150.0	50.3

Table 14B

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
4R9	-80.0	602.37	710.0
4R1	-40.0	966.88	1029.3
4R2	.0	1841.91	1633.5
4R10	20.0	2349.53	2036.7
4R3	20.0	2107.81	2036.7
4R4	20.0	2204.50	2036.7
4R5	20.0	1634.03	2036.7
4R6	73.0	3277.74	3288.8
4R7	120.0	4205.95	4346.0
4R8	210.0	5453.23	5461.1

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
865.0	-56.5	/	-50.0	924.0
1025.0	-40.4	/	-40.0	1029.3
1185.0	-27.6	/	-30.0	1153.0
1340.0	-17.1	/	-20.0	1295.1
1500.0	-7.4	/	-10.0	1455.5
1660.0	1.4	/	.0	1633.5
1820.0	9.6	/	10.0	1827.7
1980.0	17.4	/	20.0	2036.7
2140.0	24.7	/	30.0	2258.2
2300.0	31.8	/	40.0	2489.7
2460.0	38.7	/	50.0	2728.6
2620.0	45.5	/	60.0	2971.7
2780.0	52.1	/	70.0	3215.9
2940.0	58.7	/	80.0	3457.9
3100.0	65.3	/	90.0	3694.7
3260.0	71.8	/	100.0	3923.4
3420.0	78.4	/	110.0	4141.2
3580.0	85.1	/	120.0	4346.0
3740.0	91.9	/	130.0	4535.9
3900.0	99.0	/	140.0	4709.7
4060.0	106.2	/		
4220.0	113.8	/		
4380.0	121.7	/		
4540.0	130.2	/		
4700.0	139.4	/		
4860.0	149.6	/		
5020.0	161.1	/		
5180.0	174.7	/		
5340.0	192.0	/		

Table 14C.

IMPACT TEST RESULTS FOR PLATE R.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
R: A514-H, 2 IN., HEAT 07619-03W1.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
4R9	-80.0	4.50	5.0
4R1	-40.0	9.50	8.5
4R2	.0	13.50	13.9
4R10	20.0	18.00	17.0
4R3	20.0	18.00	17.0
4R4	20.0	16.00	17.0
4R5	20.0	12.50	17.0
4R6	73.0	25.50	25.6
4R7	120.0	34.50	33.0
4R8	210.0	47.00	44.6

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-79.3	/	-70.0	5.6
10.0	-27.5	/	-60.0	6.4
15.0	7.5	/	-50.0	7.4
20.0	38.8	/	-40.0	8.5
25.0	69.2	/	-30.0	9.7
30.0	100.3	/	-20.0	11.0
35.0	133.5	/	-10.0	12.4
40.0	170.4	/	.0	13.9
		/	10.0	15.4
		/	20.0	17.0
		/	30.0	18.6
		/	40.0	20.2
		/	50.0	21.8
		/	60.0	23.5
		/	70.0	25.1
		/	80.0	26.8
		/	90.0	28.4
		/	100.0	29.9
		/	110.0	31.5
		/	120.0	33.0

Table 15A

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
5Z8	-100.0	3.41	3.7
5Z1	-80.0	4.32	4.2
Z-1	-60.0	4.43	4.9
Z-2	-60.0	5.42	4.9
5Z2	-40.0	6.42	6.0
Z-3	-40.0	5.92	6.0
5Z10	-20.0	6.98	7.5
Z-4	-20.0	7.18	7.5
5Z9	.0	9.67	9.5
Z-5	.0	9.67	9.5
5Z3	20.0	13.20	11.9
5Z7	20.0	11.05	11.9
Z-6	40.0	13.60	14.7
Z-7	40.0	13.10	14.7
5Z4	74.0	20.35	20.3
Z-8	74.0	19.10	20.3
5Z5	120.0	29.80	28.3
5Z6	210.0	41.30	40.0

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	-57.8	/	-50.0	5.4
10.0	4.8	/	-40.0	6.0
15.0	41.9	/	-30.0	6.7
20.0	72.5	/	-20.0	7.5
25.0	101.0	/	-10.0	8.4
30.0	130.3	/	.0	9.5
35.0	163.6	/	10.0	10.6
		/	20.0	11.9
		/	30.0	13.2
		/	40.0	14.7
		/	50.0	16.3
		/	60.0	17.9
		/	70.0	19.6
		/	80.0	21.3
		/	90.0	23.1
		/	100.0	24.8
		/	110.0	26.6
		/	120.0	28.3
		/	130.0	30.0
		/	140.0	31.6

Table 15B

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR ENERGY / AREA DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
5Z8	-100.0	370.92	405.7
5Z1	-80.0	469.91	453.4
Z-1	-60.0	481.87	532.9
Z-2	-60.0	589.56	532.9
5Z2	-40.0	698.33	651.8
Z-3	-40.0	643.94	651.8
5Z10	-20.0	759.25	816.2
Z-4	-20.0	781.00	816.2
5Z9	.0	1051.85	1029.6
Z-5	.0	1051.85	1029.6
5Z3	20.0	1435.82	1292.3
5Z7	20.0	1201.96	1292.3
Z-6	40.0	1479.33	1600.4
Z-7	40.0	1424.95	1600.4
5Z4	74.0	2213.56	2204.3
Z-8	74.0	2077.59	2204.3
5Z5	120.0	3241.48	3077.0
5Z6	210.0	4492.39	4348.4

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
565.0	-53.8	/	-50.0	587.0
725.0	-30.4	/	-40.0	651.8
885.0	-13.0	/	-30.0	728.0
1040.0	.9	/	-20.0	816.2
1200.0	13.4	/	-10.0	916.7
1360.0	24.6	/	.0	1029.6
1520.0	35.0	/	10.0	1154.9
1680.0	44.8	/	20.0	1292.3
1840.0	54.1	/	30.0	1441.1
2000.0	63.0	/	40.0	1600.4
2160.0	71.6	/	50.0	1769.2
2320.0	80.1	/	60.0	1946.1
2480.0	88.5	/	70.0	2129.5
2640.0	96.9	/	80.0	2317.6
2800.0	105.2	/	90.0	2508.5
2960.0	113.7	/	100.0	2700.0
3120.0	122.3	/	110.0	2890.2
3280.0	131.2	/	120.0	3077.0
3440.0	140.4	/	130.0	3258.5
3600.0	150.1	/	140.0	3432.7
3760.0	160.5	/		
3920.0	171.7	/		
4080.0	184.2	/		
4240.0	198.6	/		

Table 15C

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
PRECRACKED CHARPY TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
5Z8	-100.0	1.50	1.6
5Z1	-80.0	1.50	1.8
Z-1	-60.0	1.00	2.1
Z-2	-60.0	2.50	2.1
5Z2	-40.0	4.00	2.8
Z-3	-40.0	2.50	2.8
5Z10	-20.0	5.50	3.9
Z-4	-20.0	6.00	3.9
5Z9	.0	7.00	5.6
Z-5	.0	7.00	5.6
5Z3	20.0	10.00	8.0
5Z7	20.0	9.00	8.0
Z-6	40.0	11.50	11.1
Z-7	40.0	9.50	11.1
5Z4	74.0	17.00	17.6
Z-8	74.0	15.00	17.6
5Z5	120.0	24.00	26.7
5Z6	210.0	33.50	34.5

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-6.7	/	.0	5.6
10.0	33.4	/	5.0	6.2
15.0	61.2	/	10.0	6.7
20.0	85.7	/	15.0	7.4
25.0	110.7	/	20.0	8.0
30.0	141.5	/	25.0	8.7
		/	30.0	9.5
		/	35.0	10.3
		/	40.0	11.1
		/	45.0	12.0
		/	50.0	12.9
		/	55.0	13.8
		/	60.0	14.8
		/	65.0	15.8
		/	70.0	16.8
		/	75.0	17.8
		/	80.0	18.8
		/	85.0	19.9
		/	90.0	20.9
		/	95.0	21.9

Table 16A

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
4Z10	-100.0	7.55	7.6
4Z9	-80.0	8.13	8.1
4Z1	-40.0	10.90	12.1
4Z2	.0	22.50	19.9
4Z3	20.0	25.30	24.6
4Z4	20.0	23.60	24.6
4Z5	20.0	28.90	24.6
4Z6	74.0	36.10	37.9
4Z7	120.0	45.60	46.9
4Z8	210.0	55.00	55.1

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	-56.3	/	-50.0	10.7
15.0	-23.2	/	-40.0	12.1
20.0	.6	/	-30.0	13.8
25.0	21.4	/	-20.0	15.6
30.0	41.4	/	-10.0	17.7
35.0	61.7	/	.0	19.9
40.0	83.5	/	10.0	22.2
45.0	108.9	/	20.0	24.6
50.0	142.4	/	30.0	27.1
55.0	207.0	/	40.0	29.6
		/	50.0	32.1
		/	60.0	34.6
		/	70.0	37.0
		/	80.0	39.2
		/	90.0	41.4
		/	100.0	43.4
		/	110.0	45.2
		/	120.0	46.9
		/	130.0	48.4
		/	140.0	49.7

Table 16B

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR ENERGY / AREA DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
4Z10	-100.0	730.00	731.4
4Z9	-80.0	786.08	783.6
4Z1	-40.0	1053.90	1172.9
4Z2	.0	2175.49	1920.7
4Z3	20.0	2446.22	2382.5
4Z4	20.0	2281.85	2382.5
4Z5	20.0	2784.63	2382.5
4Z6	74.0	3490.45	3662.9
4Z7	120.0	4408.99	4530.6
4Z8	210.0	5317.86	5329.7

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
735.0	-96.3	/	-90.0	747.0
895.0	-63.6	/	-80.0	783.6
1055.0	-48.7	/	-70.0	843.8
1210.0	-37.5	/	-60.0	928.7
1370.0	-27.7	/	-50.0	1038.6
1530.0	-18.9	/	-40.0	1172.9
1690.0	-10.8	/	-30.0	1330.5
1850.0	-3.2	/	-20.0	1509.3
2010.0	4.0	/	-10.0	1707.1
2170.0	11.0	/	.0	1920.7
2330.0	17.8	/	10.0	2147.0
2490.0	24.5	/	20.0	2382.5
2650.0	31.1	/	30.0	2623.6
2810.0	37.7	/	40.0	2866.6
2970.0	44.3	/	50.0	3108.2
3130.0	50.9	/	60.0	3344.9
3290.0	57.7	/	70.0	3574.0
3450.0	64.5	/	80.0	3792.8
3610.0	71.6	/	90.0	3999.3
3770.0	78.9	/	100.0	4191.8
3930.0	86.6	/		
4090.0	94.6	/		
4250.0	103.2	/		
4410.0	112.4	/		
4570.0	122.6	/		
4730.0	134.0	/		
4890.0	147.3	/		
5050.0	163.5	/		
5210.0	185.3	/		

Table 16C

IMPACT TEST RESULTS FOR PLATE Z.

CALCULATIONS FOR LATERAL EXPANSION DATA OF
CHARPY V-NOTCH TESTS OF SURFACE.
LONGITUDINAL SPECIMENS: LT ORIENTATION.
Z: A517-H, 2-1/4 IN., HEAT B9093-4B.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
4Z10	-100.0	3.50	4.3
4Z9	-80.0	3.50	5.1
4Z1	-40.0	6.50	8.2
4Z2	.0	15.50	13.0
4Z3	20.0	17.50	15.9
4Z4	20.0	18.00	15.9
4Z5	20.0	19.00	15.9
4Z6	74.0	20.50	25.0
4Z7	120.0	32.50	32.4
4Z8	210.0	41.00	41.9

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	-82.9	/	-80.0	5.1
10.0	-22.9	/	-70.0	5.7
15.0	13.9	/	-60.0	6.4
20.0	44.8	/	-50.0	7.2
25.0	74.1	/	-40.0	8.2
30.0	104.2	/	-30.0	9.2
35.0	138.5	/	-20.0	10.3
40.0	184.5	/	-10.0	11.6
		/	.0	13.0
		/	10.0	14.4
		/	20.0	15.9
		/	30.0	17.5
		/	40.0	19.2
		/	50.0	20.9
		/	60.0	22.6
		/	70.0	24.3
		/	80.0	26.0
		/	90.0	27.7
		/	100.0	29.3
		/	110.0	30.9

Table 17A

RESULTS OF NRS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
TOP CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK1T	.0	4.50	4.5
18CK1T	.0	4.00	4.5
17CK2T	80.0	10.50	9.2
18CK2T	80.0	10.50	9.2
17CK3T	160.0	14.00	14.9
18CK3T	160.0	15.00	14.9
17CK4T	240.0	18.50	19.4
18CK4T	240.0	18.50	19.4
17CK5T	320.0	23.00	22.3
18CK5T	320.0	21.50	22.3

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	12.0	/	20.0	5.4
10.0	90.8	/	30.0	5.9
15.0	160.9	/	40.0	6.5
20.0	252.6	/	50.0	7.1
		/	60.0	7.8
		/	70.0	8.5
		/	80.0	9.2
		/	90.0	9.9
		/	100.0	10.7
		/	110.0	11.4
		/	120.0	12.1
		/	130.0	12.9
		/	140.0	13.6
		/	150.0	14.3
		/	160.0	14.9
		/	170.0	15.6
		/	180.0	16.2
		/	190.0	16.8
		/	200.0	17.4
		/	210.0	18.0

Table 17B

RESULTS OF NRS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY / AREA DATA OF TOP CK: A517-H, HEAT C4913-4, (LT). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK1T	.0	434.63	439.2
18CK1T	.0	386.90	439.2
17CK2T	80.0	1012.78	888.4
18CK2T	80.0	1014.91	888.4
17CK3T	160.0	1353.47	1441.0
18CK3T	160.0	1449.50	1441.0
17CK4T	240.0	1780.59	1876.1
18CK4T	240.0	1781.49	1876.1
17CK5T	320.0	2217.92	2149.4
18CK5T	320.0	2074.59	2149.4

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
515.0	19.3	/	20.0	518.5
595.0	34.6	/	30.0	569.5
675.0	48.0	/	40.0	626.2
750.0	59.7	/	50.0	687.4
830.0	71.6	/	60.0	752.0
910.0	83.1	/	70.0	819.3
990.0	94.4	/	80.0	888.4
1070.0	105.7	/	90.0	958.8
1150.0	117.0	/	100.0	1029.7
1230.0	128.4	/	110.0	1100.6
1310.0	140.1	/	120.0	1171.1
1390.0	152.1	/	130.0	1240.7
1470.0	164.6	/	140.0	1309.1
1550.0	177.6	/	150.0	1376.0
1630.0	191.2	/	160.0	1441.0
1710.0	205.8	/	170.0	1503.9
1790.0	221.5	/	180.0	1564.6
1870.0	238.6	/	190.0	1623.0
1950.0	257.7	/	200.0	1678.8
2030.0	279.5	/	210.0	1732.1
2110.0	305.2	/		

Table 17C

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR LATERAL EXPANSION DATA OF TOP CK: A517-H, HEAT C4913-4, (LT). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK1T	.0	4.50	4.6
18CK1T	.0	3.00	4.6
17CK2T	80.0	8.00	8.1
18CK2T	80.0	9.00	8.1
17CK3T	160.0	14.00	13.2
18CK3T	160.0	13.00	13.2
17CK4T	240.0	17.00	17.6
18CK4T	240.0	17.00	17.6
17CK5T	320.0	21.00	20.3
18CK5T	320.0	19.50	20.3

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	13.8	/	20.0	5.2
10.0	110.3	/	30.0	5.6
15.0	189.5	/	40.0	6.0
20.0	307.6	/	50.0	6.5
		/	60.0	7.0
		/	70.0	7.6
		/	80.0	8.1
		/	90.0	8.7
		/	100.0	9.3
		/	110.0	10.0
		/	120.0	10.6
		/	130.0	11.3
		/	140.0	11.9
		/	150.0	12.6
		/	160.0	13.2
		/	170.0	13.8
		/	180.0	14.4
		/	190.0	15.0
		/	200.0	15.6
		/	210.0	16.1

Table 18A

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK1C	.0	4.00	4.3
17CK2C	80.0	7.00	7.2
17CK3C	160.0	15.00	13.6
17CK4C	240.0	19.50	20.4
17CK5C	320.0	24.00	24.0

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	31.0	/	40.0	5.3
10.0	118.8	/	50.0	5.7
15.0	174.9	/	60.0	6.1
20.0	234.6	/	70.0	6.6
		/	80.0	7.2
		/	90.0	7.9
		/	100.0	8.5
		/	110.0	9.3
		/	120.0	10.1
		/	130.0	10.9
		/	140.0	11.8
		/	150.0	12.7
		/	160.0	13.6
		/	170.0	14.5
		/	180.0	15.5
		/	190.0	16.4
		/	200.0	17.3
		/	210.0	18.1
		/	220.0	18.9
		/	230.0	19.7

Table 18B

RESULTS OF NRS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK1C	.0	387.20	418.2
17CK2C	80.0	676.43	698.0
17CK3C	160.0	1452.36	1315.8
17CK4C	240.0	1878.62	1965.7
17CK5C	320.0	2314.50	2312.3

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
495.0	34.6	/	40.0	512.6
575.0	56.0	/	50.0	549.9
655.0	72.3	/	60.0	593.2
730.0	85.3	/	70.0	642.6
810.0	97.6	/	80.0	698.0
890.0	108.8	/	90.0	759.4
970.0	119.3	/	100.0	826.4
1050.0	129.2	/	110.0	898.6
1130.0	138.7	/	120.0	975.6
1210.0	148.0	/	130.0	1056.6
1290.0	157.1	/	140.0	1140.8
1370.0	166.1	/	150.0	1227.5
1450.0	175.1	/	160.0	1315.8
1530.0	184.2	/	170.0	1404.6
1610.0	193.5	/	180.0	1493.0
1690.0	203.0	/	190.0	1580.0
1770.0	213.0	/	200.0	1664.8
1850.0	223.4	/	210.0	1746.4
1930.0	234.7	/	220.0	1824.2
2010.0	247.0	/	230.0	1897.5
2090.0	260.8	/		
2170.0	277.1	/		
2250.0	297.7	/		

Table 18C

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF
CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK1C	.0	3.00	3.3
17CK2C	80.0	6.00	6.1
17CK3C	160.0	13.00	12.3
17CK4C	240.0	19.00	19.4
17CK5C	320.0	24.00	24.0

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	58.1	/	60.0	5.1
10.0	133.9	/	65.0	5.3
15.0	189.4	/	70.0	5.6
20.0	248.0	/	75.0	5.8
		/	80.0	6.1
		/	85.0	6.4
		/	90.0	6.7
		/	95.0	7.0
		/	100.0	7.4
		/	105.0	7.7
		/	110.0	8.1
		/	115.0	8.5
		/	120.0	8.9
		/	125.0	9.3
		/	130.0	9.7
		/	135.0	10.1
		/	140.0	10.5
		/	145.0	11.0
		/	150.0	11.4
		/	155.0	11.8

Table 19A

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY ABSORPTION DATA OF BOTTOM CK: A517-H, HEAT C4913-4, (LT). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK1B	.0	4.00	4.6
18CK1B	.0	4.50	4.6
17CK2B	80.0	9.00	7.7
18CK2B	80.0	9.50	7.7
17CK3B	160.0	15.00	14.2
18CK3B	160.0	13.00	14.2
17CK4B	240.0	20.00	21.0
17CK5B	320.0	23.50	24.8
18CK5B	320.0	25.00	24.8

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	18.0	/	20.0	5.1
10.0	111.9	/	30.0	5.3
15.0	168.7	/	40.0	5.7
20.0	226.7	/	50.0	6.1
		/	60.0	6.6
		/	70.0	7.1
		/	80.0	7.7
		/	90.0	8.4
		/	100.0	9.1
		/	110.0	9.8
		/	120.0	10.7
		/	130.0	11.5
		/	140.0	12.4
		/	150.0	13.3
		/	160.0	14.2
		/	170.0	15.1
		/	180.0	16.0
		/	190.0	16.9
		/	200.0	17.8
		/	210.0	18.7

Table 19B

RESULTS OF NRS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
BOTTOM CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK1B	.0	386.44	446.9
18CK1B	.0	434.71	446.9
17CK2B	80.0	869.42	745.4
18CK2B	80.0	917.73	745.4
17CK3B	160.0	1451.25	1371.1
18CK3B	160.0	1256.23	1371.1
17CK4B	240.0	1927.65	2024.1
17CK5B	320.0	2266.85	2390.5
18CK5B	320.0	2413.08	2390.5

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
525.0	32.7	/	40.0	550.5
605.0	53.4	/	50.0	590.3
685.0	69.5	/	60.0	636.0
760.0	82.4	/	70.0	687.8
840.0	94.6	/	80.0	745.4
920.0	105.8	/	90.0	808.9
1000.0	116.3	/	100.0	877.5
1080.0	126.3	/	110.0	951.2
1160.0	135.8	/	120.0	1029.2
1240.0	145.1	/	130.0	1111.0
1320.0	154.2	/	140.0	1195.8
1400.0	163.3	/	150.0	1282.8
1480.0	172.3	/	160.0	1371.1
1560.0	181.3	/	170.0	1459.9
1640.0	190.5	/	180.0	1548.2
1720.0	200.0	/	190.0	1635.3
1800.0	209.7	/	200.0	1720.2
1880.0	219.9	/	210.0	1802.1
1960.0	230.7	/	220.0	1880.5
2040.0	242.4	/	230.0	1954.6
2120.0	255.2	/		
2200.0	269.8	/		
2280.0	287.0	/		
2360.0	309.2	/		

Table 19C

RESULTS OF NBS TESTS OF LONGITUDINAL CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF BOTTOM CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK1B	.0	3.00	3.8
18CK1B	.0	3.00	3.8
17CK2B	80.0	7.50	7.5
18CK2B	80.0	8.00	7.5
17CK3B	160.0	12.50	13.3
18CK3B	160.0	12.00	13.3
17CK4B	240.0	20.00	18.6
17CK5B	320.0	23.00	22.0
18CK5B	320.0	20.50	22.0

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	34.3	/	40.0	5.3
10.0	116.1	/	50.0	5.8
15.0	183.4	/	60.0	6.3
20.0	266.4	/	70.0	6.9
		/	80.0	7.5
		/	90.0	8.2
		/	100.0	8.9
		/	110.0	9.6
		/	120.0	10.3
		/	130.0	11.0
		/	140.0	11.8
		/	150.0	12.5
		/	160.0	13.3
		/	170.0	14.0
		/	180.0	14.8
		/	190.0	15.5
		/	200.0	16.2
		/	210.0	16.8
		/	220.0	17.5
		/	230.0	18.1

Table 20A

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY ABSORPTION DATA OF TOP CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
T17CK1T	.0	5.00	5.5
T18CK1T	.0	5.50	5.5
T17CK2T	80.0	10.00	9.9
T18CK2T	80.0	10.50	9.9
T17CK3T	160.0	13.50	15.0
T18CK3T	160.0	14.50	15.0
T17CK4T	240.0	19.00	17.7
T18CK4T	240.0	17.50	17.7
T17CK5T	320.0	18.50	18.6
T18CK5T	320.0	17.50	18.6

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	81.4	/	90.0	10.6
15.0	159.9	/	95.0	11.0
		/	100.0	11.3
		/	105.0	11.7
		/	110.0	12.0
		/	115.0	12.3
		/	120.0	12.7
		/	125.0	13.0
		/	130.0	13.3
		/	135.0	13.6
		/	140.0	13.9
		/	145.0	14.2
		/	150.0	14.5
		/	155.0	14.7
		/	160.0	15.0
		/	165.0	15.3
		/	170.0	15.5
		/	175.0	15.7
		/	180.0	15.9
		/	185.0	16.1

Table 20B

RESULTS OF NRS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
TOP CK: A517-H, HEAT C4913-4, (TL).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
T17CK1T	.0	484.00	538.1
T18CK1T	.0	533.55	538.1
T17CK2T	80.0	964.96	932.4
T18CK2T	80.0	1014.01	932.4
T17CK3T	160.0	1306.79	1457.7
T18CK3T	160.0	1400.29	1457.7
T17CK4T	240.0	1833.36	1733.1
T18CK4T	240.0	1688.40	1733.1
T17CK5T	320.0	1797.83	1801.7
T18CK5T	320.0	1688.40	1801.7

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
615.0	24.7	/	30.0	637.6
695.0	41.8	/	40.0	685.7
775.0	55.9	/	50.0	740.3
850.0	67.8	/	60.0	800.3
930.0	79.6	/	70.0	864.7
1010.0	91.1	/	80.0	932.4
1090.0	102.4	/	90.0	1002.2
1170.0	113.9	/	100.0	1072.8
1250.0	125.6	/	110.0	1143.2
1330.0	138.0	/	120.0	1212.2
1410.0	151.3	/	130.0	1278.9
1490.0	166.2	/	140.0	1342.5
1570.0	183.6	/	150.0	1402.3
1650.0	205.6	/	160.0	1457.7
1730.0	238.3	/	170.0	1508.5
		/	180.0	1554.5
		/	190.0	1595.5
		/	200.0	1631.7
		/	210.0	1663.3
		/	220.0	1690.5

Table 20C

RESULTS OF NRS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR LATERAL EXPANSION DATA OF TOP CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
T17CK1T	.0	3.00	4.2
T18CK1T	.0	5.50	4.2
T17CK2T	80.0	8.00	8.4
T18CK2T	80.0	9.00	8.4
T17CK3T	160.0	12.00	13.0
T18CK3T	160.0	13.00	13.0
T17CK4T	240.0	18.00	16.3
T18CK4T	240.0	15.50	16.3
T17CK5T	320.0	17.50	18.4
T18CK5T	320.0	19.00	18.4

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	21.5	/	30.0	5.4
10.0	106.4	/	35.0	5.7
15.0	203.9	/	40.0	6.0
		/	45.0	6.3
		/	50.0	6.6
		/	55.0	6.8
		/	60.0	7.2
		/	65.0	7.5
		/	70.0	7.8
		/	75.0	8.1
		/	80.0	8.4
		/	85.0	8.7
		/	90.0	9.0
		/	95.0	9.3
		/	100.0	9.6
		/	105.0	9.9
		/	110.0	10.2
		/	115.0	10.5
		/	120.0	10.8
		/	125.0	11.1

Table 21A

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY ABSORPTION DATA OF CENTER CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
T17CK1C	.0	3.50	4.1
T18CK1C	.0	4.00	4.1
T17CK2C	80.0	8.50	7.1
T18CK2C	80.0	7.50	7.1
T17CK3C	160.0	12.00	12.2
T18CK3C	160.0	12.00	12.2
T17CK4C	240.0	16.00	16.5
T18CK4C	240.0	16.50	16.5
T17CK5C	320.0	18.50	18.4
T18CK5C	320.0	18.00	18.4

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	35.5	/	40.0	5.2
10.0	126.2	/	45.0	5.4
15.0	207.1	/	50.0	5.6
		/	55.0	5.8
		/	60.0	6.0
		/	65.0	6.3
		/	70.0	6.5
		/	75.0	6.8
		/	80.0	7.1
		/	85.0	7.4
		/	90.0	7.7
		/	95.0	8.0
		/	100.0	8.3
		/	105.0	8.6
		/	110.0	8.9
		/	115.0	9.3
		/	120.0	9.6
		/	125.0	9.9
		/	130.0	10.3
		/	135.0	10.6

Table 21B

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY / AREA DATA OF CENTER CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
T17CK1C	.0	338.22	395.9
T18CK1C	.0	385.82	395.9
T17CK2C	80.0	821.75	665.1
T18CK2C	80.0	724.47	665.1
T17CK3C	160.0	1161.96	1161.2
T18CK3C	160.0	1156.95	1161.2
T17CK4C	240.0	1545.45	1592.7
T18CK4C	240.0	1590.31	1592.7
T17CK5C	320.0	1787.27	1784.6
T18CK5C	320.0	1735.65	1784.6

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
475.0	34.6	/	40.0	492.4
555.0	56.6	/	50.0	528.6
635.0	74.1	/	60.0	569.5
710.0	88.4	/	70.0	615.1
790.0	102.2	/	80.0	665.1
870.0	115.2	/	90.0	719.2
950.0	127.7	/	100.0	776.7
1030.0	140.0	/	110.0	837.3
1110.0	152.1	/	120.0	900.2
1190.0	164.5	/	130.0	964.7
1270.0	177.2	/	140.0	1030.3
1350.0	190.5	/	150.0	1096.0
1430.0	204.9	/	160.0	1161.2
1510.0	220.8	/	170.0	1225.2
1590.0	239.3	/	180.0	1287.3
1670.0	262.4	/	190.0	1346.9
1750.0	296.2	/	200.0	1403.5
		/	210.0	1456.7
		/	220.0	1506.1
		/	230.0	1551.5

Table 21C

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR LATERAL EXPANSION DATA OF CENTER CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
T17CK1C	.0	4.00	4.9
T18CK1C	.0	4.00	4.9
T17CK2C	80.0	8.00	9.3
T18CK2C	80.0	12.00	9.3
T17CK3C	160.0	11.00	12.9
T18CK3C	160.0	12.50	12.9
T17CK4C	240.0	15.50	15.4
T18CK4C	240.0	16.00	15.4
T17CK5C	320.0	16.00	17.1
T18CK5C	320.0	18.50	17.1

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	1.2	/	10.0	5.5
10.0	93.2	/	20.0	6.0
15.0	223.8	/	30.0	6.6
		/	40.0	7.2
		/	50.0	7.7
		/	60.0	8.3
		/	70.0	8.8
		/	80.0	9.3
		/	90.0	9.8
		/	100.0	10.3
		/	110.0	10.8
		/	120.0	11.3
		/	130.0	11.7
		/	140.0	12.1
		/	150.0	12.5
		/	160.0	12.9
		/	170.0	13.3
		/	180.0	13.6
		/	190.0	14.0
		/	200.0	14.3

Table 22A

RESULTS OF NRS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY ABSORPTION DATA OF BOTTOM CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
T17CK1B	.0	5.00	5.5
T18CK1B	.0	5.00	5.5
T17CK2B	80.0	9.00	8.8
T18CK2B	80.0	8.50	8.8
T17CK3B	160.0	14.00	14.2
T18CK3B	160.0	14.00	14.2
T17CK4B	240.0	20.00	18.7
T18CK4B	240.0	18.00	18.7
T17CK5B	320.0	20.00	20.7
T18CK5B	320.0	21.00	20.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	99.8	/	100.0	10.0
15.0	172.0	/	105.0	10.3
20.0	279.7	/	110.0	10.7
		/	115.0	11.0
		/	120.0	11.4
		/	125.0	11.7
		/	130.0	12.1
		/	135.0	12.4
		/	140.0	12.8
		/	145.0	13.1
		/	150.0	13.5
		/	155.0	13.8
		/	160.0	14.2
		/	165.0	14.5
		/	170.0	14.9
		/	175.0	15.2
		/	180.0	15.5
		/	185.0	15.8
		/	190.0	16.1
		/	195.0	16.4

Table 22B

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
BOTTOM CK: A517-H, HEAT C4913-4, (TL).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
T17CK1B	.0	483.11	482.9
T18CK1B	.0	482.65	482.9
T17CK2B	80.0	868.21	842.3
T18CK2B	80.0	821.38	842.3
T17CK3B	160.0	1356.05	1384.9
T18CK3B	160.0	1350.38	1384.9
T17CK4B	240.0	1932.54	1788.1
T18CK4B	240.0	1734.66	1788.1
T17CK5B	320.0	1931.57	2001.8
T18CK5B	320.0	2026.60	2001.8

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
485.0	3.6	/	10.0	494.9
565.0	31.5	/	25.0	538.8
645.0	47.9	/	40.0	604.0
720.0	60.9	/	55.0	684.8
800.0	73.6	/	70.0	776.7
880.0	85.6	/	85.0	876.0
960.0	97.2	/	100.0	979.4
1040.0	108.7	/	115.0	1084.2
1120.0	120.1	/	130.0	1187.9
1200.0	131.8	/	145.0	1288.7
1280.0	143.7	/	160.0	1384.9
1360.0	156.0	/	175.0	1475.4
1440.0	169.0	/	190.0	1559.4
1520.0	182.8	/	205.0	1636.5
1600.0	197.7	/	220.0	1706.3
1680.0	214.2	/	235.0	1768.8
1760.0	232.8	/	250.0	1824.4
1840.0	254.6	/	265.0	1873.1
1920.0	281.7	/	280.0	1915.6
2000.0	319.0	/	295.0	1952.2

Table 22C

RESULTS OF NBS TESTS OF TRANSVERSE CHARPY V-NOTCH IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR LATERAL EXPANSION DATA OF BOTTOM CK: A517-H, HEAT C4913-4, (TL). (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
T17CK1B	.0	5.00	5.0
T18CK1B	.0	4.50	5.0
T17CK2B	80.0	8.00	7.7
T18CK2B	80.0	8.00	7.7
T17CK3B	160.0	12.50	13.4
T18CK3B	160.0	13.00	13.4
T17CK4B	240.0	18.00	17.7
T18CK4B	240.0	18.50	17.7
T17CK5B	320.0	18.00	18.9
T18CK5B	320.0	19.50	18.9

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
10.0	114.3	/	120.0	10.4
15.0	183.2	/	125.0	10.8
		/	130.0	11.2
		/	135.0	11.5
		/	140.0	11.9
		/	145.0	12.3
		/	150.0	12.7
		/	155.0	13.0
		/	160.0	13.4
		/	165.0	13.8
		/	170.0	14.1
		/	175.0	14.5
		/	180.0	14.8
		/	185.0	15.1
		/	190.0	15.4
		/	195.0	15.7
		/	200.0	16.0
		/	205.0	16.3
		/	210.0	16.5
		/	215.0	16.8

Table 23A

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
TOP CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK6T	.0	4.00	4.5
18CK6T	.0	4.00	4.5
17CK7T	80.0	7.00	6.4
18CK7T	80.0	6.00	6.4
17CK8T	160.0	8.00	8.8
18CK8T	160.0	9.00	8.8
17CK9T	240.0	11.00	11.1
18CK9T	240.0	11.00	11.1
17CK10T	320.0	14.00	12.9
18CK10T	320.0	12.00	12.9

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	25.2	/	30.0	5.1
10.0	200.9	/	35.0	5.2
		/	40.0	5.3
		/	45.0	5.4
		/	50.0	5.6
		/	55.0	5.7
		/	60.0	5.8
		/	65.0	5.9
		/	70.0	6.1
		/	75.0	6.2
		/	80.0	6.4
		/	85.0	6.5
		/	90.0	6.6
		/	95.0	6.8
		/	100.0	6.9
		/	105.0	7.1
		/	110.0	7.2
		/	115.0	7.4
		/	120.0	7.5
		/	125.0	7.7

Table 23B

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
TOP CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK6T	.0	450.19	451.7
18CK6T	.0	437.11	451.7
17CK7T	80.0	781.56	650.3
18CK7T	80.0	664.90	650.3
17CK8T	160.0	876.79	962.8
18CK8T	160.0	987.11	962.8
17CK9T	240.0	1215.23	1246.3
18CK9T	240.0	1206.16	1246.3
17CK10T	320.0	1479.97	1438.2
18CK10T	320.0	1357.43	1438.2

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
455.0	3.2	/	10.0	463.8
495.0	27.2	/	25.0	490.3
535.0	43.7	/	40.0	525.3
570.0	55.8	/	55.0	567.5
610.0	68.3	/	70.0	615.5
650.0	79.9	/	85.0	668.3
690.0	90.9	/	100.0	724.5
730.0	101.4	/	115.0	783.0
770.0	111.7	/	130.0	842.9
810.0	121.8	/	145.0	903.1
850.0	131.8	/	160.0	962.8
890.0	141.7	/	175.0	1021.2
930.0	151.7	/	190.0	1077.7
970.0	161.8	/	205.0	1131.8
1010.0	172.1	/	220.0	1183.0
1050.0	182.6	/	235.0	1231.0
1090.0	193.4	/	250.0	1275.7
1130.0	204.5	/	265.0	1316.9
1170.0	216.1	/	280.0	1354.6
1210.0	228.3	/	295.0	1388.8
1250.0	241.2	/		
1290.0	255.1	/		
1330.0	270.0	/		
1370.0	286.6	/		
1410.0	305.2	/		

Table 23C

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF
TOP CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK6T	.0	3.50	3.9
18CK6T	.0	3.50	3.9
17CK7T	80.0	5.50	5.8
18CK7T	80.0	6.00	5.8
17CK8T	160.0	8.00	8.8
18CK8T	160.0	10.00	8.8
17CK9T	240.0	11.50	12.1
18CK9T	240.0	12.50	12.1
17CK10T	320.0	16.00	14.7
18CK10T	320.0	13.00	14.7

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	54.6	/	60.0	5.1
10.0	187.9	/	65.0	5.3
		/	70.0	5.4
		/	75.0	5.6
		/	80.0	5.8
		/	85.0	5.9
		/	90.0	6.1
		/	95.0	6.3
		/	100.0	6.4
		/	105.0	6.6
		/	110.0	6.8
		/	115.0	7.0
		/	120.0	7.2
		/	125.0	7.4
		/	130.0	7.6
		/	135.0	7.8
		/	140.0	8.0
		/	145.0	8.2
		/	150.0	8.4
		/	155.0	8.6

Table 24A

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK6C	.0	3.50	3.5
17CK7C	80.0	5.50	5.5
17CK8C	160.0	11.00	10.1
17CK9C	240.0	11.00	13.1
17CK10C	320.0	14.00	13.9

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	70.0	/	70.0	5.0
10.0	158.8	/	75.0	5.2
		/	80.0	5.5
		/	85.0	5.7
		/	90.0	6.0
		/	95.0	6.3
		/	100.0	6.5
		/	105.0	6.8
		/	110.0	7.1
		/	115.0	7.4
		/	120.0	7.7
		/	125.0	8.0
		/	130.0	8.3
		/	135.0	8.6
		/	140.0	8.9
		/	145.0	9.2
		/	150.0	9.5
		/	155.0	9.8
		/	160.0	10.1
		/	165.0	10.3

Table 24B

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK6C	.0	388.36	388.4
17CK7C	80.0	608.67	589.0
17CK8C	160.0	1217.88	1155.8
17CK9C	240.0	1223.06	1483.2
17CK10C	320.0	1536.38	1534.4

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
425.0	39.5	/	40.0	426.1
465.0	53.3	/	50.0	453.8
505.0	63.5	/	60.0	490.2
540.0	70.9	/	70.0	535.5
580.0	78.4	/	80.0	589.0
620.0	85.2	/	90.0	649.9
660.0	91.6	/	100.0	717.0
700.0	97.5	/	110.0	788.8
740.0	103.3	/	120.0	863.5
780.0	108.8	/	130.0	939.4
820.0	114.2	/	140.0	1014.5
860.0	119.5	/	150.0	1087.1
900.0	124.8	/	160.0	1155.8
940.0	130.1	/	170.0	1219.3
980.0	135.4	/	180.0	1276.7
1020.0	140.7	/	190.0	1327.4
1060.0	146.2	/	200.0	1371.2
1100.0	151.8	/	210.0	1408.2
1140.0	157.6	/	220.0	1438.9
1180.0	163.7	/	230.0	1463.6
1220.0	170.1	/		
1260.0	177.0	/		
1300.0	184.4	/		
1340.0	192.7	/		
1380.0	202.2	/		
1420.0	213.6	/		
1460.0	228.4	/		
1500.0	251.4	/		

Table 24C

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF
CENTER CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK6C	.0	4.00	4.0
17CK7C	80.0	5.00	4.8
17CK8C	160.0	8.50	9.4
17CK9C	240.0	13.00	15.3
17CK10C	320.0	17.50	17.3

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	86.0	/	90.0	5.1
10.0	166.9	/	95.0	5.3
15.0	235.3	/	100.0	5.6
		/	105.0	5.8
		/	110.0	6.0
		/	115.0	6.3
		/	120.0	6.6
		/	125.0	6.9
		/	130.0	7.2
		/	135.0	7.6
		/	140.0	7.9
		/	145.0	8.3
		/	150.0	8.7
		/	155.0	9.1
		/	160.0	9.4
		/	165.0	9.8
		/	170.0	10.3
		/	175.0	10.7
		/	180.0	11.1
		/	185.0	11.5

Table 25A

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
BOTTOM CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK6B	.0	4.00	4.4
18CK6B	.0	4.00	4.4
17CK7B	80.0	6.00	6.1
18CK7B	80.0	6.50	6.1
17CK8B	160.0	8.50	8.7
18CK8B	160.0	8.00	8.7
17CK9B	240.0	11.00	11.6
18CK9B	240.0	12.00	11.6
17CK10B	320.0	14.50	14.4
18CK10B	320.0	15.00	14.4

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	34.0	/	40.0	5.1
10.0	196.4	/	45.0	5.2
		/	50.0	5.3
		/	55.0	5.5
		/	60.0	5.6
		/	65.0	5.7
		/	70.0	5.8
		/	75.0	6.0
		/	80.0	6.1
		/	85.0	6.2
		/	90.0	6.4
		/	95.0	6.5
		/	100.0	6.7
		/	105.0	6.8
		/	110.0	7.0
		/	115.0	7.1
		/	120.0	7.3
		/	125.0	7.5
		/	130.0	7.6
		/	135.0	7.8

Table 25B

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
BOTTOM CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK6B	.0	452.26	452.4
18CK6B	.0	451.13	452.4
17CK7B	80.0	668.68	618.8
18CK7B	80.0	728.88	618.8
17CK8B	160.0	957.39	976.6
18CK8B	160.0	895.09	976.6
17CK9B	240.0	1190.99	1356.7
18CK9B	240.0	1367.61	1356.7
17CK10B	320.0	1596.85	1641.2
18CK10B	320.0	1649.46	1641.2

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
455.0	6.1	/	10.0	457.6
495.0	36.7	/	25.0	474.6
535.0	53.6	/	40.0	501.9
570.0	65.6	/	55.0	538.8
610.0	77.5	/	70.0	584.2
650.0	88.3	/	85.0	637.3
690.0	98.3	/	100.0	696.9
730.0	107.8	/	115.0	761.9
770.0	116.8	/	130.0	830.9
810.0	125.5	/	145.0	902.9
850.0	134.0	/	160.0	976.6
890.0	142.3	/	175.0	1051.0
930.0	150.5	/	190.0	1124.8
970.0	158.7	/	205.0	1197.3
1010.0	166.7	/	220.0	1267.6
1050.0	174.8	/	235.0	1335.0
1090.0	182.9	/	250.0	1398.8
1130.0	191.1	/	265.0	1458.8
1170.0	199.3	/	280.0	1514.5
1210.0	207.7	/	295.0	1565.8
1250.0	216.2	/		
1290.0	224.9	/		
1330.0	233.9	/		
1370.0	243.1	/		
1410.0	252.7	/		
1450.0	262.7	/		
1490.0	273.3	/		
1530.0	284.4	/		
1570.0	296.3	/		
1610.0	309.1	/		

Table 25C

RESULTS OF NBS TESTS OF LONGITUDINAL PRECRACKED CHARPY IMPACT SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF
BOTTOM CK: A517-H, HEAT C4913-4, (LT).
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK6B	.0	5.00	5.5
18CK6B	.0	6.00	5.5
17CK7B	80.0	7.00	6.2
18CK7B	80.0	6.00	6.2
17CK8B	160.0	7.00	8.5
18CK8B	160.0	8.00	8.5
17CK9B	240.0	12.50	12.0
18CK9B	240.0	12.00	12.0
17CK10B	320.0	17.00	15.7
18CK10B	320.0	17.00	15.7

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
10.0	196.1	/	200.0	10.2
15.0	303.8	/	205.0	10.4
		/	210.0	10.6
		/	215.0	10.8
		/	220.0	11.1
		/	225.0	11.3
		/	230.0	11.5
		/	235.0	11.8
		/	240.0	12.0
		/	245.0	12.2
		/	250.0	12.5
		/	255.0	12.7
		/	260.0	13.0
		/	265.0	13.2
		/	270.0	13.4
		/	275.0	13.7
		/	280.0	13.9
		/	285.0	14.1
		/	290.0	14.4
		/	295.0	14.6

Table 26A

RESULTS OF TESTS OF PCI SPECIMENS OF PLATE CK.
HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF
PLATE CK: PCI, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK6T	.0	4.00	4.0
18CK6T	.0	4.00	4.0
17CK6C	.0	3.50	4.0
17CK6B	.0	4.00	4.0
18CK6B	.0	4.00	4.0
17CK7C	80.0	5.50	5.8
18CK7T	80.0	6.00	5.8
17CK7T	80.0	7.00	5.8
17CK7B	80.0	6.00	5.8
18CK7B	80.0	6.50	5.8
18CK8T	160.0	9.00	8.8
17CK8C	160.0	11.00	8.8
17CK8T	160.0	8.00	8.8
17CK8B	160.0	8.50	8.8
18CK8B	160.0	8.00	8.8
18CK9T	240.0	11.00	11.7
17CK9T	240.0	11.00	11.7
17CK9C	240.0	11.00	11.7
17CK9B	240.0	11.00	11.7
18CK9B	240.0	12.00	11.7
17CK10C	320.0	14.00	13.9
17CK10T	320.0	14.00	13.9
18CK10T	320.0	12.00	13.9
17CK10B	320.0	14.50	13.9
18CK10B	320.0	15.00	13.9

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	52.1	/	60.0	5.2
10.0	191.0	/	65.0	5.4
		/	70.0	5.5
		/	75.0	5.7
		/	80.0	5.8
		/	85.0	6.0
		/	90.0	6.2
		/	95.0	6.4
		/	100.0	6.5
		/	105.0	6.7
		/	110.0	6.9
		/	115.0	7.1
		/	120.0	7.3
		/	125.0	7.5
		/	130.0	7.6
		/	135.0	7.8
		/	140.0	8.0
		/	145.0	8.2
		/	150.0	8.4
		/	155.0	8.6

Table 26B

RESULTS OF TESTS OF PCI SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF PLATE CK: PCI, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK6T	.0	450.19	444.7
18CK6T	.0	437.11	444.7
17CK6C	.0	388.36	444.7
17CK6B	.0	452.26	444.7
18CK6B	.0	451.13	444.7
17CK7C	80.0	608.67	652.1
18CK7T	80.0	664.90	652.1
17CK7T	80.0	781.56	652.1
17CK7B	80.0	668.68	652.1
18CK7B	80.0	728.88	652.1
18CK8T	160.0	987.11	981.2
17CK8C	160.0	1217.88	981.2
17CK8T	160.0	876.79	981.2
17CK8B	160.0	957.39	981.2
18CK8B	160.0	805.09	981.2
18CK9T	240.0	1206.16	1295.0
17CK9T	240.0	1215.23	1295.0
17CK9C	240.0	1223.06	1295.0
17CK9B	240.0	1190.99	1295.0
18CK9B	240.0	1367.61	1295.0
17CK10C	320.0	1536.38	1526.2
17CK10T	320.0	1479.97	1526.2
18CK10T	320.0	1357.43	1526.2
17CK10B	320.0	1596.85	1526.2
18CK10B	320.0	1649.46	1526.2

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
445.0	.3	/	10.0	457.6
485.0	24.7	/	25.0	485.6
525.0	41.0	/	40.0	522.2
560.0	53.0	/	55.0	566.1
600.0	65.4	/	70.0	616.1
640.0	76.7	/	85.0	670.9
680.0	87.4	/	100.0	729.4
720.0	97.6	/	115.0	790.7
760.0	107.6	/	130.0	853.6
800.0	117.2	/	145.0	917.4
840.0	126.8	/	160.0	981.2
880.0	136.2	/	175.0	1044.2
920.0	145.6	/	190.0	1105.8
960.0	155.0	/	205.0	1165.5
1000.0	164.5	/	220.0	1222.9
1040.0	174.0	/	235.0	1277.5
1080.0	183.7	/	250.0	1329.1
1120.0	193.5	/	265.0	1377.5
1160.0	203.6	/	280.0	1422.5
1200.0	213.9	/	295.0	1464.2
1240.0	224.6	/		
1280.0	235.7	/		
1320.0	247.3	/		
1360.0	259.5	/		
1400.0	272.4	/		
1440.0	286.1	/		
1480.0	301.0	/		
1520.0	317.3	/		

Table 26C

RESULTS OF TESTS OF PCI SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF PLATE CK: PCI, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK6T	.0	3.50	4.4
18CK6T	.0	3.50	4.4
17CK6C	.0	4.00	4.4
17CK6B	.0	5.00	4.4
18CK6B	.0	6.00	4.4
17CK7C	80.0	5.00	5.7
18CK7T	80.0	6.00	5.7
17CK7T	80.0	5.50	5.7
17CK7B	80.0	7.00	5.7
18CK7B	80.0	6.00	5.7
18CK8T	160.0	10.00	8.6
17CK8C	160.0	8.50	8.6
17CK8T	160.0	8.00	8.6
17CK8B	160.0	7.00	8.6
18CK8B	160.0	8.00	8.6
18CK9T	240.0	12.50	12.2
17CK9T	240.0	11.50	12.2
17CK9C	240.0	13.00	12.2
17CK9B	240.0	12.50	12.2
18CK9B	240.0	12.00	12.2
17CK10C	320.0	17.50	15.7
17CK10T	320.0	16.00	15.7
18CK10T	320.0	13.00	15.7
17CK10B	320.0	17.00	15.7
18CK10B	320.0	17.00	15.7

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	52.7	/	60.0	5.2
10.0	191.0	/	70.0	5.4
15.0	302.6	/	80.0	5.7
		/	90.0	6.0
		/	100.0	6.3
		/	110.0	6.6
		/	120.0	7.0
		/	130.0	7.4
		/	140.0	7.8
		/	150.0	8.2
		/	160.0	8.6
		/	170.0	9.1
		/	180.0	9.5
		/	190.0	10.0
		/	200.0	10.4
		/	210.0	10.9
		/	220.0	11.3
		/	230.0	11.8
		/	240.0	12.2
		/	250.0	12.7

Table 27A

RESULTS OF TESTS OF PCI SPECIMENS OF PLATE Q, HEAT C4913-4 OF A517-H STEEL.

CALCULATIONS FOR ENERGY ABSORPTION DATA OF PLATE Q: PCI, (LT) ORIENTATION. (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
2A19	.0	4.00	3.7
2B14	.0	3.30	3.7
2C13	.0	2.20	3.7
2C16	.0	2.60	3.7
2A1	76.0	6.60	5.9
2B7	76.0	7.30	5.9
1A1	76.0	7.10	5.9
1B7	76.0	7.10	5.9
1C8	76.0	5.80	5.9
2C7	76.0	5.50	5.9
1A4	120.0	9.00	7.5
1A19	120.0	7.90	7.5
1B10	120.0	7.70	7.5
1B19	120.0	7.10	7.5
1C11	120.0	6.90	7.5
2C10	120.0	6.60	7.5
2A11	160.0	9.50	9.1
2A12	160.0	9.50	9.1
1C18	160.0	8.60	9.1
1C19	160.0	7.60	9.1
2B10	160.0	8.80	9.1
1B8	210.0	11.40	11.2
2A9	210.0	11.60	11.2
2B8	210.0	10.80	11.2
1A2	210.0	11.40	11.2
1C9	210.0	9.50	11.2
2C8	210.0	10.30	11.2
1B9	300.0	14.40	14.5
1A3	300.0	15.60	14.5
1C10	300.0	14.60	14.5
2A17	360.0	17.60	16.3
2A18	360.0	16.20	16.3
2B12	360.0	15.50	16.3
2C11	360.0	16.10	16.3
2C12	360.0	14.90	16.3

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	50.0	/	60.0	5.3
10.0	181.1	/	70.0	5.6
15.0	315.4	/	80.0	6.0
		/	90.0	6.4
		/	100.0	6.7
		/	110.0	7.1
		/	120.0	7.5
		/	130.0	7.9
		/	140.0	8.3
		/	150.0	8.7
		/	160.0	9.1
		/	170.0	9.5
		/	180.0	10.0
		/	190.0	10.4
		/	200.0	10.8
		/	210.0	11.2
		/	220.0	11.6
		/	230.0	12.0
		/	240.0	12.4
		/	250.0	12.7

Table 27B

RESULTS OF TESTS OF PCI SPECIMENS OF PLATE Q, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF PLATE Q: PCI, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2A19	.0	435.10	404.2
2B14	.0	358.96	404.2
2C13	.0	239.30	404.2
2C16	.0	282.81	404.2
2A1	76.0	717.91	637.0
2B7	76.0	704.05	637.0
1A1	76.0	772.30	637.0
1B7	76.0	772.30	637.0
1C8	76.0	630.89	637.0
2C7	76.0	598.26	637.0
1A4	120.0	978.97	816.6
1A19	120.0	859.32	816.6
1B10	120.0	837.56	816.6
1B19	120.0	772.30	816.6
1C11	120.0	750.54	816.6
2C10	120.0	717.91	816.6
2A11	160.0	1033.36	993.3
2A12	160.0	1033.36	993.3
1C18	160.0	935.46	993.3
1C19	160.0	826.69	993.3
2B10	160.0	957.22	993.3
1B8	210.0	1240.03	1216.2
2A9	210.0	1261.78	1216.2
2B8	210.0	1174.76	1216.2
1A2	210.0	1240.03	1216.2
1C9	210.0	1033.36	1216.2
2C8	210.0	1120.38	1216.2
1B9	300.0	1566.35	1578.2
1A3	300.0	1696.88	1578.2
1C10	300.0	1588.11	1578.2
2A17	360.0	1914.43	1769.9
2A18	360.0	1762.15	1769.9
2B12	360.0	1686.00	1769.9
2C11	360.0	1751.27	1769.9
2C12	360.0	1620.74	1769.9

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
405.0	.4	/	10.0	427.2
485.0	31.4	/	25.0	466.5
565.0	56.2	/	40.0	511.2
640.0	76.8	/	55.0	560.7
720.0	97.0	/	70.0	614.4
800.0	116.1	/	85.0	671.8
880.0	134.6	/	100.0	732.2
960.0	152.6	/	115.0	795.2
1040.0	170.4	/	130.0	860.0
1120.0	188.3	/	145.0	926.2
1200.0	206.3	/	160.0	993.3
1280.0	224.7	/	175.0	1060.6
1360.0	243.6	/	190.0	1127.7
1440.0	263.3	/	205.0	1194.3
1520.0	284.1	/	220.0	1259.8
1600.0	306.2	/	235.0	1323.9
1680.0	330.1	/	250.0	1386.2
1760.0	356.5	/	265.0	1446.6
		/	280.0	1504.6
		/	295.0	1560.3

Table 28A

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF PLATE CK: CVN, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
17CK1T	.0	4.50	4.6
18CK1T	.0	4.00	4.6
17CK1C	.0	4.00	4.6
17CK1B	.0	4.00	4.6
18CK1B	.0	4.50	4.6
17CK2C	80.0	7.00	8.4
18CK2T	80.0	10.50	8.4
17CK2T	80.0	10.50	8.4
17CK2B	80.0	9.00	8.4
18CK2B	80.0	9.50	8.4
18CK3T	160.0	15.00	14.4
17CK3C	160.0	15.00	14.4
17CK3T	160.0	14.00	14.4
17CK3B	160.0	15.00	14.4
18CK3B	160.0	13.00	14.4
18CK4T	240.0	18.50	19.9
17CK4T	240.0	18.50	19.9
17CK4C	240.0	19.50	19.9
17CK4B	240.0	20.00	19.9
18CK5T	320.0	21.50	23.7
17CK5C	320.0	24.00	23.7
17CK5T	320.0	23.00	23.7
17CK5B	320.0	23.50	23.7
18CK5B	320.0	25.00	23.7

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	15.2	/	20.0	5.2
10.0	102.7	/	30.0	5.6
15.0	168.3	/	40.0	6.0
20.0	241.4	/	50.0	6.6
		/	60.0	7.1
		/	70.0	7.7
		/	80.0	8.4
		/	90.0	9.1
		/	100.0	9.8
		/	110.0	10.5
		/	120.0	11.3
		/	130.0	12.1
		/	140.0	12.8
		/	150.0	13.6
		/	160.0	14.4
		/	170.0	15.1
		/	180.0	15.9
		/	190.0	16.6
		/	200.0	17.3
		/	210.0	18.0

Table 28B

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF PLATE CK: CVN, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
17CK1T	.0	434.63	440.9
18CK1T	.0	386.90	440.9
17CK1C	.0	387.20	440.9
17CK1B	.0	396.44	440.9
18CK1B	.0	434.71	440.9
17CK2C	80.0	676.43	810.2
18CK2T	80.0	1014.91	810.2
17CK2T	80.0	1012.78	810.2
17CK2B	80.0	869.42	810.2
18CK2B	80.0	917.73	810.2
18CK3T	160.0	1449.50	1386.8
17CK3C	160.0	1452.36	1386.8
17CK3T	160.0	1353.47	1386.8
17CK3B	160.0	1451.25	1386.8
18CK3B	160.0	1256.23	1386.8
18CK4T	240.0	1781.49	1922.2
17CK4T	240.0	1780.59	1922.2
17CK4C	240.0	1876.62	1922.2
17CK4B	240.0	1927.65	1922.2
18CK5T	320.0	2074.59	2284.2
17CK5C	320.0	2314.50	2284.2
17CK5T	320.0	2217.92	2284.2
17CK5B	320.0	2266.85	2284.2
18CK5B	320.0	2413.08	2284.2

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
445.0	1.8	/	10.0	466.9
525.0	26.7	/	25.0	518.2
605.0	44.5	/	40.0	583.0
680.0	58.6	/	55.0	659.9
760.0	72.1	/	70.0	747.2
840.0	84.5	/	85.0	843.0
920.0	96.3	/	100.0	945.6
1000.0	107.7	/	115.0	1053.1
1080.0	118.7	/	130.0	1163.6
1160.0	129.5	/	145.0	1275.3
1240.0	140.3	/	160.0	1396.9
1320.0	151.0	/	175.0	1496.4
1400.0	161.8	/	190.0	1602.8
1480.0	172.7	/	205.0	1705.0
1560.0	183.9	/	220.0	1802.0
1640.0	195.4	/	235.0	1893.2
1720.0	207.3	/	250.0	1978.0
1800.0	219.7	/	265.0	2056.0
1880.0	232.9	/	280.0	2127.3
1960.0	246.7	/	295.0	2191.7
2040.0	261.8	/		
2120.0	278.4	/		
2200.0	297.1	/		
2280.0	318.7	/		

Table 28C

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR LATERAL EXPANSION DATA OF PLATE CK: CVN, (LT) ORIENTATION. (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
17CK1T	.0	4.50	4.2
18CK1T	.0	3.00	4.2
17CK1C	.0	3.00	4.2
17CK1B	.0	3.00	4.2
18CK1B	.0	3.00	4.2
17CK2C	80.0	6.00	7.9
18CK2T	80.0	9.00	7.9
17CK2T	80.0	8.00	7.9
17CK2B	80.0	7.50	7.9
18CK2B	80.0	8.00	7.9
18CK3T	160.0	13.00	13.1
17CK3C	160.0	13.00	13.1
17CK3T	160.0	14.00	13.1
17CK3B	160.0	12.50	13.1
18CK3B	160.0	12.00	13.1
18CK4T	240.0	17.00	18.1
17CK4T	240.0	17.00	18.1
17CK4C	240.0	19.00	18.1
17CK4B	240.0	20.00	18.1
18CK5T	320.0	19.50	21.6
17CK5C	320.0	24.00	21.6
17CK5T	320.0	21.00	21.6
17CK5B	320.0	23.00	21.6
18CK5B	320.0	20.50	21.6

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	22.1	/	30.0	5.3
10.0	113.4	/	40.0	5.8
15.0	188.7	/	50.0	6.3
20.0	279.0	/	60.0	6.8
		/	70.0	7.3
		/	80.0	7.9
		/	90.0	8.5
		/	100.0	9.1
		/	110.0	9.8
		/	120.0	10.4
		/	130.0	11.1
		/	140.0	11.8
		/	150.0	12.4
		/	160.0	13.1
		/	170.0	13.8
		/	180.0	14.4
		/	190.0	15.1
		/	200.0	15.7
		/	210.0	16.3
		/	220.0	16.9

Table 29A

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE Q, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY ABSORPTION DATA OF PLATE Q: CVN, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
2A16	-40.0	3.90	4.0
2B18	-40.0	3.50	4.0
1A15	-40.0	4.60	4.0
1B17	-40.0	3.50	4.0
1C13	-40.0	2.60	4.0
2C19	-40.0	3.10	4.0
3B?	.0	5.40	5.0
1B2	.0	5.60	5.0
2B2	.0	4.20	5.0
1C2	.0	4.40	5.0
2C2	.0	3.50	5.0
2B1	76.0	9.00	8.6
3B1	76.0	11.80	8.6
1B1	76.0	10.20	8.6
1C1	76.0	7.40	8.6
2C1	76.0	7.80	8.6
1B5	120.0	12.20	11.5
2B5	120.0	11.90	11.5
1C6	120.0	11.20	11.5
2C5	120.0	9.60	11.5
3B8	210.0	20.60	17.9
1B6	210.0	18.70	17.9
2B6	210.0	20.20	17.9
1C7	210.0	17.20	17.9
2C6	210.0	16.10	17.9
1B11	300.0	22.60	23.5
2B9	300.0	21.40	23.5
1A6	300.0	23.00	23.5
2A3	300.0	24.80	23.5
1C12	300.0	21.60	23.5
2C9	300.0	23.00	23.5
1A14	360.0	26.20	26.1
1A18	360.0	27.20	26.1
1C14	360.0	24.40	26.1
2C17	360.0	27.80	26.1

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
5.0	-1.4	/	.0	5.0
10.0	98.2	/	15.0	5.6
15.0	169.3	/	30.0	6.2
20.0	240.5	/	45.0	6.9
25.0	332.3	/	60.0	7.7
		/	75.0	8.6
		/	90.0	9.5
		/	105.0	10.4
		/	120.0	11.5
		/	135.0	12.5
		/	150.0	13.6
		/	165.0	14.7
		/	180.0	15.8
		/	195.0	16.9
		/	210.0	17.9
		/	225.0	19.0
		/	240.0	20.0
		/	255.0	20.9
		/	270.0	21.8
		/	285.0	22.7

Table 29B

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE Q, HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF PLATE Q: CVN, (LT) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
2A16	-40.0	377.08	389.6
2B18	-40.0	338.41	389.6
1A15	-40.0	444.77	389.6
1B17	-40.0	338.41	389.6
1C13	-40.0	251.39	389.6
2C19	-40.0	299.73	389.6
3B2	.0	592.12	487.9
1B2	.0	541.46	487.9
2B2	.0	406.09	487.9
1C2	.0	425.43	487.9
2C2	.0	338.41	487.9
2B1	76.0	870.20	833.1
3B1	76.0	1140.92	833.1
1B1	76.0	986.22	833.1
1C1	76.0	715.49	833.1
2C1	76.0	754.17	833.1
1B5	120.0	1179.60	1108.6
2B5	120.0	1150.59	1108.6
1C5	120.0	1092.91	1108.6
2C5	120.0	928.21	1108.6
3B8	210.0	1991.78	1733.1
1B6	210.0	1808.07	1733.1
2B6	210.0	1953.11	1733.1
1C7	210.0	1663.04	1733.1
2C6	210.0	1556.68	1733.1
1B11	300.0	2185.16	2271.0
2B9	300.0	2069.13	2271.0
1A6	300.0	2223.83	2271.0
2A3	300.0	2397.87	2271.0
1C12	300.0	2088.47	2271.0
2C9	300.0	2223.83	2271.0
1A14	360.0	2533.24	2521.2
1A18	360.0	2629.93	2521.2
1C14	360.0	2359.20	2521.2
2C17	360.0	2687.94	2521.2

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
465.0	-7.5	/	.0	497.9
545.0	16.3	/	15.0	540.1
625.0	35.6	/	30.0	600.5
700.0	51.3	/	45.0	668.9
780.0	66.6	/	60.0	744.7
860.0	80.6	/	75.0	827.3
940.0	93.9	/	90.0	916.1
1020.0	106.5	/	105.0	1010.2
1100.0	118.7	/	120.0	1108.6
1180.0	130.6	/	135.0	1210.4
1260.0	142.2	/	150.0	1314.4
1340.0	153.6	/	165.0	1419.9
1420.0	165.0	/	180.0	1525.4
1500.0	176.4	/	195.0	1630.1
1580.0	187.8	/	210.0	1733.1
1660.0	199.3	/	225.0	1833.4
1740.0	211.0	/	240.0	1930.3
1820.0	223.0	/	255.0	2023.0
1900.0	235.2	/	270.0	2111.0
1980.0	247.9	/	285.0	2193.8
2060.0	261.2	/		
2140.0	275.1	/		
2220.0	290.0	/		
2300.0	306.0	/		
2380.0	323.4	/		
2460.0	343.0	/		

Table 30A

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK, HEAT C4913-4 OF A517-H STEEL. CALCULATIONS FOR ENERGY ABSORPTION DATA OF PLATE CK: CVN, (TL) ORIENTATION. (LT) AND (TL) ORIENTATIONS REPRESENT LONGITUDINAL AND TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY ABSORPTION(FT-LB)	CALCULATED ENERGY ABSORPTION(FT-LB)
T17CK1T	.0	5.00	5.1
T18CK1T	.0	5.50	5.1
T17CK1C	.0	3.50	5.1
T18CK1C	.0	4.00	5.1
T17CK1B	.0	5.00	5.1
T18CK1B	.0	5.00	5.1
T17CK2C	80.0	8.50	8.7
T18CK2C	80.0	7.50	8.7
T17CK2T	80.0	10.00	8.7
T18CK2T	80.0	10.50	8.7
T17CK2B	80.0	9.00	8.7
T18CK2B	80.0	8.50	8.7
T17CK3T	160.0	13.50	14.0
T18CK3T	160.0	14.50	14.0
T17CK3C	160.0	12.00	14.0
T18CK3C	160.0	12.00	14.0
T17CK3B	160.0	14.00	14.0
T18CK3B	160.0	14.00	14.0
T17CK4C	240.0	16.00	17.8
T18CK4C	240.0	16.50	17.8
T17CK4T	240.0	19.00	17.8
T18CK4T	240.0	17.50	17.8
T17CK4B	240.0	20.00	17.8
T18CK4B	240.0	18.00	17.8
T17CK5T	320.0	18.50	19.3
T18CK5T	320.0	17.50	19.3
T17CK5C	320.0	18.50	19.3
T18CK5C	320.0	18.00	19.3
T17CK5B	320.0	20.00	19.3
T18CK5B	320.0	21.00	19.3

TRANSITION REGION, CALCULATED VALUES

ENERGY ABSORPTION	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY ABSORPTION(FT-LB)
10.0	100.4	/	110.0	10.6
15.0	177.0	/	115.0	11.0
		/	120.0	11.3
		/	125.0	11.7
		/	130.0	12.0
		/	135.0	12.4
		/	140.0	12.7
		/	145.0	13.0
		/	150.0	13.4
		/	155.0	13.7
		/	160.0	14.0
		/	165.0	14.3
		/	170.0	14.6
		/	175.0	14.9
		/	180.0	15.2
		/	185.0	15.4
		/	190.0	15.7
		/	195.0	16.0
		/	200.0	16.2
		/	205.0	16.4

Table 30B

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK.

HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR ENERGY / AREA DATA OF
PLATE CK: CVN, (TL) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED ENERGY AREA(IN-LB/SQ IN)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
T17CK1T	.0	484.00	494.4
T18CK1T	.0	533.55	494.4
T17CK1C	.0	338.22	494.4
T18CK1C	.0	385.92	494.4
T17CK1B	.0	493.11	494.4
T18CK1B	.0	492.65	494.4
T17CK2C	80.0	821.75	820.4
T18CK2C	80.0	724.47	820.4
T17CK2T	80.0	964.86	820.4
T18CK2T	80.0	1014.01	820.4
T17CK2B	80.0	868.21	820.4
T18CK2B	80.0	821.38	820.4
T17CK3T	160.0	1306.79	1361.7
T18CK3T	160.0	1400.29	1361.7
T17CK3C	160.0	1161.96	1361.7
T18CK3C	160.0	1156.95	1361.7
T17CK3B	160.0	1356.05	1361.7
T18CK3B	160.0	1350.38	1361.7
T17CK4C	240.0	1545.45	1752.3
T18CK4C	240.0	1590.31	1752.3
T17CK4T	240.0	1833.36	1752.3
T18CK4T	240.0	1688.40	1752.3
T17CK4B	240.0	1932.54	1752.3
T18CK4B	240.0	1734.66	1752.3
T17CK5T	320.0	1787.83	1882.3
T18CK5T	320.0	1688.40	1882.3
T17CK5C	320.0	1787.27	1882.3
T18CK5C	320.0	1735.65	1882.3
T17CK5B	320.0	1931.57	1882.3
T18CK5B	320.0	2026.60	1882.3

TRANSITION REGION, CALCULATED VALUES

ENERGY/AREA (IN LB/SQ IN)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED ENERGY /AREA(IN-LB/SQ IN)
495.0	.3	/	10.0	516.1
575.0	29.8	/	20.0	543.1
655.0	49.4	/	30.0	575.7
730.0	64.3	/	40.0	614.1
810.0	78.3	/	50.0	658.0
890.0	91.1	/	60.0	707.3
970.0	103.1	/	70.0	761.6
1050.0	114.7	/	80.0	820.4
1130.0	126.2	/	90.0	883.1
1210.0	137.6	/	100.0	949.0
1290.0	149.2	/	110.0	1017.2
1370.0	161.3	/	120.0	1086.8
1450.0	174.0	/	130.0	1157.0
1530.0	187.9	/	140.0	1226.7
1610.0	203.5	/	150.0	1295.3
1690.0	222.0	/	160.0	1361.7
1770.0	246.1	/	170.0	1425.2
1850.0	285.8	/	180.0	1485.3
		/	190.0	1541.4
		/	200.0	1593.0

Table 30C

RESULTS OF TESTS OF CVN SPECIMENS OF PLATE CK,
HEAT C4913-4 OF A517-H STEEL.
CALCULATIONS FOR LATERAL EXPANSION DATA OF
PLATE CK: CVN, (TL) ORIENTATION.
(LT) AND (TL) ORIENTATIONS REP-
RESENT LONGITUDINAL AND
TRANSVERSE SPECIMENS, RESPECTIVELY.

SPECIMEN	TEMPERATURE(F)	OBSERVED LATERAL EXPANSION (MILS)	CALCULATED LATERAL EXPANSION (MILS)
T17CK1T	.0	3.00	4.9
T18CK1T	.0	5.50	4.9
T17CK1C	.0	4.00	4.9
T18CK1C	.0	4.00	4.9
T17CK1B	.0	5.00	4.9
T18CK1B	.0	4.50	4.9
T17CK2C	80.0	8.00	8.1
T18CK2C	80.0	12.00	8.1
T17CK2T	80.0	8.00	8.1
T18CK2T	80.0	9.00	8.1
T17CK2B	80.0	8.00	8.1
T18CK2B	80.0	8.00	8.1
T17CK3T	160.0	12.00	12.8
T18CK3T	160.0	13.00	12.8
T17CK3C	160.0	11.00	12.8
T18CK3C	160.0	12.50	12.8
T17CK3B	160.0	12.50	12.8
T18CK3B	160.0	13.00	12.8
T17CK4C	240.0	15.50	16.8
T18CK4C	240.0	16.00	16.8
T17CK4T	240.0	18.00	16.8
T18CK4T	240.0	15.50	16.8
T17CK4B	240.0	18.00	16.8
T18CK4B	240.0	18.50	16.8
T17CK5T	320.0	17.50	18.7
T18CK5T	320.0	19.00	18.7
T17CK5C	320.0	16.00	18.7
T18CK5C	320.0	18.50	18.7
T17CK5B	320.0	18.00	18.7
T18CK5B	320.0	19.50	18.7

TRANSITION REGION, CALCULATED VALUES

LATERAL EXPANSION(MILS)	CALCULATED TEMPERATURE(F)	/	TEMPERATURE (F)	CALCULATED LATERAL EXPANSION(MILS)
5.0	3.1	/	10.0	5.2
10.0	113.4	/	15.0	5.3
15.0	199.3	/	20.0	5.5
		/	25.0	5.6
		/	30.0	5.8
		/	35.0	6.0
		/	40.0	6.2
		/	45.0	6.4
		/	50.0	6.6
		/	55.0	6.8
		/	60.0	7.0
		/	65.0	7.3
		/	70.0	7.5
		/	75.0	7.8
		/	80.0	8.1
		/	85.0	8.3
		/	90.0	8.6
		/	95.0	8.9
		/	100.0	9.2
		/	105.0	9.5

APPENDIX A

CHARPY DATA ON SEVEN ASTM A514/517 STEELS

These data are from a current investigation and, therefore, have not been released to the public by the State of California Department of Public Works.

These data are proprietary information for use by the Federal Government only.

Plate A, A517-F, 2-1/4 in., Heat B9863-2C

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
-40	5A1	2.06	1
	5A2	2.10	0
	5A3	2.26	1
-20	A-1	2.01	1
	A-2	2.05	0
0	A-3	2.80	2
	A-4	2.59	2
+20	A-5	3.28	3
	A-6	3.90	3
+40	5A7	3.76	3
	5A8	3.98	4
	5A9	4.32	4
RT	5A10	7.69	8
	5A11	6.87	9
	5A12	7.01	8
+120	5A13	10.75	13
	5A14	11.60	15
	5A15	12.09	14
+160	5A16	15.8	18
	5A17	17.0	18
	5A18	17.7	21
+180	5A4	20.6	23
	5A5	18.3	23
	5A6	19.1	21
+210	5A19	23.8	26
	5A20	29.2	31
	5A21	29.7	30

Charpy V-Notch

-40	6A1	13.20	10
	6A2	14.55	11
	6A3	13.28	8
0	6A4	15.20	9
	6A5	15.73	11
	6A6	16.42	11
40	6A7	17.29	11
	6A8	20.19	14
	6A9	15.73	10
+74	6A10	19.40	13
	6A11	18.58	14
	6A12	16.68	12

Plate A, A517-F, 2-1/4 in., Heat B9863-2C (Cont.)

Charpy V-Notch (cont.)

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
+120	6A13	21.40	21
	6A14	25.36	20
	6A15	26.35	24
+160	6A16	30.57	26
	6A17	30.48	25
	6A18	27.19	24
+210	6A19	37.93	32
	6A20	39.06	35
	6A21	42.53	36

Plate AL, A517H, 2-1/4 in., Heat A4071-6

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
+80	5AL1	2.61	0
-40	5AL2	4.82	2.5
0	5AL9	6.33	3.5
+20	5AL3	8.30	7.0
	AL-1	7.05	6.0
-40	AL-2	8.60	9.5
	AL-3	8.72	7.5
+60	AL-4	9.04	10.0
	AL-5	10.50	10.5
+74	5AL4	13.0	12.5
	5AL8	14.1	12.5
+120	5AL5	19.0	17.0
+160	5AL7	24.2	22.5
	AL-6	20.85	21.5
+210	5AL6	32.6	32.0

Charpy V-Notch

-40	4AL1	6.95	2.5
0	4AL2	10.5	7
+20	4AL3	11.9	8
	4AL4	10.4	6
	4AL5	13.1	9
+74	4AL6	20.85	16.5
	4AL10	22.5	18
+120	4AL7	24.7	20.5
	4AL9	31.1	26.5
+210	4AL8	41.8	36.5

Plate L, A517F, 2-1/4 in., Heat 97L168-06W2

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
-80	5L1	7.2	6
	5L10	6.8	4.5
-60	L-1	10.2	10.5
	L-2	9.4	8
-40	5L2	12.4	10
	L-3	13.9	12.5
	L-4	14.0	13
-20	L-5	15.5	15
	L-6	18.6	17
0	5L7	26.3	24.5
	5L8	24.9	20
+20	5L3	23.2	19
+40	L-7	36.9	36
	L-8	42.6	37
+73	5L4	44.4	39.5
	5L9	48.4	39.5
+120	5L5	52.8	45
+210	5L6	52.6	45

Charpy V-Notch

-80	4L9	10.9	7.5
	4L10	8.8	5.5
-40	4L1	39.8	29
0	4L2	72.3	50
+20	4L3	79.1	48
	4L4	65.5	44
	4L5	70.5	45
+73	4L6	79.1	51
+120	4L7	78.8	51.5
+210	4L8	74.9	53

Plate M, A514-F, 2-1/4 in., Heat 92L088-10W2

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
-100	5M9	9.4	7.5
	M-1	11.6	10
	M-2	11.8	12
-80	5M1	14.8	13.5
	5M10	13.4	13.0
-60	M-3	23.2	20.5
	M-4	20.4	21
-40	5M2	36.2	28.5
	5M9	29.4	23
-20	M-5	36.3	34
	M-6	42.4	37.5
0	5M8	51.0	41.5
+20	5M3	53.2	41.5
+74	5M4	51.3	42
+120	5M5	52.3	45
+210	5M6	49.4	42.5

Charpy V-Notch

-100	4M10	24.1	17.5
-80	4M9	32.2	23
-40	4M1	51.3	34
0	4M2	64.7	44
+20	4M3	66.7	47
	4M4	64.5	46.5
	4M5	65.8	47.5
+74	4M6	66.7	41.5
+120	4M7	66.7	48.5
+210	4M8	64.8	46

Plate Q, A517-H, 2-1/4 in., Heat C4913-4

Test (°F)	Specimen No.	Energy (ft-lb) Midthick	Energy (ft-lb) Surface	Lat Expans (mils) Midthick	Lat Expans (mils) Surface
Precrack Charpy Impact					
0	2C13	2.2			
	2C16	2.6			
	2A19		4.0		
	2B14		3.3		
+76	1C8	5.8			
	2C7	5.5			
	1A1		7.1		
	1B7		7.1		
	2A1		6.6		
	2B7		7.3		
+120	1C11	6.9			
	2C10	6.6			
	1A4		9.0		
	1A19		7.9		
	1B10		7.7		
	1B19		7.1		
+160	1C18	8.6			
	1C19	7.6			
	2A11		9.5		
	2A12		9.5		
	2B10	8.8			
+210	1C9	9.5			
	2C8	10.3			
	1A2		11.4		
	1B8		11.4		
	2A2		11.6		
	2B8		10.8		
+300	1C10	14.6			
	1A3		15.6		
	1B9		14.4		
+360	2C11	16.1			
	2C12	14.9			
	2A17		17.6		
	2A18		16.2		
	2B12		15.5		

Plate Q, A517-H, 2-1/4 in., Heat C4913-4 (Cont'd)

Test (°F)	Specimen No.	Energy (ft-lb) Midthick	Energy (ft-lb) Surface	Lat Expans (mils) Midthick	Lat Expans (mils) Surface
Charpy V-Notch Impact					
-40	1C13	2.6			
	2C19	3.1			
	2A16		3.9		
	2B18		3.5		
	1A15		4.6		
	1B17		3.5		
0	1C2	4.4			
	2C2	3.5			
	1B2		5.6		
	2B2		4.2		
	3B2		5.4		
+76	1C1	7.4			
	2C1	7.8			
	1B1		10.2		
	2B1		9.0		
	3B1		11.8		
+120	1C6	11.2			
	2C5	9.6			
	1B5		12.2		
	2B5		11.9		
+210	1C7	17.2			
	2C6	16.1			
	1B6		18.7		
	2B6		20.2		
	3B8		20.6		
+300	1C12	21.6			
	2C9	23.0			
	1A6		23.0		
	2A3		24.8		
	1B11		22.6		
	2B9		21.4		
+360	1C14	24.4			
	2C17	27.8			
	1A14		26.2		
	1A18		27.2		

Plate R, A514-H, 2-in., Heat 07619-03W1

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
-100	5R9	2.60	0
-80	5R1	2.92	0
-60	R-1	4.11	2.5
	R-2	4.49	3.5
-40	5R2	4.42	2
	R-3	5.73	5
	R-4	5.38	4
-20	R-5	7.22	7
	R-6	6.30	6
0	5R7	9.77	8
	5R8	10.2	8.5
+20	5R3	12.0	11.5
+73	5R4	17.8	16.5
+120	5R5	26.0	23.5
+210	5R6	35.5	35

Charpy V-Notch

-80	4R9	6.23	4.5
-40	4R1	10.0	9.5
0	4R2	19.05	13.5
+20	4R10	24.3	18
	4R3	21.8	18
	4R4	22.8	16
	4R5	16.9	12.5
+73	4R6	33.9	25.5
+120	4R7	43.5	34.5
+210	4R8	56.4	47

Plate Z, A517-H, 2-1/4 in., Heat B9093-4B

Precrack Charpy Impact

Test (°F)	Specimen No.	Energy (ft-lb)	Lat Expans (mils)
-100	5Z8	3.41	1.5
-80	5Z1	4.32	1.5
-60	Z-1	4.43	1
	Z-2	5.42	2.5
-40	5Z2	6.42	4
	Z-3	5.92	2.5
-20	5Z10	6.98	5.5
	Z-4	7.18	6
0	5Z9	9.67	7
	Z-5	9.67	7
+20	5Z3	13.2	10
	5Z7	11.05	9
+40	Z-6	13.6	11.5
	Z-7	13.1	9.5
+74	5Z4	20.35	17
	Z-8	19.1	15
+120	5Z5	29.8	24
+210	5Z6	41.3	33.5

Charpy V-Notch

-100	4Z10	7.55	3.5
-80	4Z9	8.13	3.5
-40	4Z1	10.9	6.5
0	4Z2	22.5	15.5
+20	4Z3	25.3	17.5
	4Z4	23.6	18
	4Z5	28.8	19
+74	4Z6	36.1	20.5
+120	4Z7	45.6	32.5
+210	4Z8	55.0	41.5

APPENDIX B

Test Plan for Specimens Submitted to NBS for Testing and Computer Evaluation. Specimens were Taken from Plate CK, Heat C4913-4, A517-H Steel.

Longitudinally Oriented (LT)

	Specimen Location	Test Temperature (F) 0	+80	+160	+240	+320
Charpy V-notch (CVN)	Top	17CK1T 18CK1T	17CK2T 18CK2T	17CK3T 18CK3T	17CK4T 18CK4T	17CK5T 18CK5T
	Center	17CK1C	17CK2C	17CK3C	17CK4C	17CK5C
	Bottom	17CK1B 18CK1B	17CK2B 18CK2B	17CK3B 18CK3B	17CK4B 18CK4B	17CK5B 18CK5B
Precracked Charpy (PCI)	Top	17CK6T 18CK6T	17CK7T 18CK7T	17CK8T 18CK8T	17CK9T 18CK9T	17CK10T 18CK10T
	Center	17CK6C	17CK7C	17CK8C	17CK9C	17CK10C
	Bottom	17CK6B 18CK6B	17CK7B 18CK7B	17CK8B 18CK8B	17CK9B 18CK9B	17CK10B 18CK10B

Transversely Oriented (TL)

Charpy V-notch (CVN)	Top	T17CK1T T18CK1T	T17CK2T T18CK2T	T17CK3T T18CK3T	T17CK4T T18CK4T	T17CK5T T18CK5T
	Center	T17CK1C T18CK1C	T17CK2C T18CK2C	T17CK3C T18CK3C	T17CK4C T18CK4C	T17CK5C T18CK5C
	Bottom	T17CK1B T18CK1B	T17CK2B T18CK2B	T17CK3B T18CK3B	T17CK4B T18CK4B	T17CK5B T18CK5B

APPENDIX C

Results of Measurements Taken on Specimens from Plate CK of Heat C4913-4, ASTM Type A517-H Steel.

SPECIMEN NUMBER	TEMPERATURE (F)	ENERGY ABSORPTION (FT-LB)	LATERAL EXPANSION (MILS.)	A SPECIMEN DEPTH (IN.)	SIDE 2 (IN.)	SIDE 1, FRACTURE DEPTH (IN.)	LENGTH (IN.)
T18CK1B	0.0	5.0	4.5	.3945	.3949	.3148	2.1596
T17CK1B	0.0	5.0	5.0	.3943	.3944	.3149	2.1603
T18CK1C	0.0	4.0	4.0	.3947	.3947	.3152	2.1589
T17CK1C	0.0	3.5	4.0	.3946	.3946	.3147	2.1596
T18CK1T	0.0	5.5	5.5	.3945	.3947	.3134	2.1597
T17CK1T	0.0	5.0	3.0	.3942	.3943	.3144	2.1599
18CK1B	0.0	4.5	3.0	.3946	.3946	.3148	2.1590
17CK1B	0.0	4.0	3.0	.3946	.3947	.3147	2.1574
17CK1C	0.0	4.0	3.0	.3943	.3943	.3144	2.1604
18CK1T	0.0	4.0	3.0	.3946	.3946	.3144	2.1589
17CK1T	0.0	4.5	4.5	.3942	.3943	.3151	2.1601
18CK6B	0.0	4.0	6.0	.3946	.3948	.2695	2.1592
17CK6B	0.0	4.0	5.0	.3942	.3944	.2691	2.1610
17CK6C	0.0	3.5	4.0	.3947	.3947	.2740	2.1591
18CK6T	0.0	4.0	3.5	.3942	.3943	.2785	2.1564
17CK6T	0.0	4.0	3.5	.3944	.3946	.2702	2.1616
T18CK2B	80.0	8.5	8.0	.3946	.3946	.3147	2.1602
T17CK2B	80.0	9.0	8.0	.3950	.3949	.3150	2.1599
T18CK2C	80.0	7.5	12.0	.3944	.3945	.3149	2.1570
T17CK2C	80.0	8.5	8.0	.3944	.3943	.3148	2.1619
T18CK2T	80.0	10.5	9.0	.3946	.3949	.3149	2.1598
T17CK2T	80.0	10.0	8.0	.3946	.3947	.3151	2.1612
18CK2B	80.0	9.5	8.0	.3946	.3946	.3148	2.1617
17CK2B	80.0	9.0	7.5	.3946	.3946	.3148	2.1568
17CK2C	80.0	7.0	6.0	.3946	.3946	.3147	2.1574
18CK2T	80.0	10.5	9.0	.3944	.3945	.3147	2.1598
17CK2T	80.0	10.5	8.0	.3946	.3947	.3152	2.1597
17CK7B	80.0	6.0	7.0	.3947	.3947	.2728	2.1589
18CK7B	80.0	6.5	6.0	.3943	.3943	.2714	2.1625
17CK7T	80.0	7.0	5.5	.3946	.3947	.2723	2.1586
18CK7T	80.0	6.0	6.0	.3942	.3942	.2747	2.1613
17CK7C	80.0	5.5	5.0	.3942	.3943	.2750	2.1612
T17CK3B	160.0	14.0	12.5	.3942	.3943	.3142	2.1597
T18CK3B	160.0	14.0	13.0	.3946	.3947	.3152	2.1599
T18CK3C	160.0	12.0	12.5	.3944	.3945	.3151	2.1598
T17CK3C	160.0	12.0	11.0	.3944	.3943	.3143	2.1603
T18CK3T	160.0	14.5	13.0	.3946	.3946	.3149	2.1589
T17CK3T	160.0	13.5	12.0	.3943	.3943	.3144	2.1592
17CK3B	160.0	15.0	12.5	.3944	.3945	.3144	2.1600
18CK3B	160.0	13.0	12.0	.3946	.3946	.3147	2.1596
17CK3C	160.0	15.0	13.0	.3942	.3942	.3144	2.1604
18CK3T	160.0	15.0	13.0	.3945	.3946	.3147	2.1568
17CK3T	160.0	14.0	14.0	.3944	.3943	.3148	2.1589
18CK8B	160.0	8.0	8.0	.3946	.3946	.2718	2.1602
17CK8B	160.0	8.5	7.0	.3944	.3943	.2702	2.1601
18CK8T	160.0	9.0	10.0	.3946	.3947	.2772	2.1592
17CK8T	160.0	8.0	8.0	.3946	.3947	.2774	2.1609
17CK8C	160.0	11.0	8.5	.3947	.3947	.2746	2.1598
T18CK4T	240.0	17.5	15.5	.3948	.3946	.3152	2.1586
17CK4C	240.0	19.5	19.0	.3950	.3948	.3155	2.1601
17CK4T	240.0	18.5	17.0	.3950	.3948	.3158	2.1592
18CK4T	240.0	18.5	17.0	.3948	.3948	.3154	2.1568
17CK4B	240.0	20.0	20.0	.3949	.3949	.3152	2.1616
T17CK4T	240.0	19.0	18.0	.3948	.3948	.3150	2.1606
T17CK4C	240.0	16.0	15.5	.3946	.3944	.3150	2.1605
T18CK4C	240.0	16.5	16.0	.3946	.3945	.3156	2.1599
T17CK4B	240.0	20.0	18.0	.3950	.3945	.3148	2.1607
T18CK4B	240.0	18.0	18.5	.3947	.3948	.3154	2.1603
18CK4B *	240.0			.3947	.3949	.3158	2.1613
17CK9B	240.0	11.0	12.5	.3950	.3947	.2808	2.1605
18CK9T	240.0	11.0	12.5	.3950	.3948	.2772	2.1567
17CK9C	240.0	11.0	13.0	.3948	.3949	.2733	2.1617
18CK9B	240.0	12.0	12.0	.3950	.3948	.2667	2.1616
17CK9T	240.0	11.0	11.5	.3950	.3947	.2752	2.1584
18CK5T	320.0	21.5	19.5	.3950	.3948	.3150	2.1564
17CK5T	320.0	23.0	21.0	.3951	.3948	.3152	2.1590
17CK5B	320.0	23.5	23.0	.3950	.3948	.3151	2.1605
17CK5C	320.0	24.0	24.0	.3951	.3949	.3151	2.1598
18CK5B	320.0	25.0	20.5	.3950	.3948	.3149	2.1615
T17C-5T	320.0	18.5	17.5	.3945	.3947	.3146	2.1620
T18CK5T	320.0	17.5	19.0	.3948	.3946	.3152	2.1616
T17CK5C	320.0	16.5	16.0	.3949	.3947	.3147	2.1622
T18CK5C	320.0	18.0	18.5	.3947	.3947	.3153	2.1612
T18CK5B	320.0	21.0	19.5	.3946	.3945	.3152	2.1606
T17CK5B	320.0	20.0	18.0	.3946	.3947	.3148	2.1610
18CK10T	320.0	12.0	13.0	.3951	.3948	.2687	2.1574
17CK10T	320.0	14.0	16.0	.3949	.3947	.2876	2.1591
17CK10C	320.0	14.0	17.5	.3953	.3949	.2769	2.1611
17CK10B	320.0	14.5	17.0	.3948	.3948	.2760	2.1607
18CK10B	320.0	15.0	17.0	.3953	.3951	.2762	2.1623

* SPECIMEN IMPROPERLY TESTED, NOT USED IN REPORT.

FORM NBS-114A (1-71)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBSIR 73-293	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE
FRACTURE TOUGHNESS EVALUATION OF QUENCHED-AND-TEMPERED BRIDGE STEELS

5. Publication Date
October, 1973

6. Performing Organization Code

7. AUTHOR(S)
C. G. Interrante and G. E. Hicho

8. Performing Organization
NBSIR 73-293

9. PERFORMING ORGANIZATION NAME AND ADDRESS
NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No.
3120417

11. Contract/Grant No.
3-1-1889

12. Sponsoring Organization Name and Address
Office of Research
Federal Highway Administration
Department of Transportation
Washington, D. C. 20591

13. Type of Report & Period Covered
Failure Analysis Report

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

The results of analyses of 25 sets of impact test data representing 8 plates from 7 heats of ASTM type 514 and type 517 steels are given as 43 Figures containing 128 plots and as 90 Tables. The figures and tables give the observed data and the calculated values of the fitted curves based on the available data for energy absorption, energy absorption per unit area, and lateral expansion. The calculations were made using the computer program ITER, created at the National Bureau of Standards (NBS). Sixteen of the data sets, representing 7 heats of steel, were furnished by the Federal Highway Administration (FHWA). The other 9 data sets represented only one of the 7 heats of steel, and these data were obtained in tests conducted at NBS with specimens furnished by FHWA. The results of the NBS tests on one plate are compared with the results of another laboratory's tests on another plate from the same heat of steel.

17. KEY WORDS (Alphabetical order, separated by semicolons)
ASTM A514 and A517 Steels; Charpy (CVN) and precracked (PCI); Impact tests data

18. AVAILABILITY STATEMENT

☐ UNLIMITED.

☒ FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.

19. SECURITY CLASS (THIS REPORT)
UNCLASSIFIED

21. NO. OF PAGES
245

20. SECURITY CLASS (THIS PAGE)
UNCLASSIFIED

22. Price

USCOMM-DC 66244-P71