

Effects of Thermal Aging on Stress Corrosion Cracking and Mechanical Properties of Stainless Steel Weld Metals

by

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Submitted to the Department of Nuclear Science and Engineering
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

August 2006

[September 2006]

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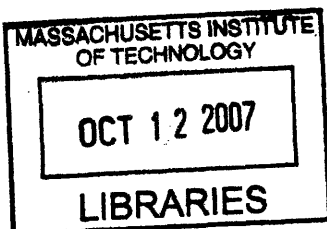
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ABSTRACT

Stress Corrosion Cracking (SCC) in and around primary loop piping welds in Boiling Water Reactors has been observed worldwide as plants continue to operate at temperatures and pressures near 288°C (550°F) and 6.9 MPa (1000 PSI). An experimental program was designed to explore the effect of thermal aging on the SCC crack growth rate in weld materials for type 316 and 304 stainless steels. An autoclave facility was designed and constructed for the measurement of SCC crack growth rates under BWR conditions and testing was underway at the time of this writing. The effects of composition and thermal aging on mechanical properties (i.e. tensile, micro-hardness, nano-hardness, J_{IC} , and Charpy-impact toughness) was in process and initial results show an increase in yield strength and a decrease in fracture toughness after aging for 1000 hours at 430 and 400 °C. Thermal aging results in no discernable changes to the δ -ferrite morphology when viewed optically at 500 X magnifications and in the scanning electron microscope.

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Acknowledgements

This work would not have been possible with the efforts of many. I would like to thank the many people at the U.S. Nuclear Regulatory who gave me have the opportunity to study at MIT through the NRC Graduate Fellowship Program and have guided me along the way. This includes Ms. Debbie Jackson, Ms. Donna Lam, Dr. Bill Cullen and the staff and management in the Office of Regulatory Research and throughout the Agency who supported this work financially and provided much guidance throughout my career at NRC. I would also like to thank Tokyo Electric Power Company for their financial support of this work and efforts in making this research possible. GE Global Research provided much expertise in the development of the SCC test system. Thank you Dr. Peter Andresen, Bill Catlin and everyone else at GE.

Thank you Professor Ballinger and the whole nuclear materials group for the daily collaboration and guidance. It was truly a pleasure working with a group who would always take the time to help each other. Dr. Ji Hyun Kim, thank you for your continuous effort everyday in the lab and for always taking time to share your knowledge and expertise. Much of what is seen in this thesis is directly due to the efforts and guidance Ji Hyun. Mr. Pete Stahle is the Research Engineer who keeps the lab together through the constant changing of students. Thank you Pete. And I still one you for that bet we had. Monica Ware and Mike Short worked many hours with me preparing samples, constructing the test system, and using the SEM. Kevin Miu, thank you for your friendship and always helping with anything and everything in the lab and out of the lab. Thank you Monica and Mike. Many thanks to Dr.'s Jeongyoun Lim and Ning Li and the whole laboratory staff.

Monica and Wesley Hixon, you are my life. Thank you for sharing yours with me through it all.

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INTRODUCTION

Nuclear energy provides about 16 percent of the world's electricity with 440 commercial nuclear reactors without the production of greenhouse gases or particulate air pollution.¹ Of those, 95 are of the Boiling Water Reactor (BWR) type (Figure 1)². As BWR's continue to operate at temperatures and pressures near 288°C (550°F) and 6.9 MPa (1000 PSI), the structural materials can degrade with time. The average age of nuclear power plants worldwide is now over 20 with the oldest operating U.S. nuclear plant going online in 1969. Stress Corrosion Cracking (SCC) in and around primary loop piping welds has been observed worldwide. A better understanding of the thermal aging effects on SCC growth rates and mechanical properties of welds would increase safety and operating efficiency by reducing uncertainty and providing insight into SCC mitigation techniques. This study specifically addresses the effects of thermal aging on SCC growth rates and mechanical properties of stainless steel (SS) weld metals in a BWR environment.

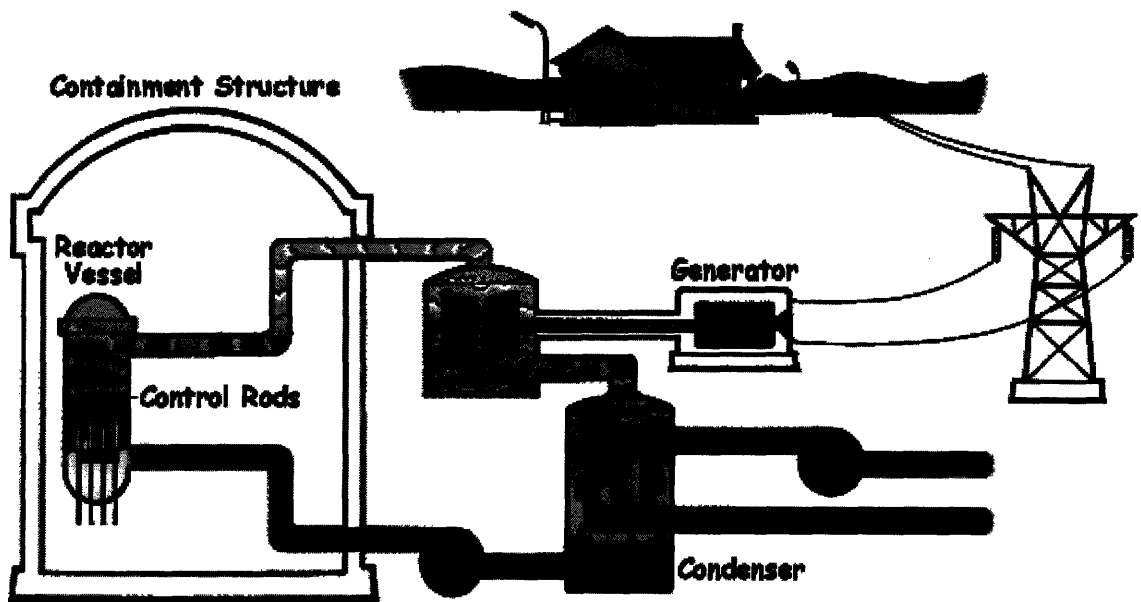


Figure 1: Boiling Water Reactor Schematic

The schematic in Figure 2 demonstrates how a better understanding of the factors causing SCC can reduce the likelihood of component failure due to SCC. Stress, corrosive environment, susceptible microstructure and time are the requirements for SCC to occur.

Component lifetime and a logical inspection interval can be estimated by quantifying these and other factors through observation and experimentation. As an example, at time $t = 0$, a_0 is the crack length with a probability of detection via ultrasonic testing equal to 50%. a_f is the estimated crack length that would result in component failure 50% of the time (calculated using fracture mechanics techniques). a_0 has been established by non-destructive examination (NDE) round robin studies on various materials using a variety of NDE techniques. a_f is established by utilizing fracture mechanics with the material properties, geometry, stress and environment as inputs. The dashed lines represent the 95% confidence interval associated with both a_0 and a_f . The intersection of the dashed lines defines a logical inspection interval. The intersection of the solid lines represent the most probable lifetime of the component.

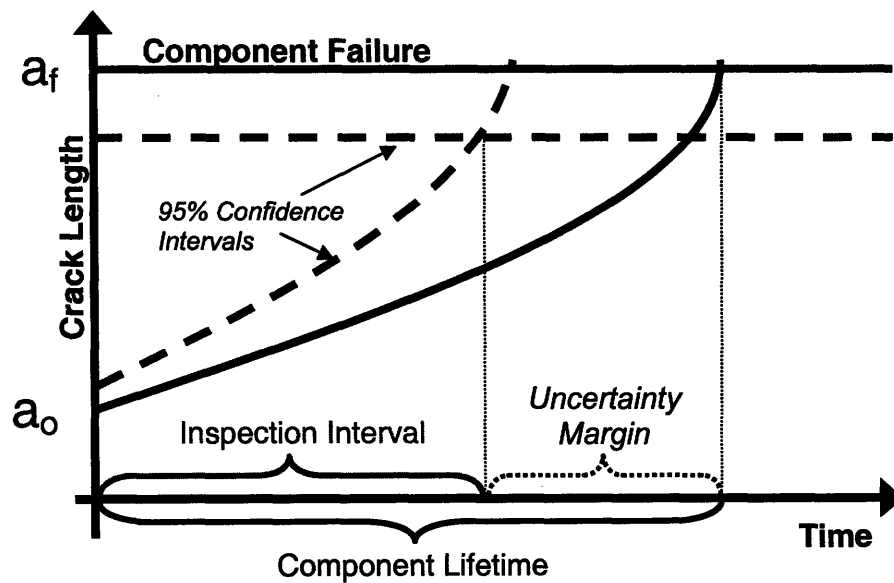


Figure 2: SCC vs. Time Schematic

Historically, in-service inspection intervals for most primary pressure boundary weldments were set to ten years per ASME Boiler & Pressure Vessel Code Section XI. Component failures due to SCC in and around welds after extended operation have led to research regarding the causes of SCC, the effects of long term operation (i.e. thermal aging) on its growth rate, and various mitigation techniques that can be applied to stop or slow the growth of SCC in and around welds³.

The results reported in this thesis are a part of an overall program to investigate the effect of thermal aging on the SCC crack growth rates in stainless steel weldments.

The overall objectives of the study are as follows:

- Measure the SCC growth rates of 316L and 308L stainless steel weld metals with varying compositions and aging times and temperatures in typical BWR environments
- Determine the effects of composition and thermal aging on mechanical properties (i.e. tensile, micro-hardness, nano-hardness, J_{IC} , and Charpy-impact toughness)
- Identify the effects of composition and thermal aging on changes in micro and nano-structure
- Compare the thermal aging effects on structure and mechanical properties to changes in SCC growth rates

The objectives of this thesis were as follows:

- Design an experimental program to explore the effect of thermal aging on the SCC crack growth rate in weld materials for type 316 and 304 stainless steels.
- The production of welds in large diameter (or similar) stainless steel piping with the following characteristics:
 - a. Type 316L and 308L weld materials
 - b. Two different ferrite numbers
- The design and construction of an autoclave facility for the measurement of SCC crack growth rates under BWR conditions.
- The production of sample “blanks” for the overall project and the initiation of the overall aging test matrix.

- The initial characterization of the as-received and “early aged” welds in terms of mechanical properties.

BACKGROUND

Stainless steels are used extensively in light water reactor systems because of their excellent ductility, high notch toughness, corrosion resistance, and good formability. Austenitic stainless steel weld metals are predominately face-centered cubic (fcc) austenite with small amounts of body-centered cubic (bcc) ferrite. This ferrite is often described as δ -ferrite, because it forms at elevated temperatures and is distinguished from α -ferrite, which is the low temperature form in iron-base alloys. The primary solidification structure of austenitic stainless steels during welding may be either austenite or ferrite, depending on the composition.⁴ Figure 3 shows that primary solidification can be austenite, austenite-ferrite, ferrite-austenite, or ferrite depending on the chromium and nickel content.⁵

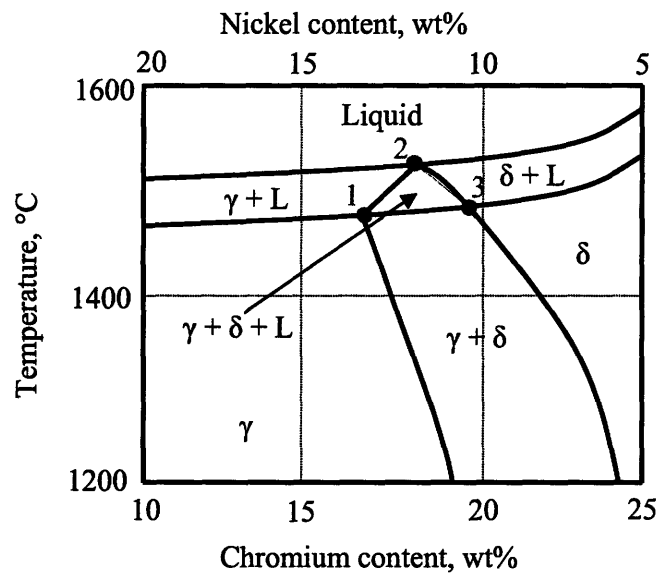


Figure 3: Vertical Section of Iron-Nickel-Chrome Ternary Phase Diagram, at 70% Iron Content

Welds that solidify as primary austenite may be very susceptible to solidification cracking.⁶ Solidification cracking results from the formation of low-melting point liquid films along grain boundaries during the last stages of solidification. Primary austenite solidification yields grain boundaries with higher wettability and less tortuous grain

boundaries (Figure 4).⁷ In order to lower susceptibility to solidification cracking during welding, nuclear construction codes require a minimum δ -ferrite content of about 5%.

In order to achieve δ -ferrite, chrome and nickel contents must fall in the range between points 1 and 3 shown in Figure 3. Cooling from the liquid phase to below 1500 °C with a nickel chrome composition to the left of point 1 in Figure 3 yields a fully austenitic micro-structure as demonstrated in the fully austenitic (A) schematic in Figure 4. The relatively long and straight grain boundaries of this microstructure are more susceptible to solidification cracking as the weld metal attempts to shrink during the phase change from liquid to solid. Cooling from the liquid phase with a composition between points two and three results in primary solidification as δ -ferrite and increasing amounts of austenite as the weld metal solidifies as demonstrated in the ferrite schematic (FA) in Figure 4. The more tortuous grain boundaries in FA solidification in combination with the relatively lower wet-ability of δ -ferrite to austenite grain boundaries lower the susceptibility of solidification cracking.

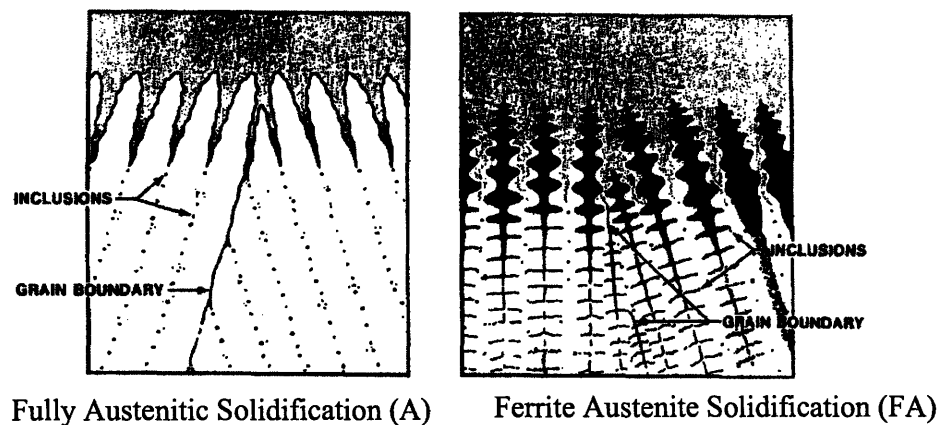


Figure 4: Austenitic Stainless Steel Solidification Behavior

While a certain amount of δ -ferrite is desirable to lower the susceptibility of solidification cracking, δ -ferrite has been shown to become more brittle with time at temperatures above 200 °C. Studies on austenitic stainless steels have shown that thermal aging has little to no effect on the austenite phase.⁸ However, aging of SS weld metals at

temperatures <500 °C can lead to precipitation of additional phases in the ferrite, e.g., formation of Cr-rich α' phase by spinodal decomposition; nucleation and growth of α' ; precipitation of a Ni- and Si-rich G phase, $M_{23}C_6$, and γ_2 (austenite); formation of σ -phase; and additional precipitation and/or growth of existing carbides at ferrite/austenite grain boundaries. These micro and nano-structural changes result in increases in hardness and tensile strength; decreases in ductility, impact strength, and fracture toughness; and shifts the Charpy transition curve to higher temperatures. However, little data exists on the effect of these changes on the SCC crack growth rates in aqueous environments.

The tendency for sigma phase formation increases with increasing amounts of chromium, molybdenum, and silicon, and is reduced somewhat by nitrogen.⁹ As a consequence of alloy partitioning during both solidification and the solid-state transformation of ferrite to austenite, ferrite is enriched in the alloying elements, which promote the sigma phase, and depleted in the elements that retard its formation. The rate of formation of sigma-phase and carbides is very time and temperature dependant. A time-temperature transformation (TTT) diagram for 308L was derived from experimental data (Figure 5).¹⁰ The TTT diagram shows that aging weld metal below about 475°C should result in minimal carbide and sigma phase formation.

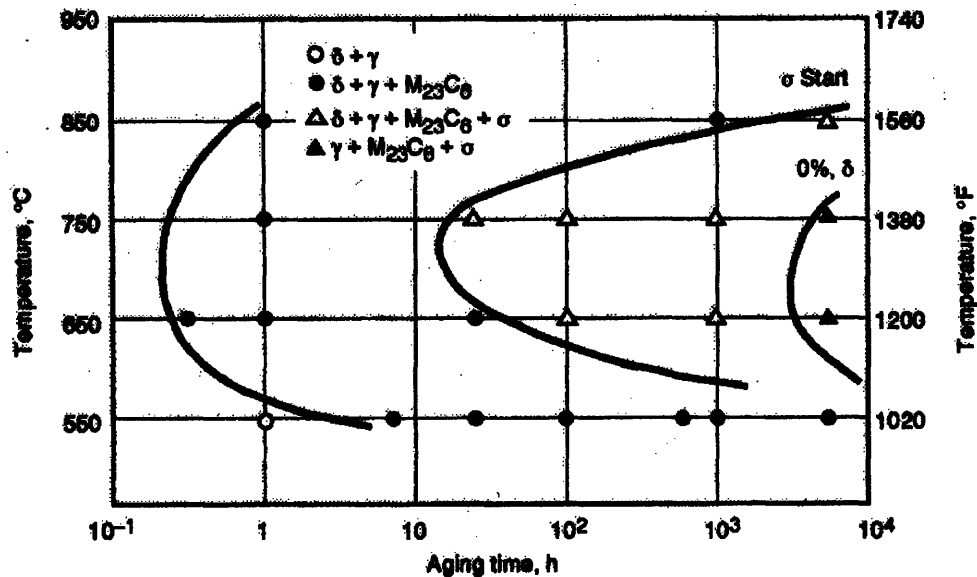


Figure 5: Time-temperature Transformation diagram for welded and aged type 308L alloy gas-tungsten arc welds.

While little to no carbide and sigma phase formation is expected when thermally aging at temperatures at or below 430°C, spinodal decomposition is expected. Spinodal decomposition is a process of phase separation in which the chromium rich α' phase separates from the iron α phase in the δ -ferrite.¹¹ The Gibb's free energy curve of the iron-chrome binary system at 400 C° is shown schematically in Figure 6. If the weight percent of chromium in the δ -ferrite is between α and α' , spinodal decomposition will occur in order to lower the free energy to where $\frac{\partial^2 G}{\partial c^2} = 0$. The resultant microstructure will have a sinusoidal composition profile with an average wavelength that is inversely proportional to $\frac{\partial^2 G}{\partial c^2} = 0$. Typical values in δ -ferrite have been experimentally measured at about 5 nm.¹²

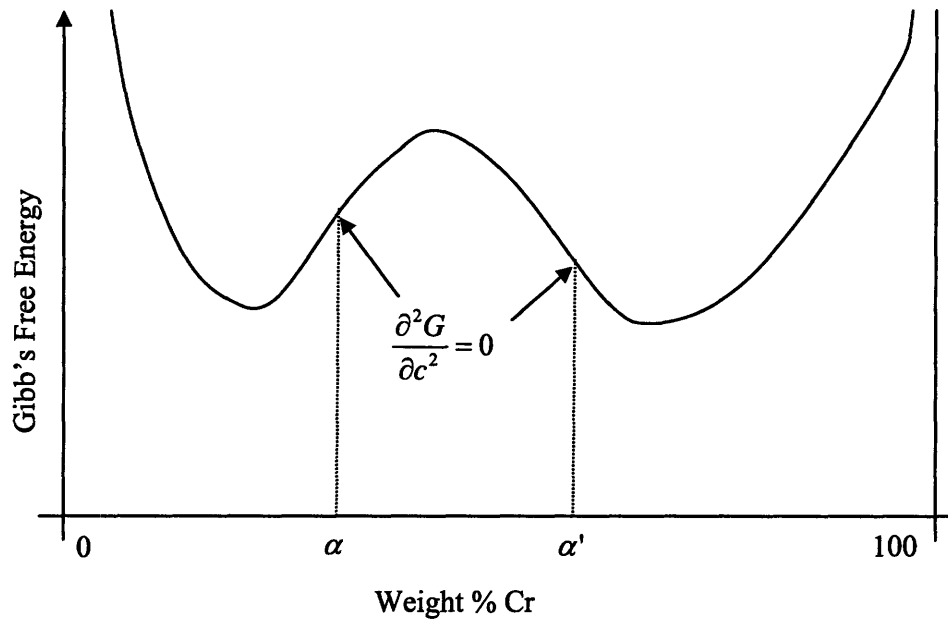


Figure 6: Free Energy schematic for Fe-Cr binary system.

As discussed, past work has been done to better understand the effects of thermal aging on SS microstructures and mechanical properties. But there have been no thorough studies on the effects of thermal aging on SCC growth rates. The main research effort in the overall program, of which the results reported here are a part, will compare the thermal aging effects on micro and nano-structure and mechanical properties to changes in SCC growth rates in 308L and 316L SS weld metals.

EXPERIMENTAL SETUP

Weldment Fabrication

Automated gas tungsten arc welds were made using two heats each of 316L and 308L filler metals. Materials, welding procedures and joint geometries are all consistent with BWR recirculation piping. The compositions of the weld wire are listed in Figure 7. Four welds were made in 2.5' long, 1.25" thick plates, one with each heat of weld wire. 304 and 316 SS base material was used for the plate welds corresponding to the 308L and 316L weld wires respectively. Six welds were made onto 316 pipes with a thickness of 1 5/8" thickness and 2' in diameter. Three of the pipe welds were with one heat of 316L, and three pipe welds with the other. All welds were made by the Electric Power Research Institute in Charlotte, NC in accordance with ASME Boiler & Pressure Vessel Code with qualified weld procedures and non-destructive testing (see Appendix C).

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu
316L W021437	0.015	1.75	0.35	0.014	0.017	19.2	12.3	2.61	0.05
316L HT 94780	0.022	1.85	0.44	0.001	0.021	19.34	12.68	2.51	0.26
308L HT2D280	0.015	1.93	0.530	0.013	0.027	19.62	10.96	0.09	0.220
308L HT228052	0.017	1.62	0.38	0.002	0.015	20.01	9.63	0.04	0.07

Figure 7: Weld Wire Chemistry

Figure 8 shows the weld preparation geometry that was used and is a typical design found in BWR recirculation piping weldments.

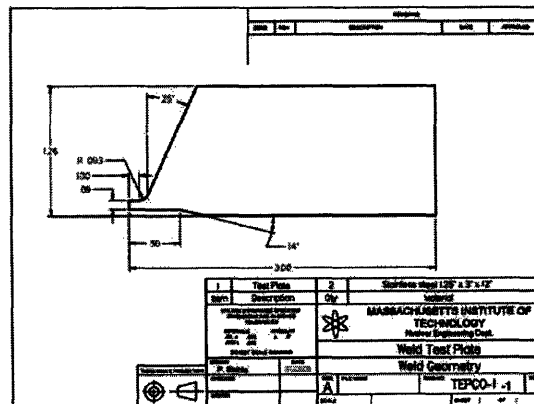


Figure 8: Weld Preparation Geometry

Figure 9 shows the pipe and plate welding set-up. Plates were done in the flat position while the pipes were done in the vertical position using an orbital GTA welder while rotating the pipe. The shielding gas was pure argon and all of the weld parameter sheets are contained in Appendix-A.



Figure 9: Photos of Pipe and Plate Welding

After welding, the pipe was cut into separate rings containing the welds and shipped to MIT along with the plates. The weld rings were marked for cutting, and each piece was stamped before cutting (Figure 10). The saw cuts of the pipe welds resulted in blanks of different sizes for use in making different specimens. The largest blanks are sized for making one inch thick compact tension (CT) specimens for J_{IC} and SCC growth rate testing. Medium sized blanks are sized for making transverse weld tension specimens with 0.25" diameter. Small blanks were cut for Charpy impact specimens.

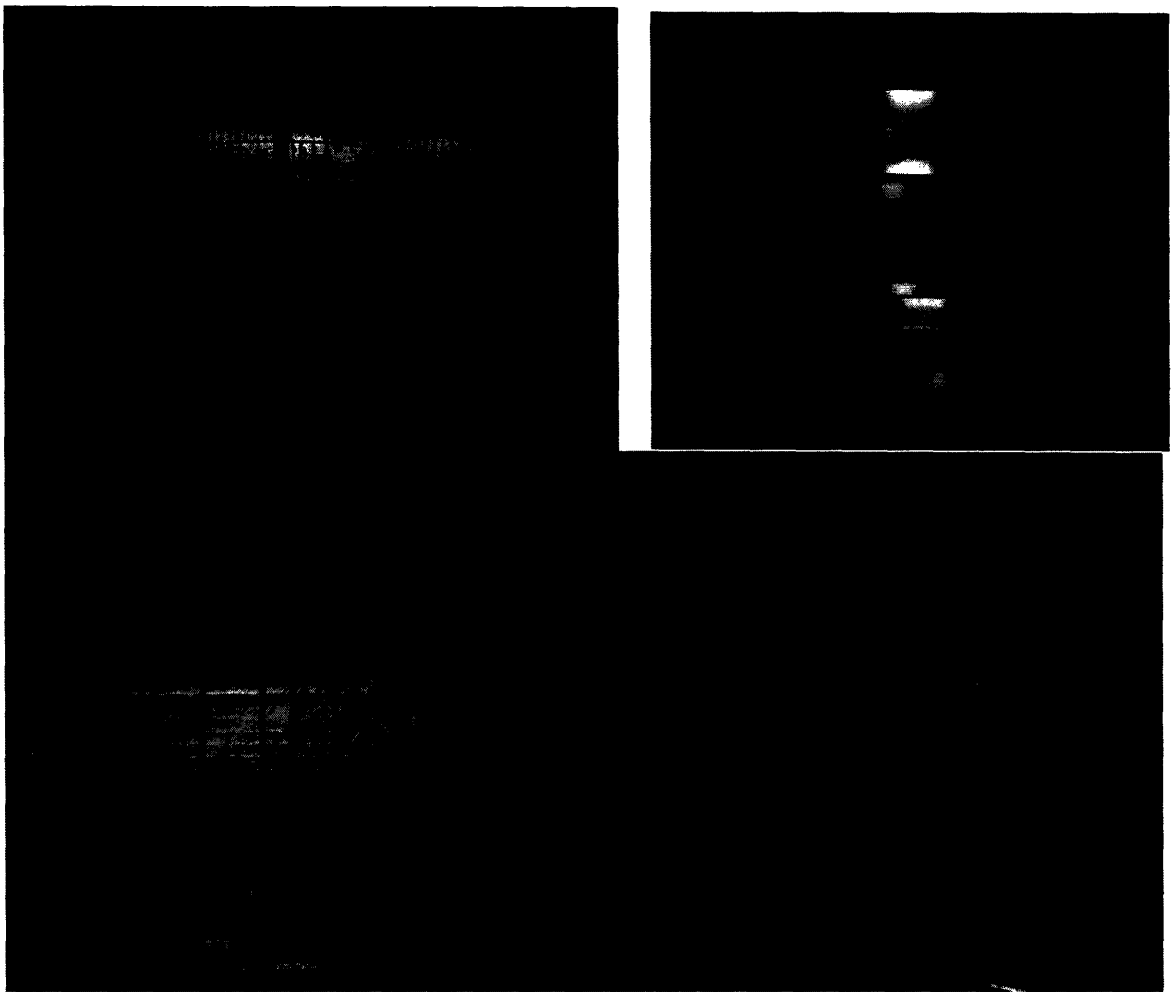


Figure 10: Photos of Typical Welded Pipe Rings and Plates

ASTM specifications require one inch thick CT specimens with a height and width near 2.5". Figure 11 shows the orientation of the compact tension specimen blanks that were

produced to accommodate for the fact that SCC grows from the inside diameter to the outside diameter. Since the wall thickness of the pipe is less than 2.5", extra material was electron beam (EB) welded onto the blanks cut from the pipe and plates.

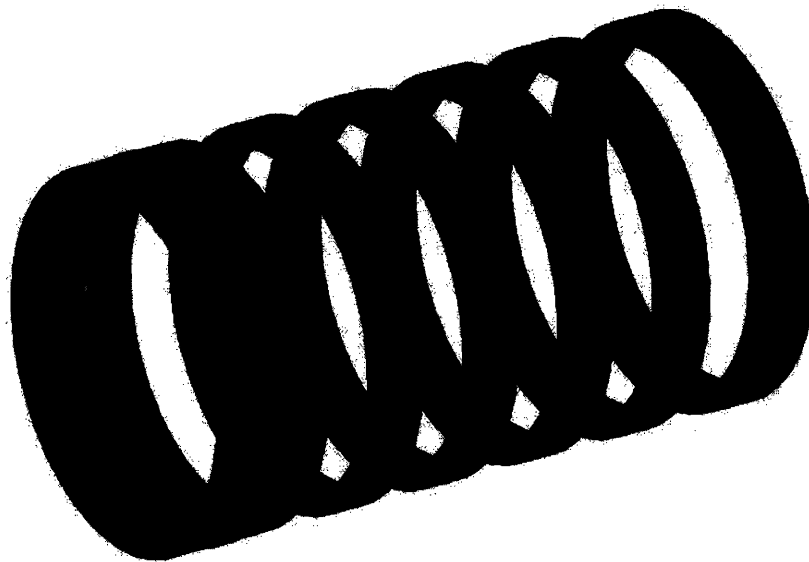


Figure 11: Pipe Weld Ring Configuration Showing CT Specimen Orientation

A representative sample of cut pipe and plate weld blanks is shown in Figure 12. The darker colored blanks were aged at 430 °C for 1000 hours. The thermal aging and testing matrix for all of the blanks is listed in Figures 13, 14 and 15. Following thermal aging, tensile, Charpy v-notch and CT specimen were machined out of the blanks. Aging times and temperatures were selected to increase the speed of thermal aging without causing micro-structural changes not present in the BWR environment (such as σ -phase). Maximum aging temperature was limited to 430 °C in order to prevent excess carbide and σ -phase per the experimental data in Figure 5. At the time of this writing, only as-welded and 1000 hour data were available. Also, some of the as welded 316L pipe weld material was sent to Japan for collaborative analysis as listed in the far right column of Figure 13.

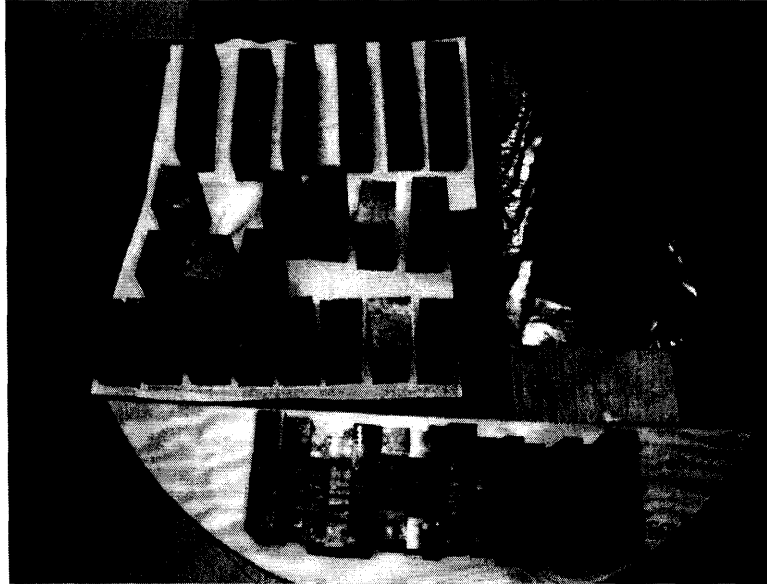


Figure 12: Sample Blanks Cut from the Pipe and Plate Welds

316L Pipe Specimen																							
316L-WO21437	As Welded	6	38	84	64	92	112	44	102	41T	41B	83T	83B	115T	115M	115B	2T	2M	2B	65	46	88	1/2 of WO21437-3
	400 °C	1,000	23	89	15	119	31	128	27	123	78T	78B	58T	58B	51T	51M	51B	110T	110M	110B	13		
		5,000	28	118	22	125	34	75	32	124	122T	122B	14T	14B	18T	18M	18B	126T	126M	126B	30		
		10,000	33	81	17	120	9	90	21	80	121T	121B	1T	1B	24T	24M	24B	66T	66M	66B	129		
316L-HT94789	As Welded	144	160	199	193	211	259	173	238	225T	225B	132T	132B	219T	219M	219B	142T	142M	142B	187	158	208	1/2 of HT94789-3
	400 °C	1,000	237	184	256	138	240	174	244	195	236T	236B	170T	170B	224T	224M	224B	169T	169M	169B	226		
		5,000	245	182	234	183	200	186	232	167	242T	242B	176T	176B	241T	241M	241B	175T	175M	175B	197		
		10,000	233	177	229	171	226	172	227	168	203T	203B	181T	181B	195T	195M	195B	230T	230M	230B	235		
#of Specimen	377																						

Figure 13: 316L Pipe Weld Blank Thermal Aging and Testing Matrix

308L Plate Specimen																
308L-HT228052-2	As Welded	327		334		338	320T	320B	325T	325B	324T	324M	324B	330T	30M	330B
	[Redacted]															
308L-HT20280-1	As Welded	305		311		309	302T	302B			303T	303M	303B			
	[Redacted]															
# of Specimen		62														

Figure 14: 308L Plate Weld Blank Thermal Aging and Testing Matrix

316L Plate Specimen																
316L-W021437-3	As Welded	274				275	271T	271B								
	[Redacted]															
316L-HT94789-4	As Welded	280		279		278	282T	282B			281T	281M	281B			
	[Redacted]															
# of Specimen		50														

Figure 15: 316L Plate Weld Blank Thermal Aging and Testing Matrix

Specimen Production

Compact Tension Specimens

CT specimens were, and will be, produced from the as-welded 316L pipe and 304 plate material. As of this writing all of the CT specimen blanks have been cut and are in the aging process. Two of the as-welded 316L blanks have been processed through to completed CT specimens and are currently on test. Below is a detailed description of the process through to finished CT specimen. The rough saw cut blanks were machined in preparation of EB welding. Figure 16 is a schematic of the sample after EB welding. The EB welding process was chosen for its high energy density resulting in essentially no distortion and minimal heat effected zone.

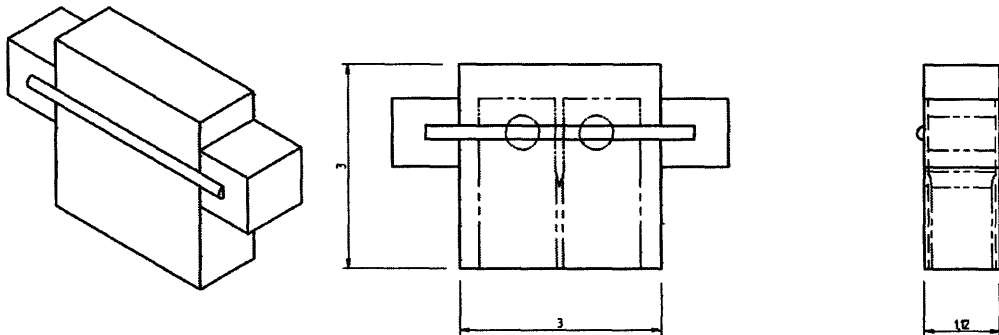


Figure 16: EB Weld Schematic

Following EB welding, the material was macro etched to reveal the location of the welds to insure proper water-jet cutting. Figure 17 is a representative sample of a CT specimen blank after EB welding. The EB weld was cross-sectioned at the edge of the sample and polished and etched.



Figure 17: CT Specimen following EB welding macro-etched to Show Location of GTA Weld

CT specimens were water-jet cut per the dimensions shown in Figure 18. The dimensions are consistent with ASTM E-647 and the International Cooperative Group on Environmentally Assisted Cracking standards.

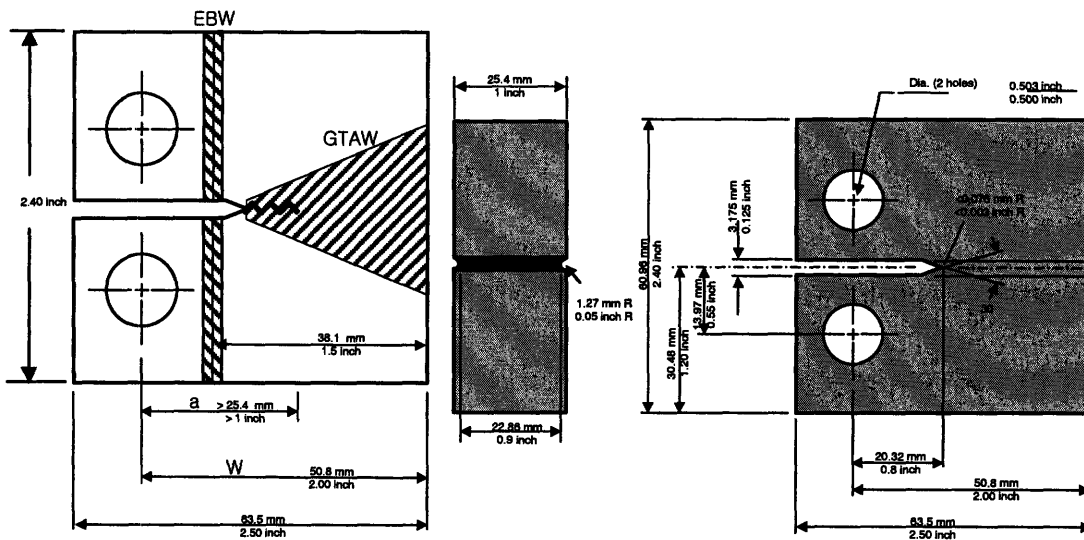


Figure 18: CT Specimen Drawing Showing Dimensions and Locations of EB and GTA Welds

Figure 19 shows a completed CT sample macro-etched with a Marbles reagent [150 mL HCl, 30 g CuSO₄ (copper sulfate), 150 mL H₂O] to show the location of the EB and GTA welds.

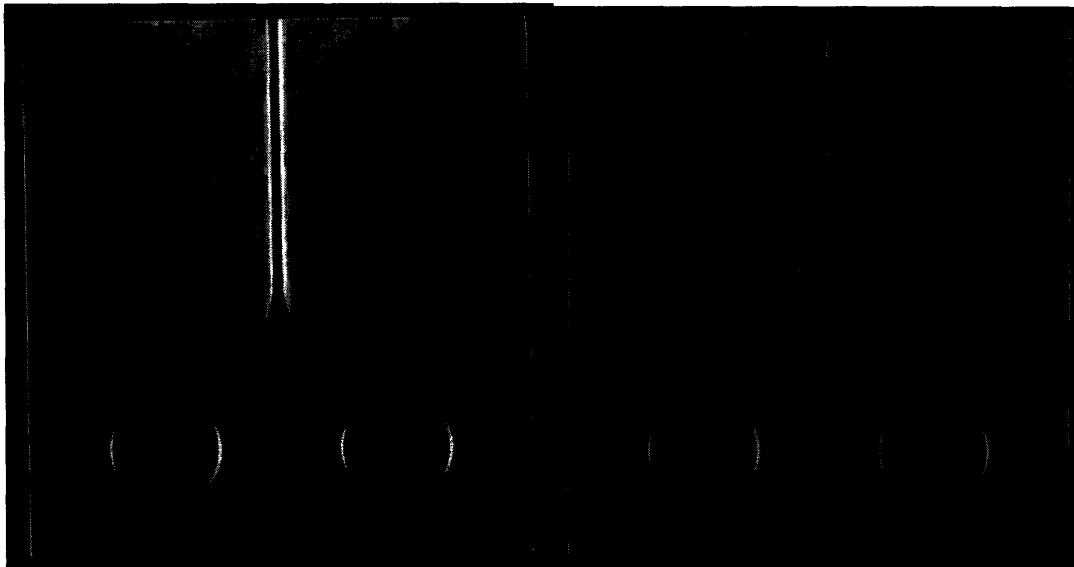


Figure 19: CT Specimens Macro-etched Showing Locations of EB and GTA Welds

Charpy V-Notch Specimens

Three Charpy V-notch impact specimens were able to be machined per ASTM E-23 from one blank. The specimens were labeled by the blank number and either “T”, “M”, or “B” for “top,” “middle,” and “bottom” respectively. Figure 20 shows the orientation of the specimens with the V-notch facing the weld root.

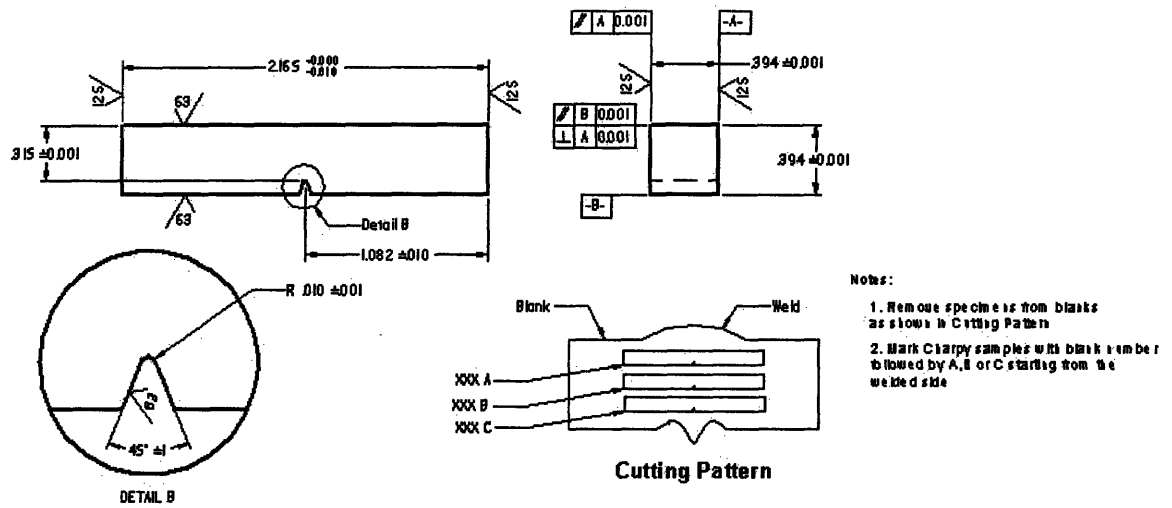


Figure 20: Charpy V-notch Specimens Drawings Showing Orientation with respect to the Weld

Tensile Specimens

Two transverse weld tension specimens could be machined out of one blank. The specimens were labeled with the blank number and “T” for “top” and “B” for “bottom.” Figure 21 shows the dimensions of the specimen used. The diameter of the specimens was set at 0.25” in order to include at least 10 grain boundaries across the diameter per ASTM E-8 specifications.

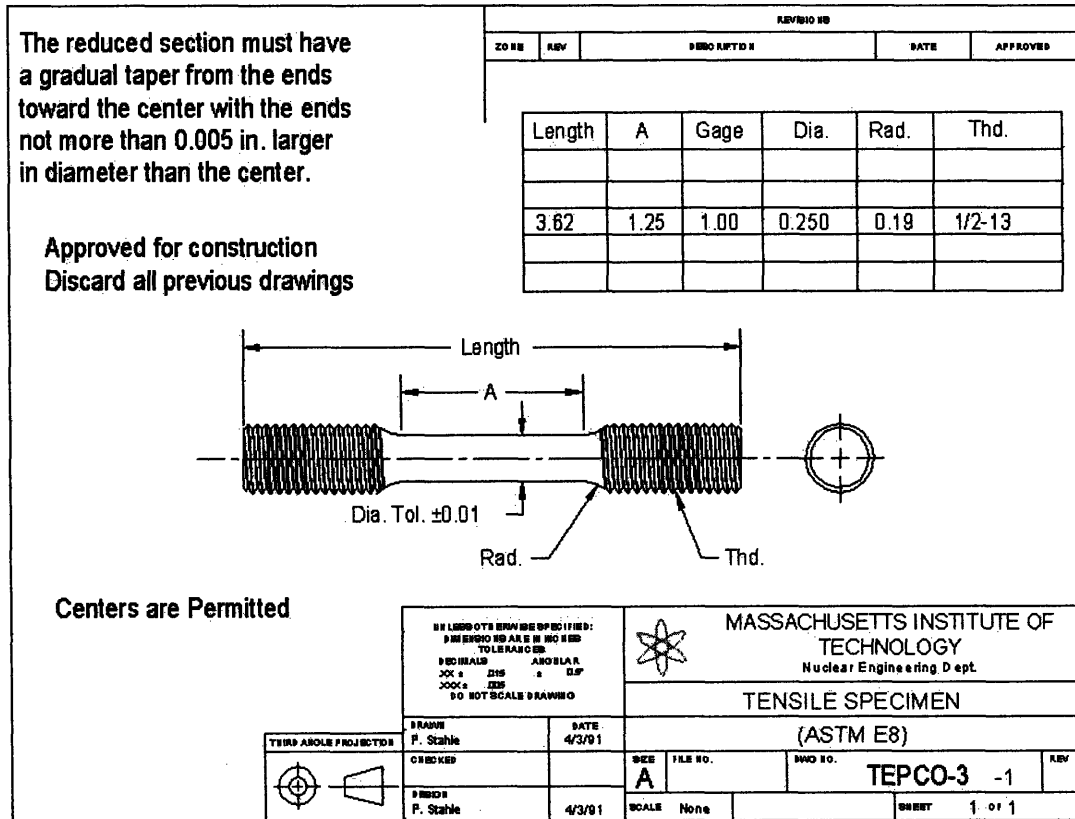


Figure 21: Tensile Specimens Drawing

Autoclave SCC Crack Growth Rate Testing System

A new SCC growth rate test system was designed and developed for this study under consultation with the experienced scientists and engineers at G.E. Global Research. It is a closed loop system using ultra-high purity water and has the capability to introduce dissolved gasses and impurities. The system operates at 10.4 MPa (1500 psi) and 288°C. The system is capable of operation over the oxygen range from essentially zero (< 2 ppb) to air (or oxygen) saturated conditions with adjustable conductivity. The initial water supply is of theoretical purity. Tests will be conducted at constant stress intensity factor (K) conditions using DC potential drop techniques for crack length measurement. The system control software is capable of allowing high flexibility in terms of the test schedule (number of values of K, increments in crack length, etc.) and chemistry changes.

In addition to crack growth rate measurements, crack initiation measurements can be conducted using statically loaded smooth specimens. Crack initiation in this case will be monitored using AC potential drop techniques. Figure 22 is a schematic of the SCC test system.

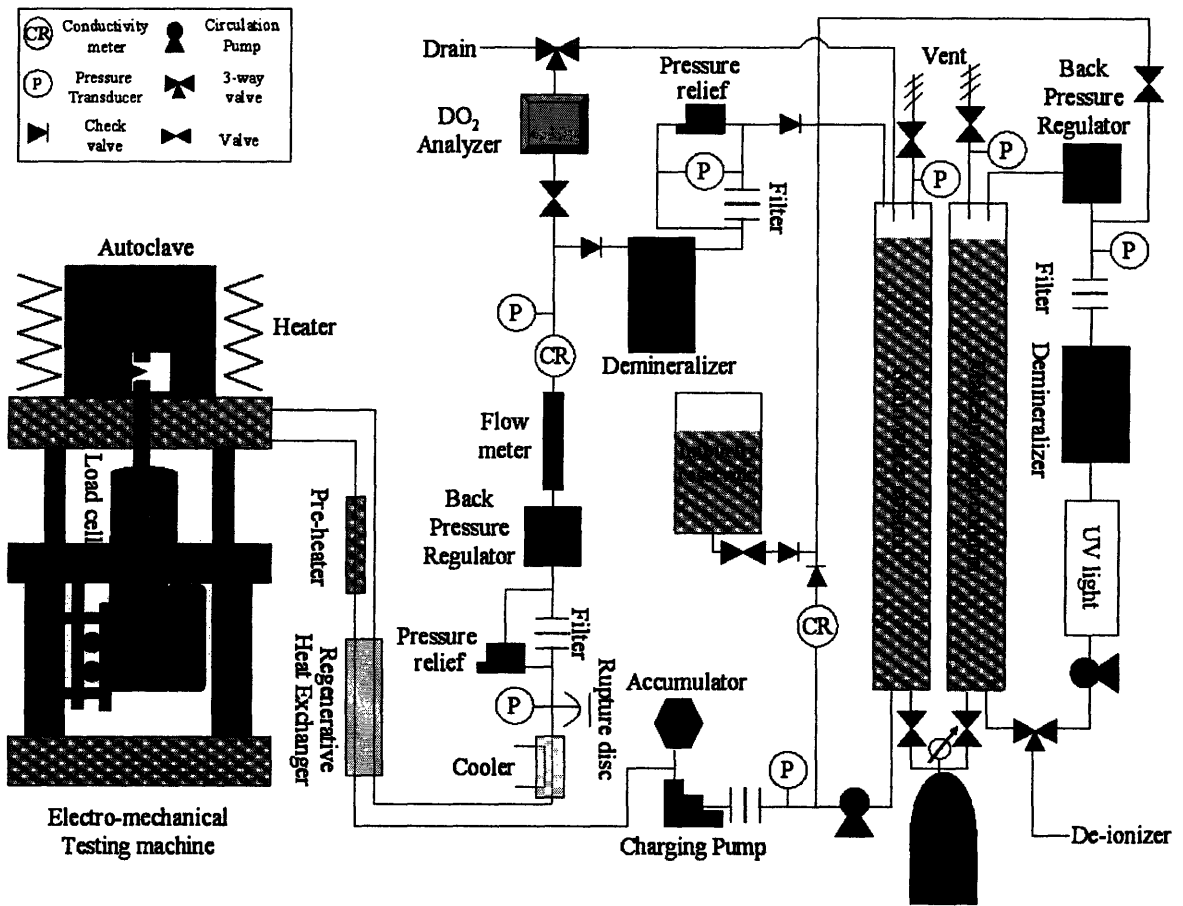


Figure 22: SCC Test System Schematic

All high temperature components, including the autoclave, are made of titanium or titanium alloys. The low temperature metal components in the loop are made from stainless steel. Water from the glass main water column is drawn through a booster/re-circulation pump where it splits. The majority of the water mixes with the demineralized and filtered water that had exited the autoclave and returns to the glass column. This recirculation is necessary for mixing when impurities are injected and also to aid in mixing in dissolved gasses.

12 liters (about three gallons) an hour leaves the booster/re-circulation pump and goes to the charging pump where the pressure increases to 10 MPa (1500 PSI). This water is heated in the regenerative heat exchanger and pre-heater before entering the autoclave. The autoclave also has an external heater to maintain a constant temperature. The water leaving the autoclave is cooled in the regenerative heat exchanger and cooler before reducing pressure to about 0.04 MPa (6 PSI) at the back pressure regulator. Conductivity is then measured before the water is demineralized, filtered, and returned to the glass column. A dissolved O₂ meter is placed on a separate sampling line before the demineralizer and empties to drain. A separate make-up water loop is provided for any water losses that may occur during the multiple month testing. Figures 23 and 24 show the actual SCC test system and data acquisition and control hardware.

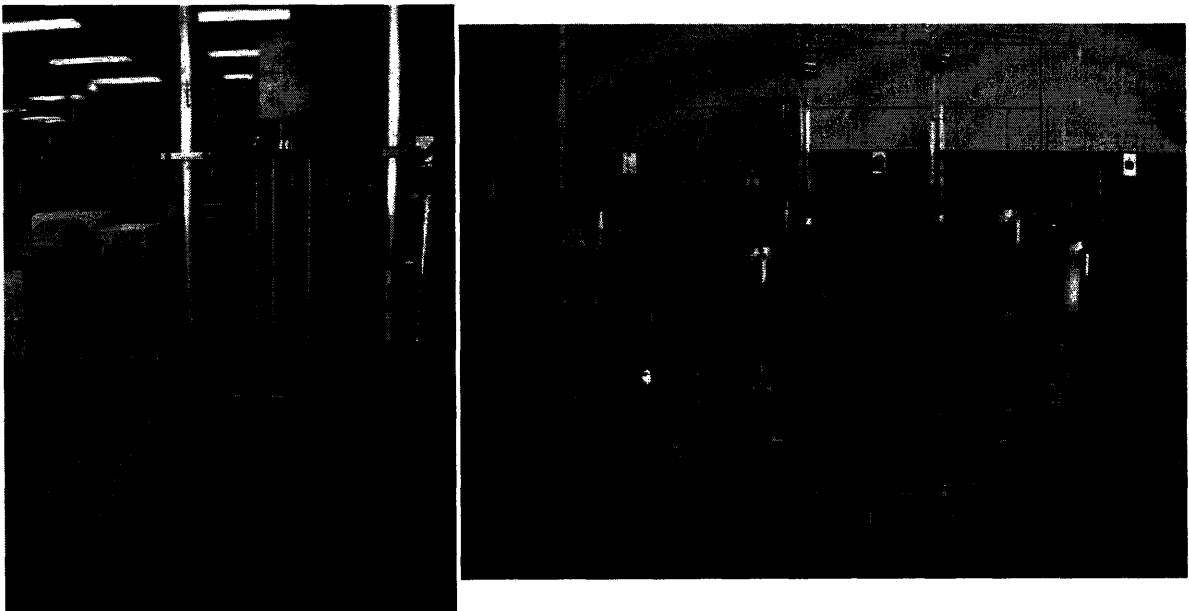


Figure 23: SCC Test System Showing the Autoclave and Water Loops

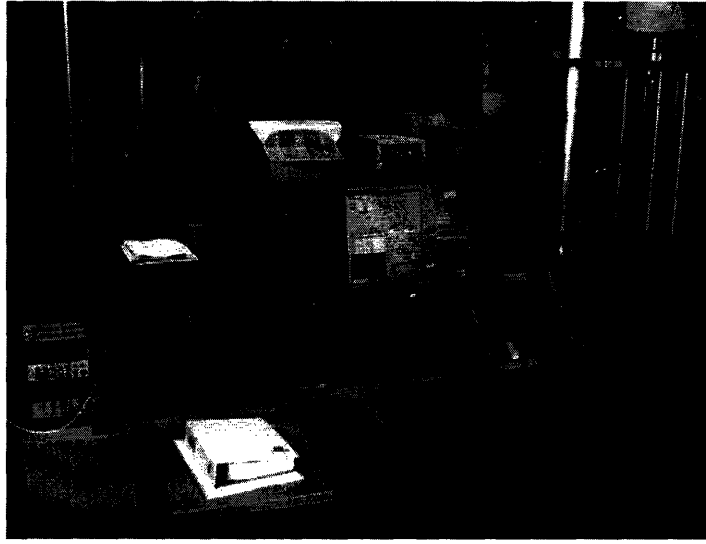


Figure 24: SCC Test System Control and Data Acquisition Hardware

INITIAL RESULTS

Room temperature transverse weld tensile testing was conducted at MIT on as-welded and 1000 hour aged specimen (Figure 25). The data show increases in average yield strength and ultimate yield stress due to thermal aging. Thermal aging for 1000 hours acts to increase the yield strength by 5% and ultimate tensile stress by 7% of both heats of 316L SS weld metals. The differences in composition between heat W021437 and HT94789 resulted in different as-welded average yield strengths of 483 MPa (70 KSI) and 510 MPa (74 KSI).

Room Temperature Tensile Data												
		Yield (KSI)	Avg. Yield (KSI)	Ultimate (KSI)	Avg. Ultimate (KSI)	Elongation (%)	Avg. Elongation (%)	Reduction in Area (%)	Avg. Reduction in Area (%)			
316L	W021437	As Welded	41T	68.1	70	87.3	89	31	29	59	60	
			41B	76		92.3		21		49		
			271T	68.9		85		29		63		
			271B	67.2		90.6		36		69		
		1000 hrs. 400°C	78T	72.2	73	91.8	95	39	35	64	62	
			78B	74.7		97.3		30		59		
	1000 hrs. 430°C	72T	72.5	73	95.1	96	33	27	64	71		
		72B	72.9		97.6		20		77			
	316L	HT94789	As Welded	225T	77.9	74	92.7	91	33	34	69	74
				225B	71.8		91		27		65	
				282T	67.8		86.1		27		77	
				282B	77.7		94.7		50		84	
1000 hrs. 400°C			236T	80.5	78	100.5	99	36	30	69	75	
			236B	74.7		97.5		23		81		
1000 hrs. 430°C		143T	74.8	78	100.7	100	24	21	59	70		
		143B	81.3		98.3		17		81			
308L		HT228052	As Welded	320T	67.8	70	89.4	91	32	33	73	73
				320B	71.3		92.2		34		73	
	HT20280	As Welded	302T	62.9	67	81	86	33	34	73	73	
			302B	70.1		90		34		73		

Figure 25: Room Temperature Tensile Data for As-Welded and 1000 Hr. Aged Material

The non-homogenous nature of the weld micro-structures resulted in scattered elongation and reduction in area data. The location of failure varied among the specimen from the center to near the ends, and the fracture surfaces had a range of angles and topography. Figures 26, 27 and 28 show the ductile nature of the yielded surfaces of the tensile specimens. The topography varies from specimen to specimen depending on the location

of failure. Failures occurred in the weld metal, base material and potentially the heat affected zone. A more thorough analysis of the fracture surfaces was underway at the time of this writing.

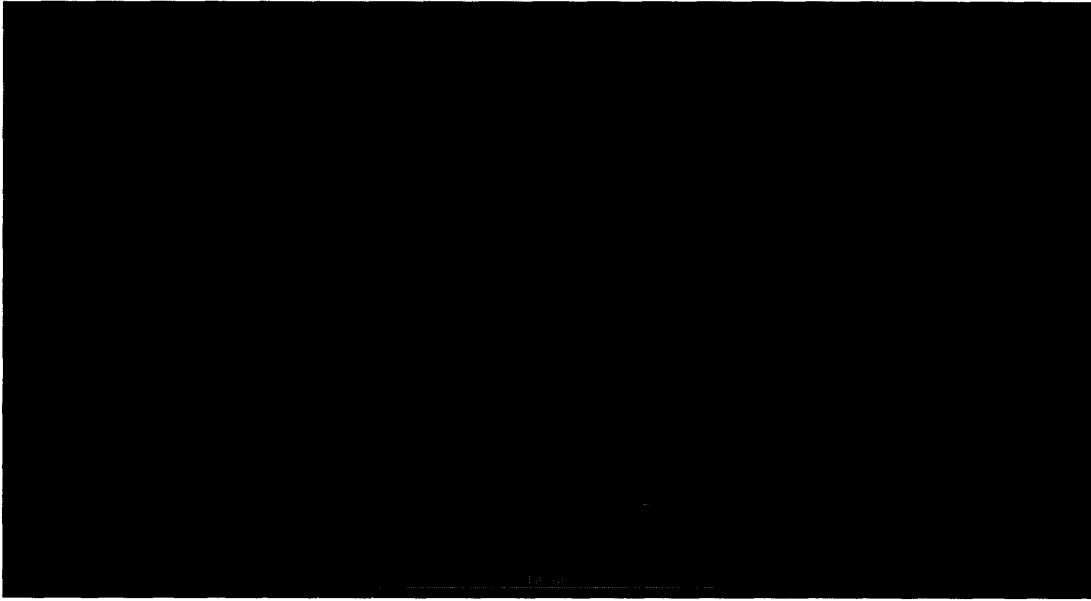


Figure 26: Tensile Specimen 72B, 250X

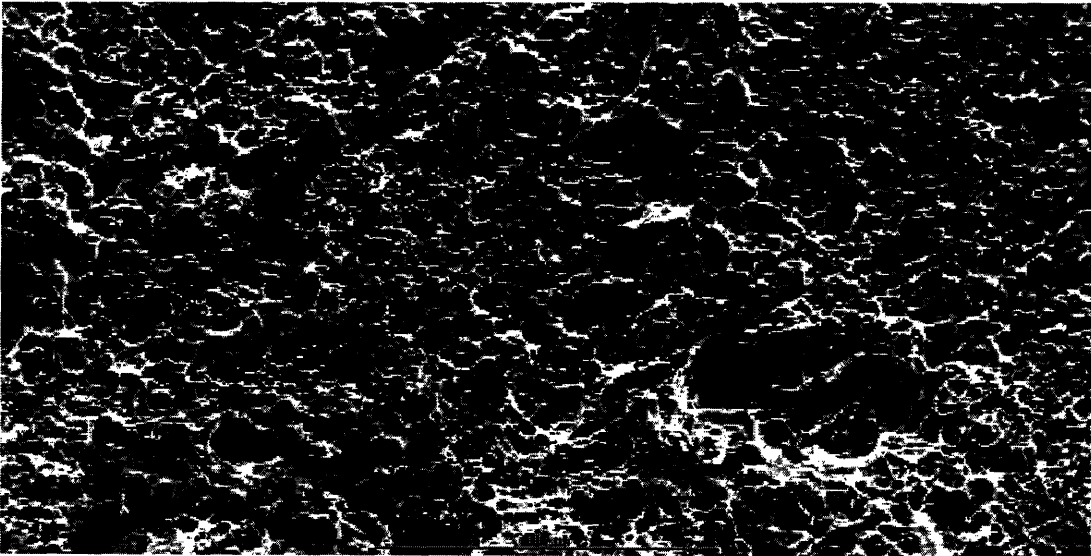


Figure 27: Tensile Specimen 143T, 250X



Figure 28: Tensile Specimen 271B, 250X

Figure 29 is a stress vs. strain plot of the as-welded 316L pipe with heat number W021437. Yield strength was determined by drawing a line with the same slope as the linear region of the data and offsetting by 0.2% per ASTM standards. Ultimate Yield strength is the maximum stress that the material experienced. Stress is calculated by dividing the force by the original diameter, and not the actual diameter that changes during testing. This is commonly referred to as “engineering stress”. All of the tensile data is contained in Appendix E.

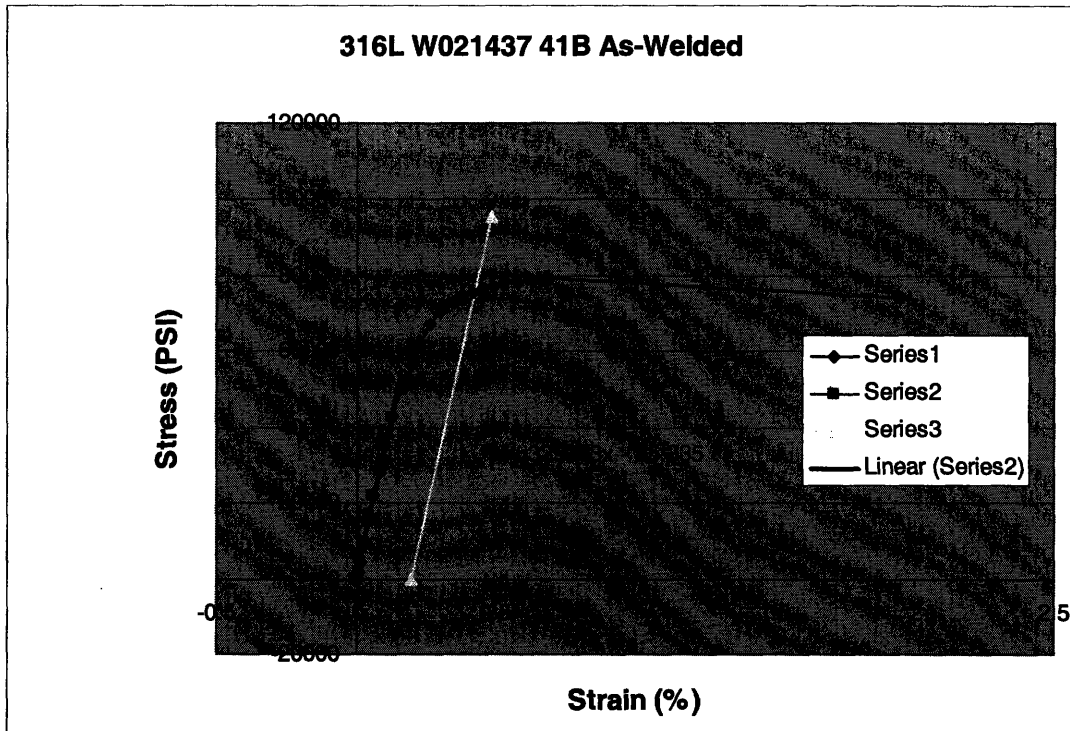


Figure 29: Representative Tensile Stress vs. Strain Plot with 0.2% offset determining Yield Stress

Results for room temperature and 288°C Charpy v-notch impact toughness testing are contained in Figures 30 and 31 respectively. Testing was performed by Laboratory Testing in Hatfield, PA. Appendix D contains Laboratory Testing’s qualifications issued by the National Institute of Standards and Technology. Charpy v-notch impact toughness testing shows thermal aging lowers impact energy in both heats of 316L.

Room Temperature Charpy Data								
			Impact Energy (Ft-lbs)	Avg. Impact Energy (Ft-lbs)	Lateral Exp. (inches)	Avg. Lateral Exp. (inches)	% Shear	
316L	W021437	As Welded	115T	141	118	0.103	0.101	100%
			115M	120		0.109		100%
			115B	128		0.092		100%
		1000 hrs. 400°C	51T	82	85	0.069	0.074	100%
			51M	84		0.078		65%
			51B	90		0.074		100%
		1000 hrs. 430°C	7T	80	89	0.082	0.083	100%
			7M	95		0.072		100%
			7B	91		0.094		100%
	HT94789	As Welded	219T	151	146	0.106	0.103	100%
			219M	185		0.095		100%
			219B	138		0.104		100%
			281T	96		0.099		100%
			281M	140		0.104		100%
			281B	163		0.107		100%
		1000 hrs. 400°C	224T	57	74	0.057	0.067	40%
			224M	94		0.084		65%
			224B	70		0.06		40%
1000 hrs. 430°C		153T	49	47	0.054	0.050	40%	
		153M	45		0.044		35%	
		153B	48		0.051		40%	
308L	HT228052	As Welded	324T	143	142	0.093	0.094	100%
			324M	152		0.095		100%
			324B	130		0.093		100%
	HT20280	As Welded	303T	156	141	0.104	0.095	100%
			303M	134		0.098		100%
			303B	134		0.082		100%

Figure 30: Room Temperature Charpy V-Notch Impact Toughness Data for As-Welded and 1000 Hr. Aged Material

288°C Charpy Data								
			Impact Energy (Ft-lbs)	Avg. Impact Energy (Ft-lbs)	Lateral Exp. (inches)	Avg. Lateral Exp. (inches)	% Shear	
316L	W021437	As Welded	2T	163	150	0.083	0.088	100%
			2M	150		0.091		100%
			2B	161		0.091		100%
		1000 hrs. 400°C	110T	126	133	0.1	0.087	100%
			110M	125		0.087		100%
			110B	148		0.075		100%
		1000 hrs. 430°C	77T	136	135	0.103	0.094	100%
			77M	114		0.098		100%
			77B	155		0.081		100%
	HT94789	As Welded	142T	251	241	0.076	0.082	100%
			142M	278		0.096		100%
			142B	195		0.075		100%
		1000 hrs. 400°C	169T	235	192	0.08	0.084	100%
			169M	173		0.093		100%
			169B	168		0.08		100%
1000 hrs. 430°C		252T	166	190	0.075	0.073	100%	
		252M	222		0.077		100%	
		252B	182		0.068		100%	
308L	HT228052	As Welded	330T	253	221	0.101	0.084	100%
			330M	188		0.091		100%
			330B	223		0.061		100%

Figure 31: 288°C Charpy V-Notch Impact Toughness Data for As-Welded and 1000 Hr. Aged Material

Composition differences between heats W021437 and HT94789 resulted in room temperature as-welded average impact energies of 118 and 146 ft-lbs, respectively. Testing at 288 °C yielded impact energies of 150 and 241 ft-lbs for as-welded heats W021437 and HT94789 respectively. Room temperature impact toughness was reduced by 49% after aging for 1000 hours at 400 °C and 68% after 1000 hours at 430 °C for HT94789. Testing at 288 °C in the aged specimen reduced the impact toughness by 11% for heat W021437 and 21% for heat HT94789. The effect of thermal aging is

significantly different between the two heats and further research into the fractography, composition, and nano/micro-structure could yield better insight.

As welded and 1000 hour aged samples were polished and etched for 15 seconds in a modified Murakami's reagent (30 grams of $K_3Fe(CN)_6$, 30 grams of KOH, and 150 mL H_2O) at 95 °C to color δ -ferrite brown. Figures 32 through 35 show the δ -ferrite morphology of the as-welded specimen. No changes due to thermal aging were observed in the ferrite morphology with optical or SEM. Changes due to spinodal decomposition would only be observable with the higher resolution of an atom probe.



Figure 32: As-Welded 316L HT94789 Etched to Show δ -ferrite (500X)

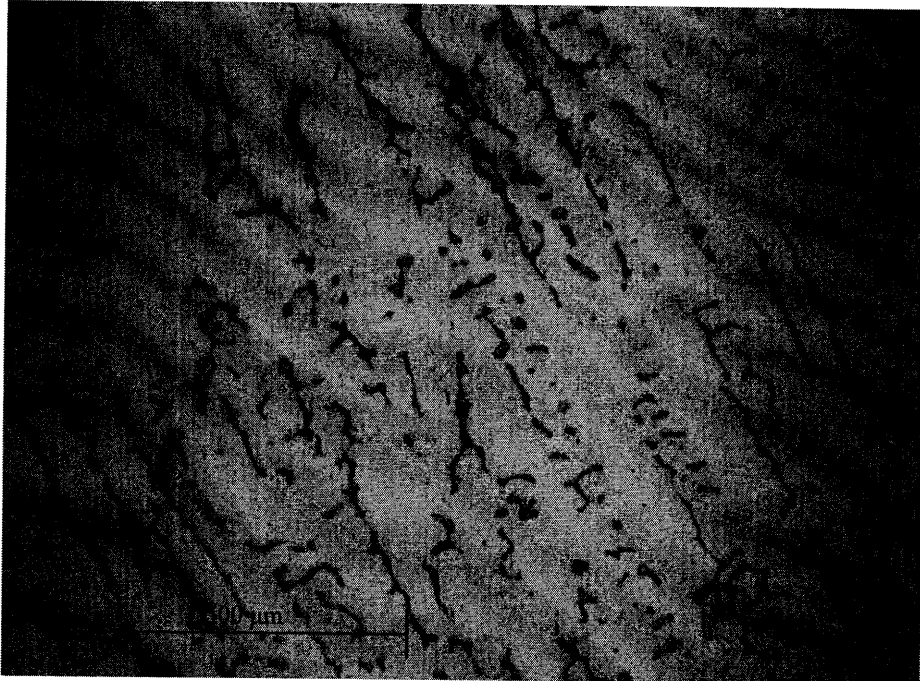


Figure 33: As-Welded 316L W021437 Etched to Show δ -ferrite (500X)

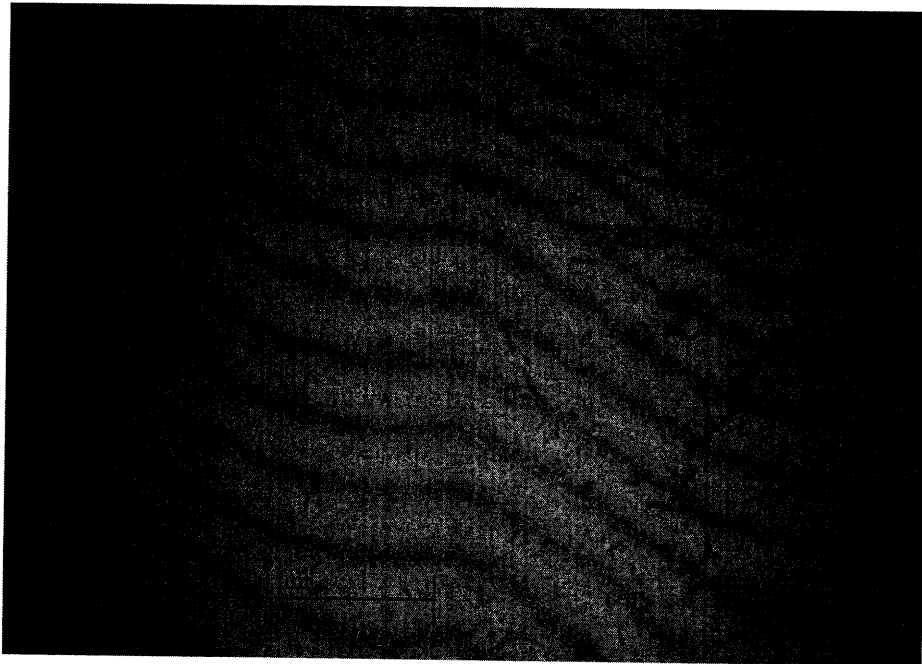


Figure 34: As-Welded 308L HT228052 Etched to Show δ -ferrite (500X)

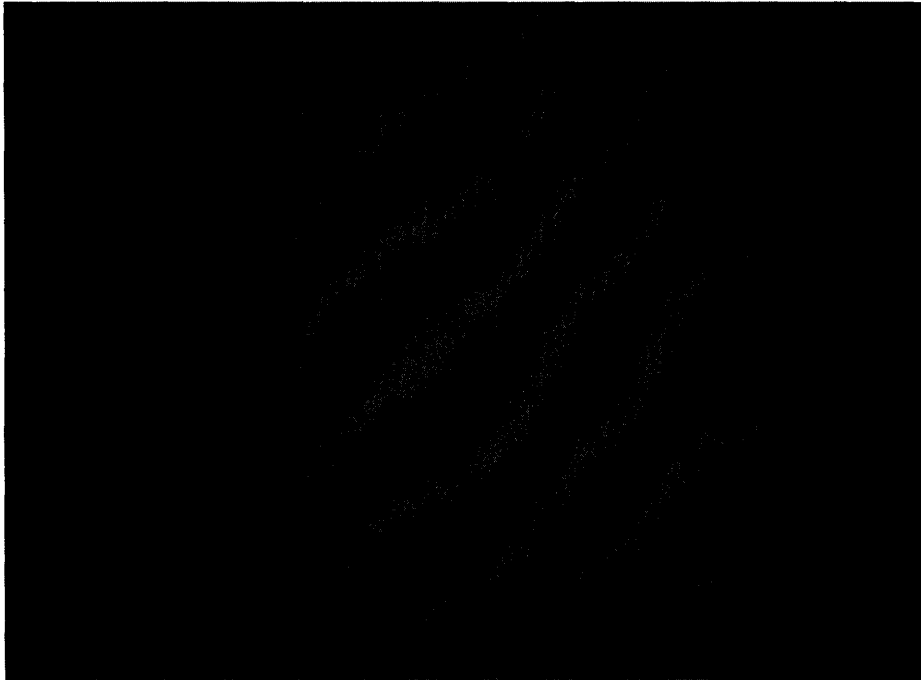


Figure 35: As-Welded 308L HT20280 Etched to Show δ -ferrite (500X)

CONCLUSIONS

The overall progress of the study is as follows:

Measurement of the SCC growth rates of 316L and 308L stainless steel weld metals with varying compositions and aging times and temperatures in typical BWR environments is currently underway. The effects of composition and thermal aging on mechanical properties (i.e. tensile, micro-hardness, nano-hardness, J_{IC} , and Charpy-impact toughness) is in process and initial results show an increase in yield strength and a decrease in fracture toughness after aging for 1000 hours at 430 and 400 °C.

Determining the effect of composition and thermal aging on changes in micro and nano-structure is underway. Initial results with samples aged for 1000 hours show no discernable changes to the micro-structure with optical and SEM analysis. Changes in the nano-structure due to spinodal decomposition of the delta ferrite is suspected to have occurred. Further analysis using different echants and other techniques such as

Transmission Electron Microscopy and Atom Probe could reveal spinodal decomposition and quantify the degree. As SCC growth rate data become available, a comparison between the thermal aging effects on structure and mechanical properties to changes in SCC growth rates would be possible.

The Conclusions of this thesis were as follows:

An experimental program was designed to explore the effect of thermal aging on the SCC crack growth rate in weld materials for type 316 and 304 stainless steels. Welds were produced in large diameter (or similar) stainless steel piping with the following characteristics:

- c. Type 316L and 308L weld materials
- d. Two different ferrite numbers

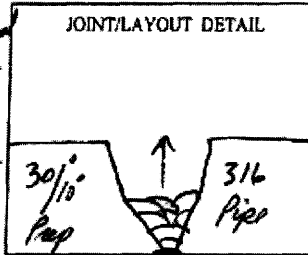
An autoclave facility was designed and constructed for the measurement of SCC crack growth rates under BWR conditions and testing is currently underway. Sample “blanks” were produced for the overall project and the initiation of the overall aging test matrix. Tensile and Charpy data of the as-received and “early aged” welds show an increase in yield strength and decrease in impact toughness due to thermal aging. Thermal aging results in no discernable changes to the δ -ferrite morphology when viewed optically at 500 X magnifications and in the SEM.

APPENDIX

Appendix A: Weld Parameter Sheets

Weld Parameter Sheet

Technician Boswell/Lathrop
 Date _____
 Position IG Rotated
 Direction of Travel Weld up
 Preheat Room Temp 72°F
350°F Interpass Temp
 Pulse Control: Sync.
 P.A.



Page _____ of _____
 Material 316
 Size & Sch. 24" 15R T
 Filler: Type 316L
 & Size .045
 Arc Voltage: Continuous
Sampled

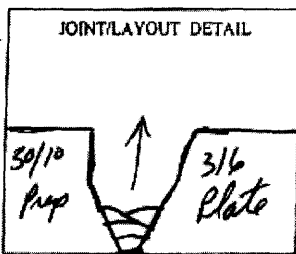
Equipment: Dimatix Gold Track II Pipe Welding System

PARAMETER	Weld Pass Number						
	Root	Hot	1	2	3	Balance	Cap
Layer Number							
Current, Primary	180	180	200	220	240		220
Current, Background	80	80	100	120	140		140
Volts, Primary	9.6	9.4	9.6	9.7	9.7		9.7
Volts, Background							
Wire Speed, Primary	12	25	30	35	35		30
Wire Speed, Background	10	15	20	25	25		20
Oscillation Amplitude	.01	.06	.15	.2	.2		.15
Out Dwell	.1	.3	.5	.5	.5		.5
Excursion Time	.1	.2	.4	.5	.5		.4
In Dwell	.1	.3	.5	.5	.5		.5
Actual Travel Speed							
Travel Speed	2.5	2.8	2.9	3.0	3.0		3.0
Travel Start Delay							
Down Slope Time							
Up Slope Time							
Total Time							
I Average							
V Average							
WFS Average							
KJ/Inch							
MJ/Inch ³							
MJ							
Deposited Pounds/Hour							

316 Pipe	Notes	316 Pipe
Lower Ferrite		Higher Ferrite
ID# 316L-HT 94789-1		ID# 316L-WO 21437-1
" " " " " -2		" " " " " -2
" " " " " -3		" " " " " -3

Weld Parameter Sheet

Technician R. Lathwood
 Date R. Danner
 Position Flat
 Direction of Travel _____
 Preheat Room Temp 72°F
350°F Inter pass Temp
 Pulse Control: Sync.
 P.A.



Page _____ of _____
 Material 316
 Size & Sch. 1 1/4" plate
 Filler: Type 316 L
 & Size .045
 Arc Voltage: Continuous
Sampled

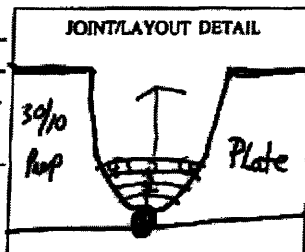
Equipment: Dimetries Gold Track II Pipe welding System

PARAMETER	Weld Pass Number						Sample to cap
	Root	Hot	1	2	3	4	
Layer Number							
Current, Primary	180	180	220	240	240	240	
Current, Background	70	70	140	150	150	150	
Volts, Primary	9.6	7.5	9.6	7.7	9.7	9.7	
Volts, Background							
Wire Speed, Primary	12	25	35	35	35	35	
Wire Speed, Background	8	15	25	25	25	25	
Oscillation Amplitude	.01	.06	.15	.25	.30	.30	
Out Dwell	1	3	5	5	5	5	
Excursion Time	1	2	4	5	7	7	
In Dwell	1	3	5	5	5	5	
Actual Travel Speed							
Travel Speed	2.8	2.8	2.9	2.9	2.9	2.9	
Travel Start Delay							
Down Slope Time							
Up Slope Time							
Total Time							
I Average							
V Average							
WFS Average							
KJ/Inch							
MJ/Inch ³							
MJ							
Deposited Pounds/Hour							

Notes	
<p> <u>Plate 3</u> ID # 316L-W021437-3 Higher Ferrite </p>	<p> <u>Plate 4</u> ID # 316L-94789-4 Lower Ferrite </p>

Weld Parameter Sheet

Technician _____
 Date _____
 Position _____
 Direction of Travel _____
 Preheat _____



Page _____ of _____
 Material 304SS Plate
 Size & Sch. _____
 Filler: Type _____
 & Size _____
 Arc Voltage: Continuous
 Sampled

Pulse Control: Sync.
 P.A.

FLAT

PARAMETER	Weld Pass Number								
	1	2	3	4	5	6			
Layer Number									
Current, Primary	180	180	220	240	230	250			
Current, Background	90	90	140	170	150	150			Balance
Volts, Primary									
Volts, Background									
Wire Speed, Primary	12	25	35	35	35	35			
Wire Speed, Background	9	15	25	25	25	25			
Oscillation Amplitude	.01	.06	.13	.24	.30	.30			
Out Dwell	1	3	5	5	5	5			
Excursion Time	1	2	4	5	6	6			
In Dwell	1	3	5	5	5	5			
Actual Travel Speed									
Travel Speed	2.9	2.8	2.8	2.8	2.7	2.7			
Travel Start Delay	5	5	5	5	5	5			
Down Slope Time	7	7	7	7	7	7			
Up Slope Time	3	3	3	3	3	3			
Total Time									
I Average									
V Average									
WFS Average									
KJ/Inch									
MJ/Inch ³									
MJ									
Deposited Pounds/Hour									

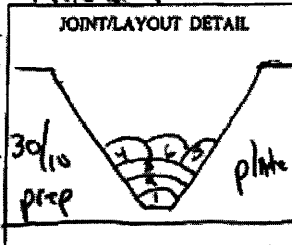
Notes

Plate 2
 ID # 308L HT 228052-2
 High Ferrite

Weld Parameter Sheet

Plate # 1

Technician _____
 Date _____
 Position _____
 Direction of Travel _____
 Preheat _____



Page _____ of _____
 Material 304 plate
 Size & Sch. 1 5/8 T
 Filler: Type _____
 & Size _____
 Arc Voltage: Continuous
 Sampled

FLAT

PARAMETER	Weld Pass Number						→ Stone to cap
	1	2	3	4	5	6	
Layer Number							
Current, Primary	180	180	220	240	260	260	
Current, Background	90	80	140	170	170	170	
Volts, Primary	9.8	9.8	10.0				
Volts, Background							
Wire Speed, Primary	12	25	35	35	35	35	
Wire Speed, Background	8	15	25	25	25	25	
Oscillation Amplitude	.01	.06	.15	.24	.30	.30	
Out Dwell	1	3	5	5	5	5	
Excursion Time	1	2	4	5	7	7	
In Dwell	1	3	5	5	5	5	
Actual Travel Speed	2.9	2.8	2.8	2.3	2.7	2.7	
Travel Speed	2.9	2.8	2.8	2.3	2.7	2.7	
Travel Start Delay	5	5	5	5	5	5	
Down Slope Time	9	9	9	9	9	9	
Up Slope Time	2	2	2	2	2	2	
Total Time							
I Average							
V Average							
WFS Average							
KJ/Inch							
MJ/Inch ²							
MJ							
Deposited Pounds/Hour							

Notes

Plate # 1
 IO # 308 HT 20280-1

Certification of Analysis

Date: 02/21/06

Euroweld, Ltd.
 255 Rolling Hills Road
 Mooresville, NC 28117 USA
 704/862-3663 FAX:704/862-8820
 http://www.euroweld.com
 E Mail: euroweld@pobox.com

Sold To:	Ship To:

ITEM	SIZE	GRADE	LOT/HEAT NO.	QUANTITY
1	.045"	ER308L	2D260	

SPECIFICATION: AWS A5.9-03 / ASME-SFA 5.9	ER308L
---	--------

CERTIFIED MATERIAL TEST REPORT (GMTR) ACTUAL CHEMICAL ANALYSIS (%)									
C	Mn	Si	S	P	Cr	Ni	Mo	Nb	N
0.015	1.93	0.530	0.013	0.027	19.62	10.86	0.080		0.032
O ₂	Ti	Al	V	Cu	Fe	As	Sn	Sb	Total
				0.220	Bal.				Others <0.50

ADDITIONAL TEST RESULTS

Ferrite: WRC-62 7.2 FN
 Hardness:
 X-Ray:

Bends:
 Toughness:
 Tensiles:
 Yield:
 Tensile
 Elong.
 Red. Of Area

As-Welded Heat Treatment Remarks

OTHER INFORMATION	10 Lb Spools - Level Layer Wound
-------------------	----------------------------------

We certify that the above material has been tested in accordance with the listed specification and is in conformance with all requirements.

Euroweld Ltd.

FROM : INWELD CORP

POK NO. : 1 784 398 3454

Apr. 05 2005 11:42AM P1

Inweld
Welding Alloys & Supplies

1838 SHELLEY DRIVE, BOX 100
CHARLOTTE, NC 28217
Phone: (704) 364-1100 / (704) 364-1105
Fax: (704) 364-1438
E-Mail: inweld@inweldcorporation.com
Web: www.inweldcorporation.com

SOLD TO: NATIONAL WELDERS SUPPLY - CHARLOTTE
5315 OLD FORD ROAD
CHARLOTTE, NC 28209

DATE SHIPPED: 4/4/2005
CUST. P.O. NO.: 487508
QUANTITY: 187 LBS

**STAINLESS STEEL WELDING WIRE
CERTIFIED MATERIAL TEST REPORT - ACTUAL**

Alloy:	316L
Diameter:	1.049 X 1/16" BS
Specification:	AWS A5.9 ER316L
Heat:	84788
Lot:	
Code:	11316LH

C	Cr	Co	Mn	Ni	Al	P	S	Si
0.022	18.34	0.28	1.8	2.4	12.06	0.021	0.001	0.44
Fe	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TENSILE STRENGTH	81000 psi	ELONGATION	18%
YIELD STRENGTH	62000 psi	CHARPY ENERGY	150 J

I certify the chemical analysis and mechanical test results reported above are correct as contained in the records of the property.

[Signature]
QUALITY ASSURANCE MANAGER

QUALITY ASSURANCE INSPECTOR
DATE 4/5 INITIALS *[Signature]*
INWELD CORPORATION
Charlotte, NC 28217

Appendix C: Ultrasonic Testing Reports

Appendix C-1: 316L HT94789-1

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_HT94789-1**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

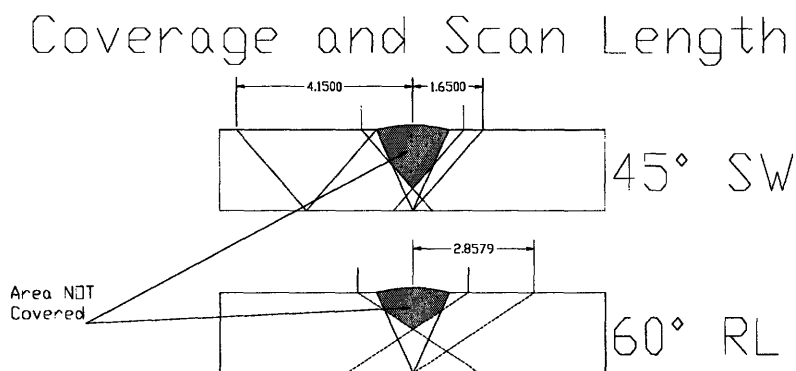


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° RL angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

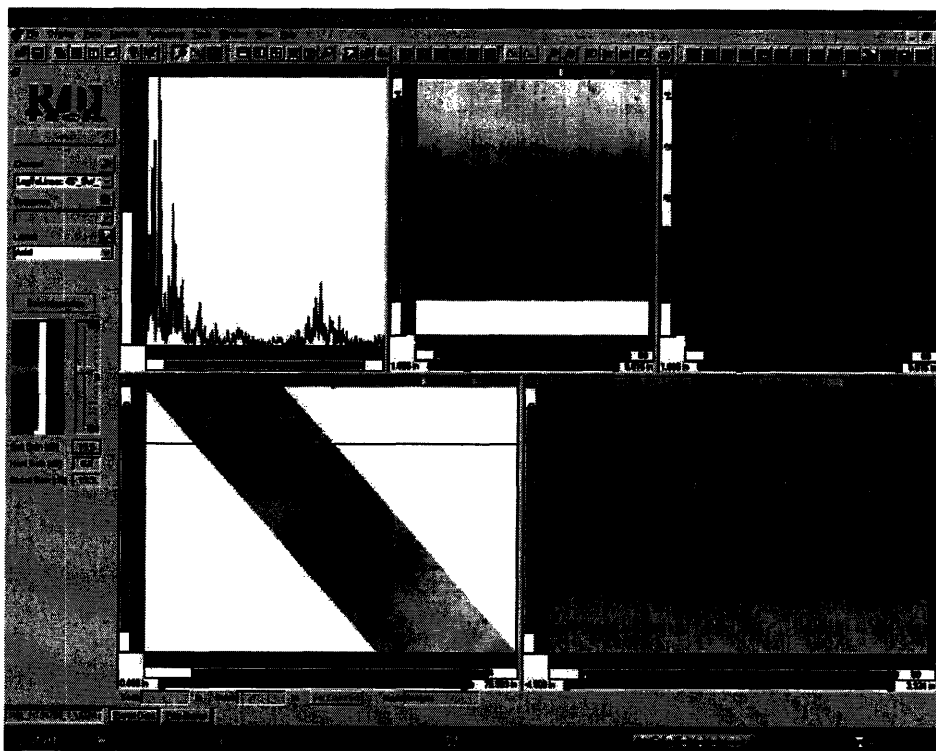


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

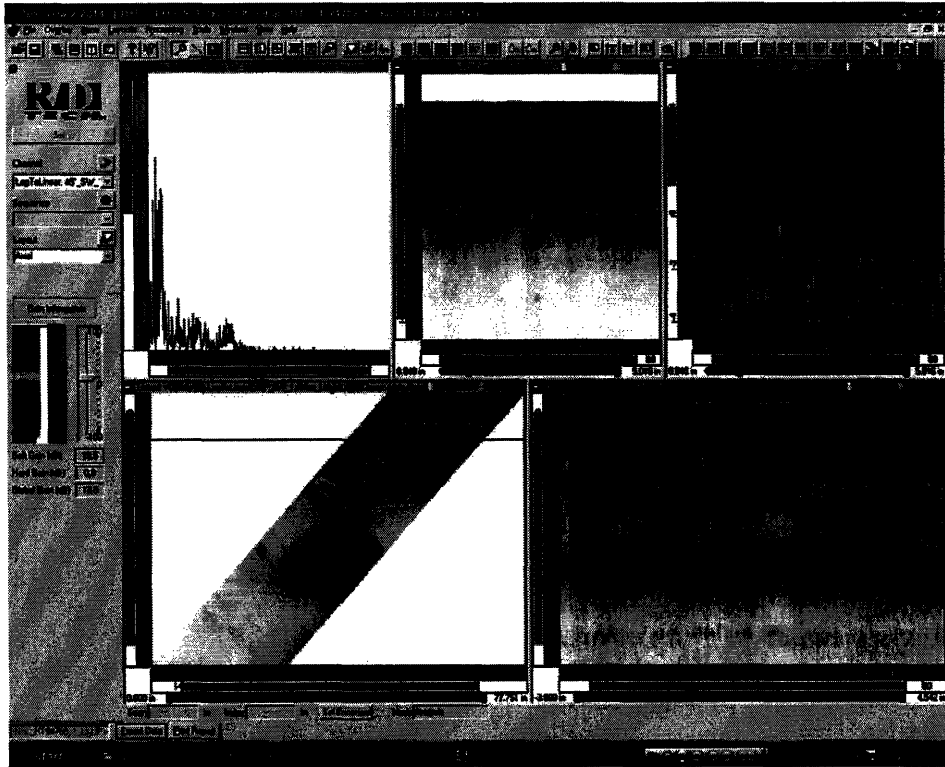


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream



Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

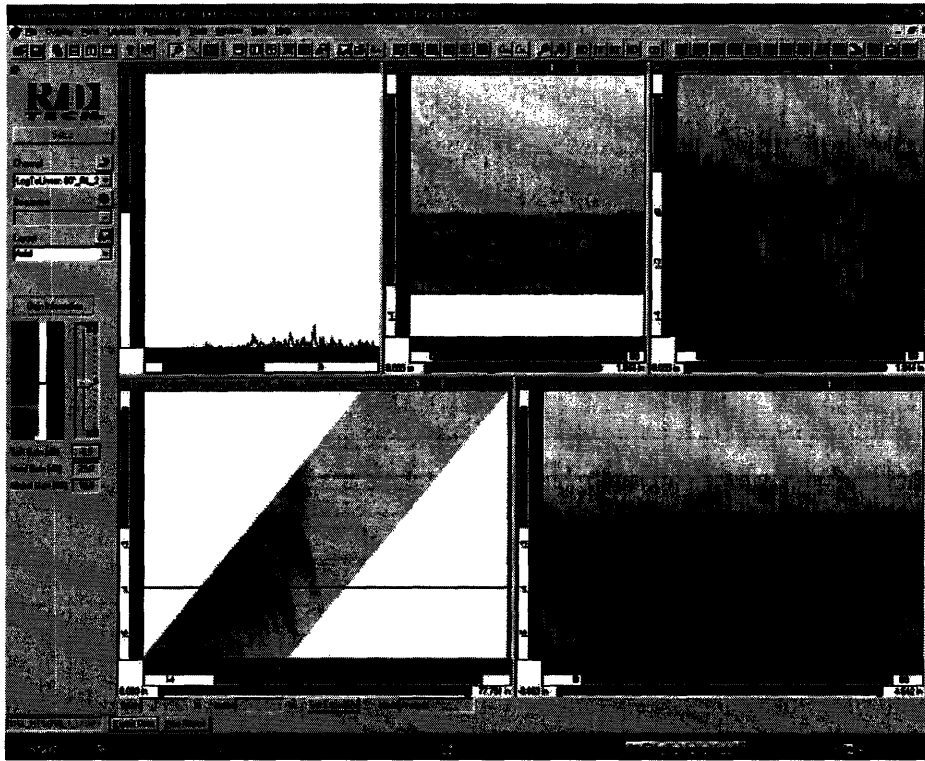


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L HT94789-1 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1	#2			
	04-210	00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all 24" Pipe Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential

Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential

Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential

Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 10/5/2005 2:29:21 PM
 C:\PDI\Fingerprints\Sammy\New Folder\316L_04789_11_LKDN.rdt

Analysis information

Tomoview 2.2Q14 FileSize: 116.4 MB Date: 01/22/2005 3:04:03 PM
 C:\Documents and Settings\user\Desktop\316L_HTS4789_Pipe_1\316L_HTS4789_1_LKDN.rdt

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
General Settings										
Gain: 0 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: 0.12 µs		Time base Range: 117.12 µs				
Configuration										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	306 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz	
Digital Acquisition Processing Settings										
Dig. Frequency: 12.50 MHz		Recurrence: 2000 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 1484		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %										
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
General Settings										
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.25 µs		Time base Range: 43.12 µs				
Configuration										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	306 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz	
Digital Acquisition Processing Settings										
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 564		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %										

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>		
Gain: 50 dB										25 dB Booster: <input type="checkbox"/>	Time base Start: -0.53 μ s	Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing			
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None			
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 1464		A-scan <input type="checkbox"/>		None							
Acq Rate: 300 Acq/s	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %					
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>		
Gain: 75 dB										25 dB Booster: <input type="checkbox"/>	Time base Start: -0.53 μ s	Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing			
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None			
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 564		A-scan <input type="checkbox"/>		None							
Acq Rate: 300 Acq/s	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %					

Probe Settings



Acquisition information

Tomoview 2.2014 Hardware Used: pTomo Date: 10/22/05 2:29:21 PM
 C:\PDI\Fingerprint\Sammy\New Folder\318L_H794789_11_LKDN.rdt

Analysis information

Tomoview 2.2014 File Size: 110.4 MB Date: 01/22/05 3:04:03 PM
 C:\Documents and Settings\user\Desktop\318L_H794789_Pipe_11316L_H794789_1_LKDN.rdt

Channel	Probe Name	Snd vel. [m/s]	Vz. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Probe Position	
								Separ.	Orientation
45°_SW_1.5MHz_	KS-A_1.5_00X6	3073	5.18	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_03-050_2M	5638	11.12	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	-12.70	57.15	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.279 Hardware Used: µTomo
 C:\PDI\Fingerprints\Sanny\New Folder\316L_H794788_11_LKDN.rdt

Date: 10/3/2005 2:29:21 PM

Analysis Information

Tomoview 2.2014 File Size: 118.4 MB
 C:\Documents and Settings\user\Desktop\316L_H794788_Pipe_T016L_H794788_1_LKDN.rdt

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	68727.57	<input type="checkbox"/>				
Sequence Type: Bidirectional Fine on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	-4.00	-1.12	6.04	6.98	in	Never	-2.0
Index axis	Wheels	6.00	78.48	6.10	6.98	in	Never	6.0

µTomo General Settings



Acquisition information

Tomoview 2.299 Hardware Used: µTomo Date: 10/6/2005 3:27:18 PM
 C:\PDI\Fingerprint\Sammy\316L_HTS4789_1\316L_HTS4789_1_LKUP.rdt

Analysis information

Tomoview 2.2Q14 FileSize: 107.4 MB Date: 10/12/2005 3:04:54 PM
 C:\Documents and Settings\user\Desktop\316L_HTS4789_Pipe_1\316L_HTS4789_1_LKUP.rdt

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1494		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 564		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -9.53 μ s Time base Range: 40.96 μ s																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>0 V</td> <td>0 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %																						
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -9.53 μ s Time base Range: 40.96 μ s																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>0 V</td> <td>0 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 0		Samples: 564		A-scan <input type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %																						

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: gTomo Date: 10/22/2005 3:27:15 PM
 C:\PDI\Fingerprints\Benny\316L_HT94789_1\316L_HT94789_1_LKUP.rdt

Analysis Information

Tomoview 2.2Q14 File Size: 187.4 MB Date: 10/22/2005 3:34:54 PM
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Channel	Probe Name	Send vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Separ.	Orientation
45°_SW_1.5MHz_	KS-A_1.5_0006	3073	5.16	0.00	0.00	45	180	0	Perpendicular
60°_RL_2MHz_LK	60°_03-659_2M	5638	11.12	12.70	57.15	60	180	0	Perpendicular
LogToLines: 45°	Probe no.4	3073	12.70	12.70	57.15	60	180	0	Perpendicular
LogToLines: 60°	Probe no.4	5638	12.70	12.70	57.15	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo Date: 10/5/2005 3:27:18 PM
 C:\FDI\Fingerprint\Sunny\316L_HT94789_1\316L_HT94789_1_LKUP.rpt

Analysis Information

Tomoview 2.2Q14 FileSize: 107.4 MB Date: 10/5/2005 3:04:54 PM
 C:\Documents and Settings\user\Desktop\316L_HT94789_Pipe_1\316L_HT94789_1_LKUP.rpt

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15916.95	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	65727.37	<input type="checkbox"/>				
Sequence Type: Bidirectional		Fire on: Encoder		Index axis preset: None				
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	1.20	4.00	0.05	0.30	in	Never	2.0
Index axis	Wheels	0.00	75.40	0.10	0.05	in	Never	0.0

Appendix C-2: 316L W021437-1

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_W021437-1**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

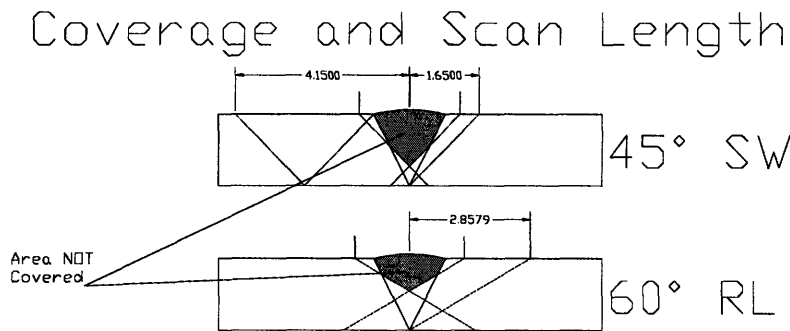


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° refracted longitudinal (RL) angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews



Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

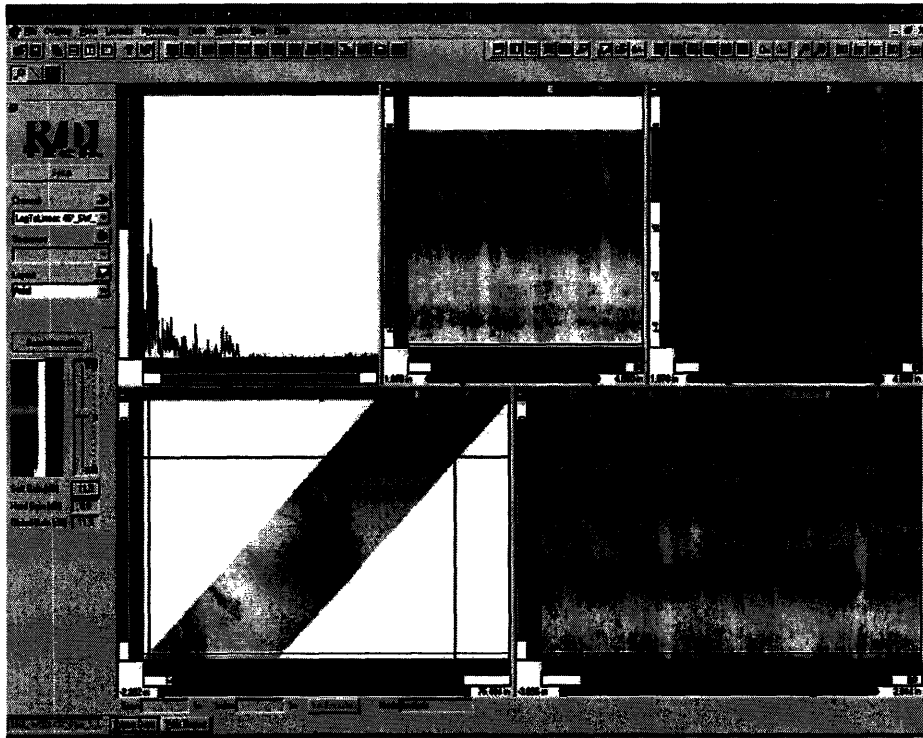


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

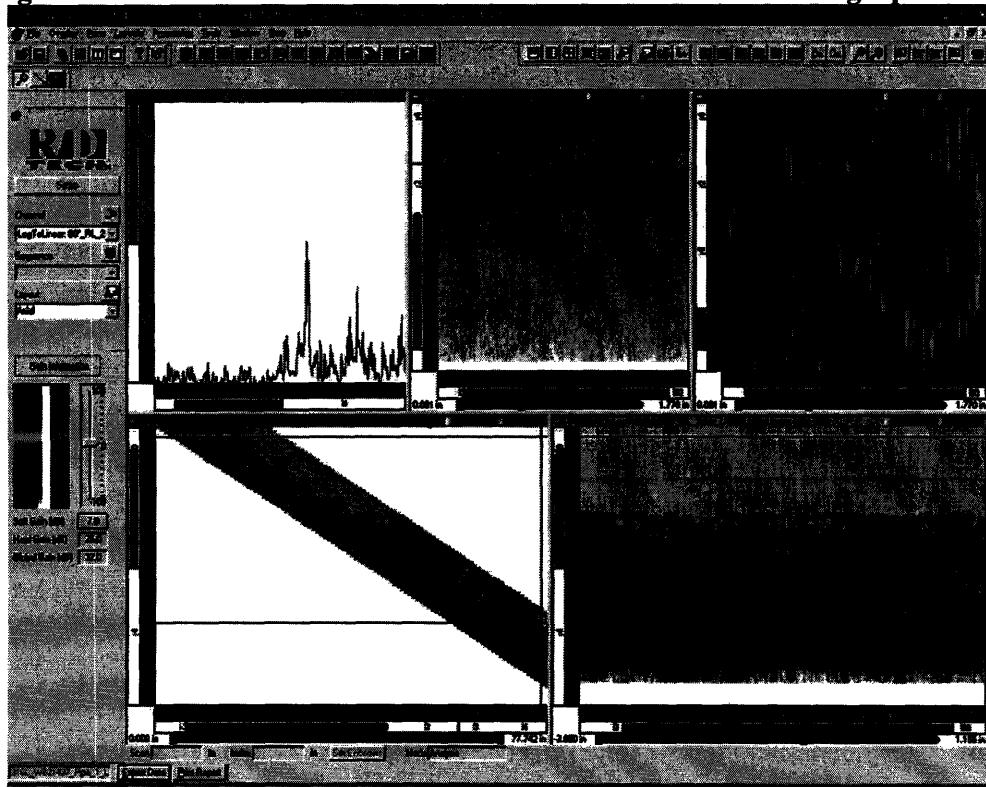


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

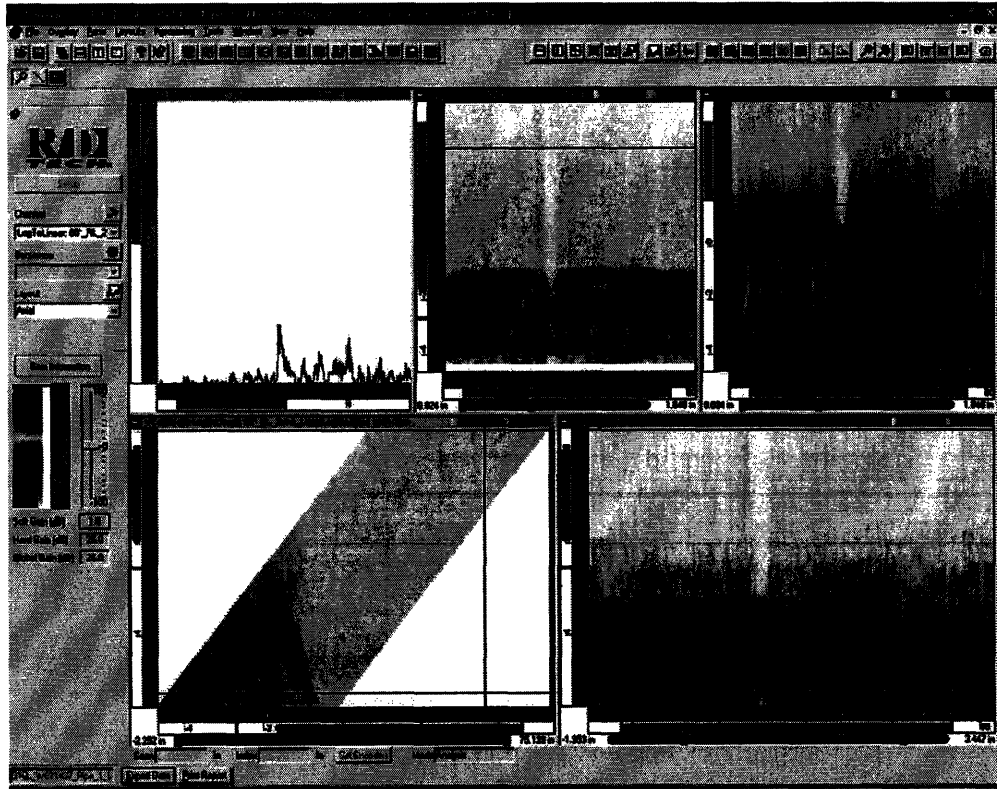


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L_HW021437-1 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1 04-210	#2 00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all 24” Pipe Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Syncho	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 - Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 0/24/2005 8:50:44 PM
 C:\PDI\Fingerprint\Sammy\new pipe weld 1\new pipe weld 1 lkdn.rdt

Analysis information

Tomoview 2.2R9 FileSize: 44.4 MB Date: 1/11/2005 2:39:54 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKDN\316L_W021437_Pipe_1_LKDN.rdt

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>	
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs											
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz		
Digitizing and Processing Settings											
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>						
AVG: 1	Samples: 1464		A-scan <input checked="" type="checkbox"/>		None						
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %				
Channel 2 : 60°_RL_2Mhz_LKDN											DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs											
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz		
Digitizing and Processing Settings											
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>						
AVG: 1	Samples: 504		A-scan <input checked="" type="checkbox"/>		None						
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %				

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs			Time base Range: 40.96 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %		
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs			Time base Range: 40.96 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 594		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %		

Probe Settings



Acquisition Information

Tomoview 2.2R9

Hardware Used: pTomo

Date: 9/24/2005 8:58:44 PM

C:\PDI\Fingerprint\Sammy\new pipe weld 1\new pipe weld 1.lkdn.rdt

Analysis Information

Tomoview 2.2R9

File Size: 44.4 MB

Date: 1/11/2005 2:39:54 PM

C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKDN\316L_W021437_Pipe_1.LKDN.rdt

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Seper.	Orientation
45°_SW_1.5MHz	K5-A_1.5_00X8	3073	5.18	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_03-659_2M	5638	11.12	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	-12.70	57.15	60	0	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sammy\new pipe weld 1\new pipe weld 1 lkdn.rdt

Date: 0/24/2005 8:50:44 PM

Analysis information

Tomoview 2.2R9 FileSize: 44.4 MB
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKDN\316L_W021437_Pipe_1_LKDN.rdt

Sequence 1 : Default Sequence										
Encoder Settings										
	Name	Type	Resolution	Invert						
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>						
Index axis	Wheels	Quadrature	65875.38	<input type="checkbox"/>						
Sequence Settings										
Sequence Type:		Bidirectional		Fire on: Encoder			Index axis preset			None
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value		
Scan axis	Arm	-2.35	-1.23	0.04	0.98	in	Never	-2.0		
Index axis	Wheels	0.00	75.39	0.10	0.98	in	Never	0.0		

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKUP\316L_W021437_Pipe_1_LKUP.rdt

Date: 0/24/2005 7:51:35 PM

Analysis information

Tomoview 2.2R9 FileSize: 107.4 MB
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKUP\316L_W021437_Pipe_1_LKUP.rdt

Date: 1/11/2005 2:39:22 PM

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 2000 Hz Synchro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 1464 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 300 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
										M-P Threshold: 0 %
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 1211 Hz Synchro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 564 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 300 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 μ s		Time base Range: 40.96 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 1484		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Clr: 0				
										M-P Threshold: 0 %
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 μ s		Time base Range: 40.96 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 584		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Clr: 0				
										M-P Threshold: 0 %

Probe Settings



Acquisition Information

Tomoview 2.2RS Hardware Used: jfomo
 C:\PDI\Fingerprint\Sammy\new pipe weld 1\new pipe weld 1 lkup.rdt

Date: 02/2/2005 7:01:36 PM

Analysis Information

Tomoview 2.2RS File Size: 107.4 MB
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKUP\316L_W021437_Pipe_1_LKUP.rdt

Date: 1/11/2005 2:39:23 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Separ.	Orientation
45°_SW_1.5Mhz_	KB-A_1.5_0009	3073	5.16	0.00	0.00	45	180	0	Perpendicular
60°_RL_2Mhz_LK	60°_03-660_2M	5638	11.12	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	12.70	-57.15	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo Date: 0/24/2005 7:51:35 PM
 C:\PDI\Fingerprint\Sammy\new pipe weld 1\new pipe weld 1 lkup.rdt

Analysis Information

Tomoview 2.2R9 FileSize: 107.4 MB Date: 1/11/2005 2:39:22 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_1\LKUP\316L_W021437_Pipe_1_LKUP.rdt

Sequence 1 : Default Sequence									
Encoder Settings									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	65875.38	<input type="checkbox"/>					
Sequence Settings									
Sequence Type: Bidirectional		Fire on: Encoder			Index axis preset		None		
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.20	4.00	0.04	0.98	in	Never	2.0	
Index axis	Wheels	0.00	75.39	0.10	0.98	in	Never	0.0	

Appendix C-3: 316L HT94789-2

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_HT94789-2**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

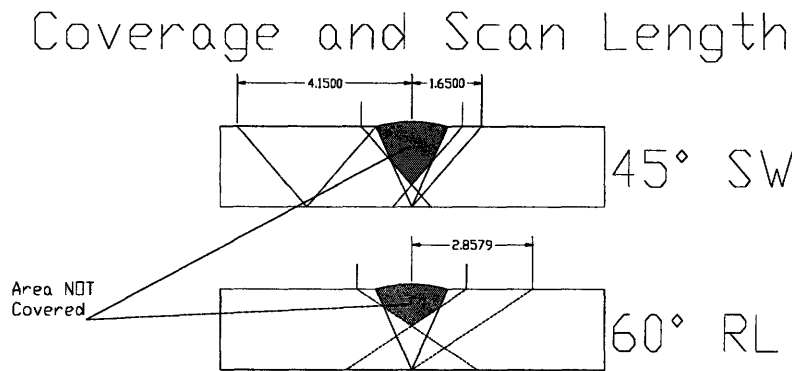


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° RL angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

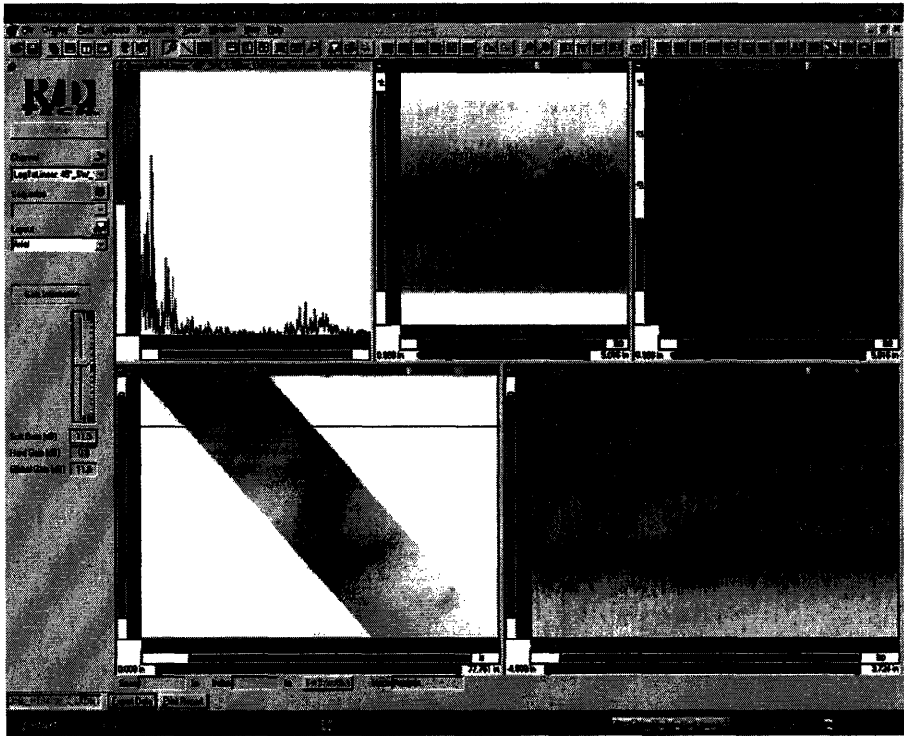


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

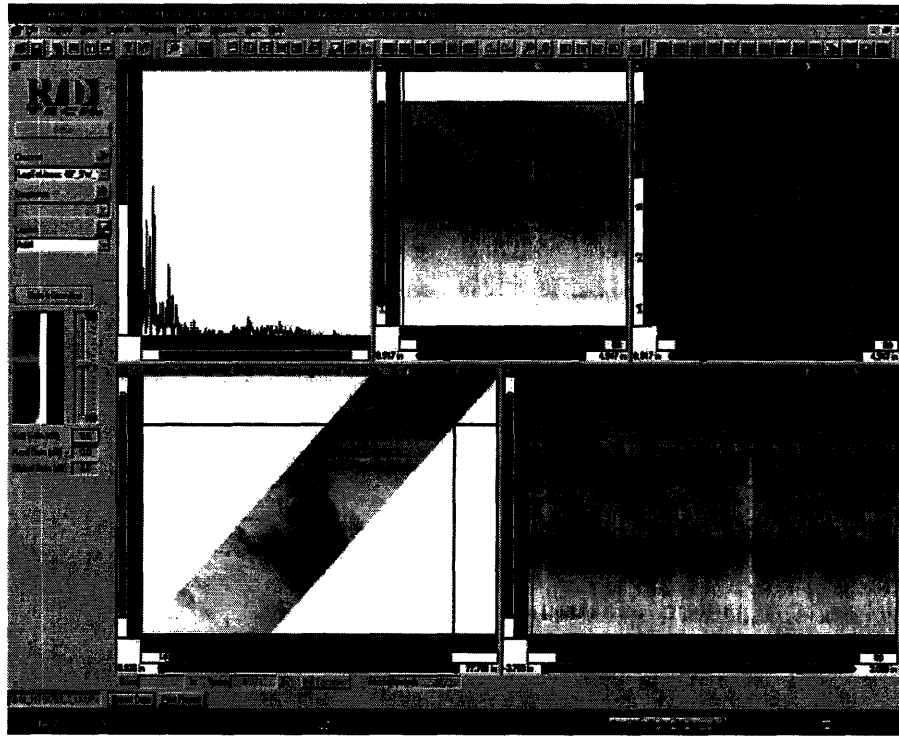


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

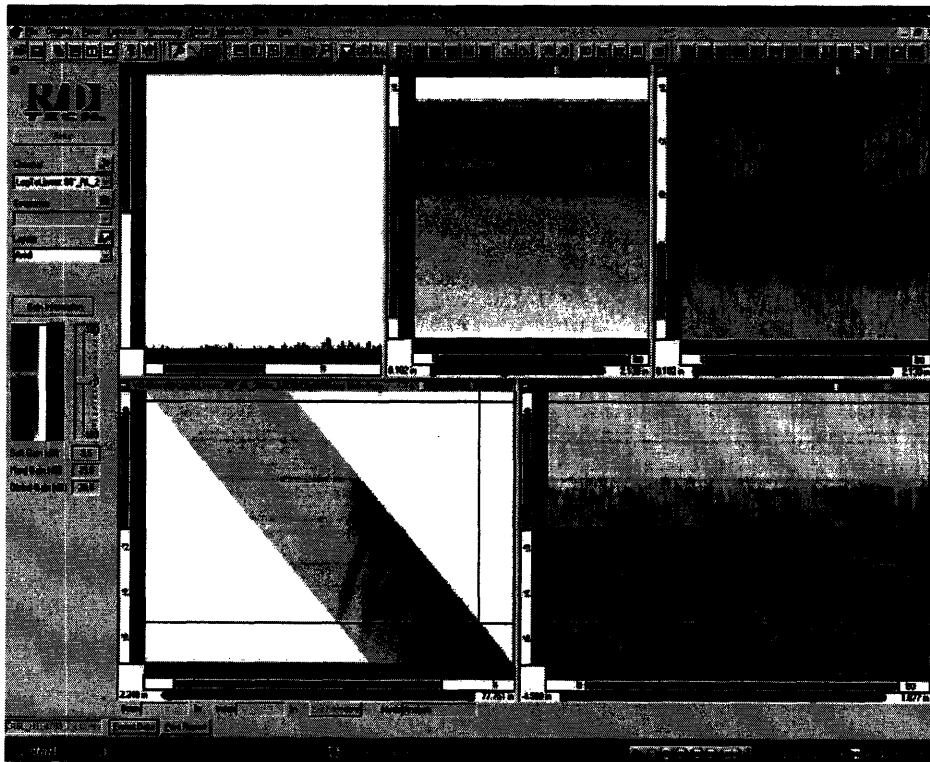


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

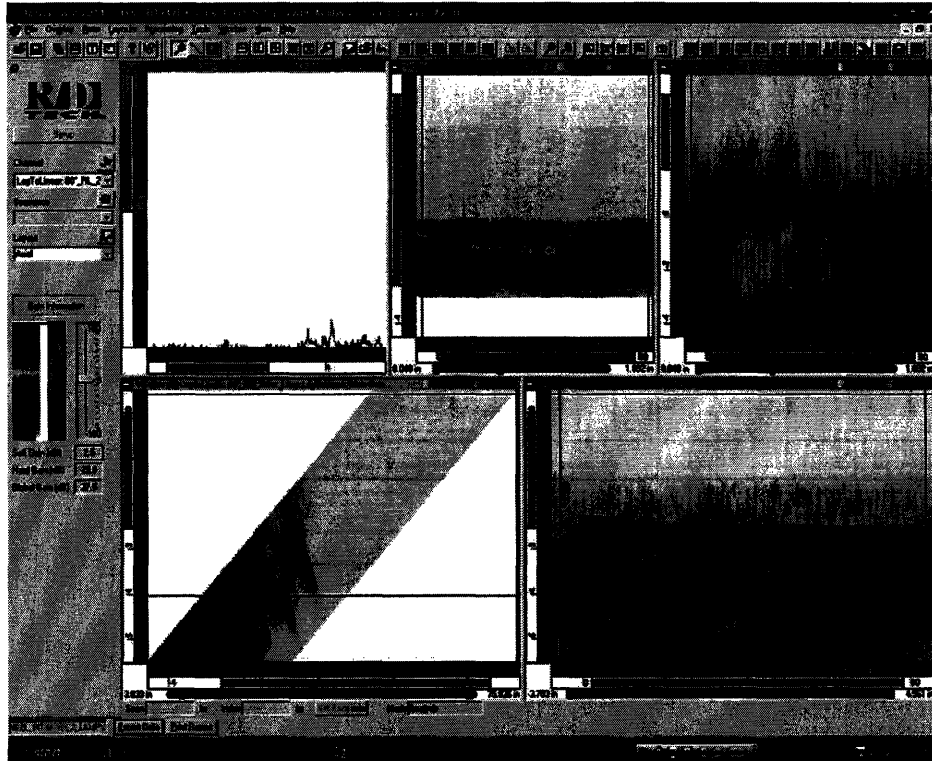


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L_HT94789-2 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1 04-210	#2 00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all 24" Pipe Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 - Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential

DO NOT USE	All Fields Unchecked / Inactive	Essential
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I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential /
	MicroTomo	Non-Essential
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 10/5/2005 1:20:45 PM
 C:\PDI\Fingerprints\Sammy\New Folder\316L_HT94789_1_LKDN.rdt

Analysis information

Tomoview 2.2Q14 File Size: 102.9 MB Date: 9/12/2005 3:32:00 PM
 C:\Documents and Settings\user\Desktop\316L_HT94789_Pipe_2\316L_HT94789_2_LKDN.rdt

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 0 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: 0.12 µs		Time base Range: 117.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 1404		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.25 µs		Time base Range: 45.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 504		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>	
Gain: 50 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -0.53 μ s	Time base Range: 40.95 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 1484		A-scan <input type="checkbox"/>		None					
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0					
										M-P Threshold: 0 %	
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>	
Gain: 75 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -0.53 μ s	Time base Range: 40.95 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 584		A-scan <input type="checkbox"/>		None					
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0					
										M-P Threshold: 0 %	

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: pTomo Date: 10/5/2005 1:26:45 PM
 C:\PDI\Fingerprint\Sammy\New Folder\316L_HTB4789_1_LKDN.rdt

Analysis information

Tomoview 2.2Q14 FileSize: 102.9 MB Date: 8/12/2005 3:32:00 PM
 C:\Documents and Settings\User\Desktop\316L_HTB4789_Pipe_R316L_HTB4789_2_LKDN.rdt

Channel	Probe Name	Std. Dev. [m/s]	W. Delay [ps]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Seper.	Orientation
45°_SW_1.5MHz_	KB-A_1.5_00X5	3073	5.18	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_03-658_2M	5636	11.12	-12.70	57.15	60	0	0	Perpendicular
LegToLinear: 45°	Probe no.4	3073	12.70	-12.70	57.15	60	0	0	Perpendicular
LegToLinear: 60°	Probe no.4	5636	12.70	-12.70	57.15	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\FDI\Fingerprints\Sanny\New Folder\316L_84788_1_LKDN.rdt

Date: 10/5/2005 1:26:45 PM

Analysis Information

Tomoview 2.2Q14 File Size: 192.9 MB
 C:\Documents and Settings\user\Desktop\316L_HT94788_Pipe_2316L_HT94788_2_LKDN.rdt

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15918.86	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	65727.37	<input type="checkbox"/>				
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	-4.00	-1.32	0.04	0.00	In	Never	-2.0
Index axis	Wheels	0.00	75.00	0.19	0.00	In	Never	0.0

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 10/5/2005 4:26:24 PM
 C:\PDI\Fingerprint\Sanny\316L_HT94789_2\316L_HT94789_2_LKUP.rdt

Analysis information

Tomoview 2.2Q14 FileSize: 104.4 MB Date: 8/12/2005 3:33:28 PM
 C:\Documents and Settings\user\Desktop\316L_HT94789_7\316L_HT94789_2_LKUP.rdt

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 Mhz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 1464		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pitch & Catch</td> <td>2</td> <td>2</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 Mhz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 584		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 μ s		Time base Range: 40.95 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>		None			
AVG: 0	Samples: 1464		A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>							
Channel 4 : LogToLinear: 90°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 μ s		Time base Range: 40.95 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>		None			
AVG: 0	Samples: 664		A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>							

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: jfomo
 C:\PDI\Fingerprint\Semmy\316L_HT94789_2\316L_HT94789_2_LKUP.ndt

Date: 10/9/2005 4:26:24 PM

Analysis information

Tomoview 2.2Q14 FileSize: 104.4 MB
 C:\Documents and Settings\user\Desktop\316L_HT94789_Pipe_2\316L_HT94789_2_LKUP.ndt

Date: 01/22/2005 3:33:28 PM

Channel	Probe Name	Snd. vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Separ.	Orientation
45°_SW_1.5MHz	KB-A_1.5_0008	3073	5.16	0.00	0.00	45	180	0	Perpendicular
60°_RL_2MHz_LK	60°_03-658_2M	5636	11.12	12.70	57.15	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	57.15	60	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5636	12.70	12.70	57.15	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\PDI\Fingerprint\Sammy\316L_HT94789_2\316L_HT94789_2_LKUP.rdt

Date: 10/5/2005 4:26:24 PM

Analysis Information

Tomoview 2.2Q14 FileSize: 104.4 MB
 C:\Documents and Settings\user\Desktop\316L_HT94789_Pipe_2\316L_HT94789_2_LKUP.rdt

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15916.86	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	66727.57	<input type="checkbox"/>				
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	1.59	4.82	6.94	6.98	In	Never	2.9
Index axis	Wheels	6.00	75.40	6.10	6.86	In	Never	6.6

Appendix C-4: 316L W021437-2

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_W021437-2**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

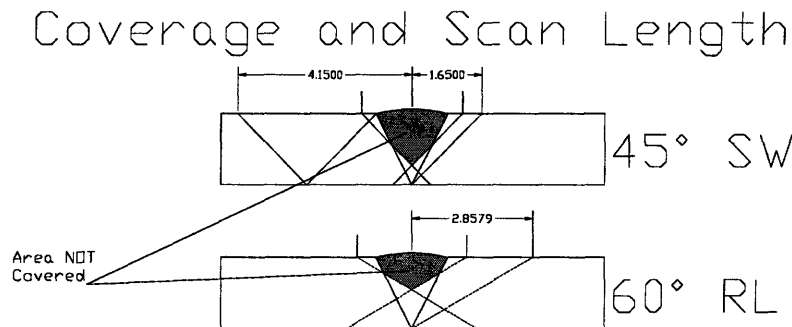


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° refracted longitudinal (RL) angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews



Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

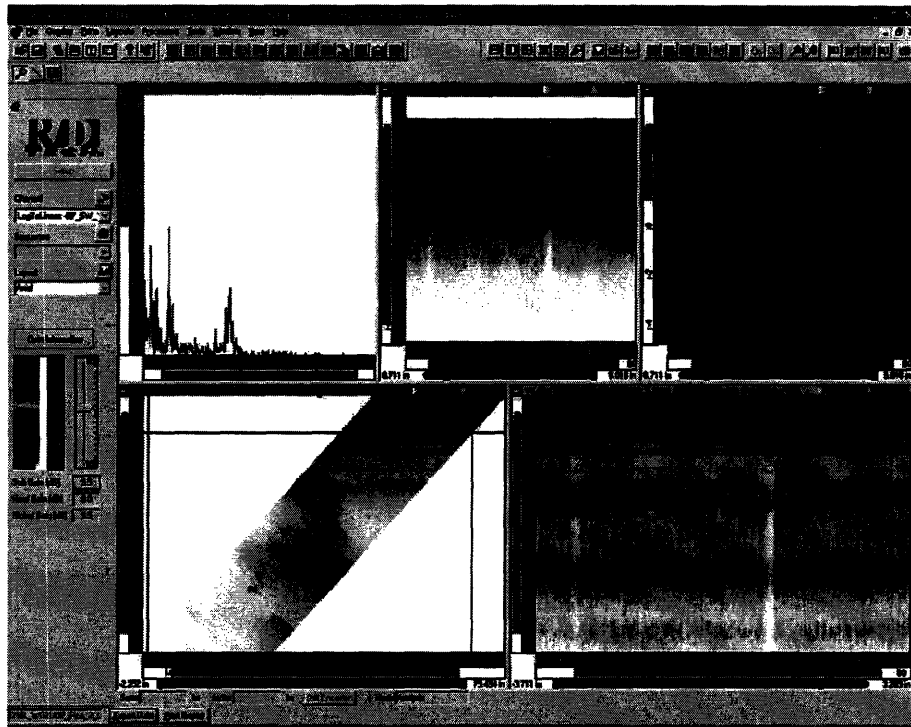


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

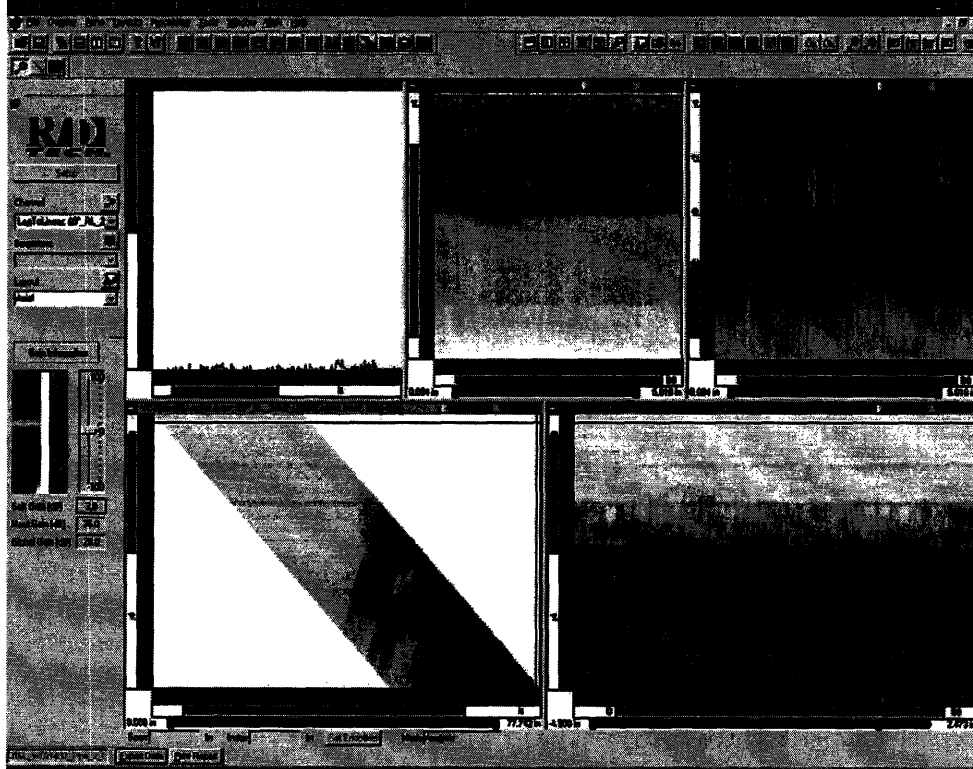


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

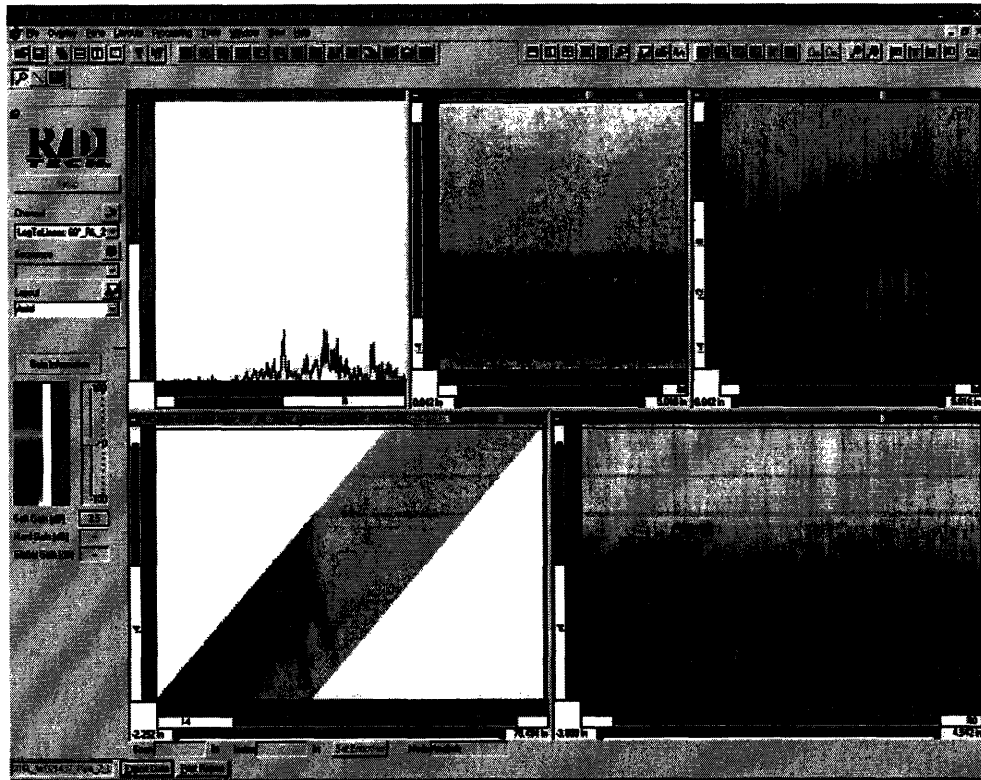


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L_HW021437-2 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1	#2			
	04-210	00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3” per sec. either axis
Data Resolutions:	≤ 0.040”: data taking / 0.1”: indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all 24” Pipe Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition information

Tomoview 2.2RS Hardware Used: µTomo Date: 11/9/2005 2:08:25 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_2\316L_W021437_Pipe_2_LKDN.rdt

Analysis information

Tomoview 2.2RS File Size: 162.9 MB Date: 1/11/2005 2:43:18 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_2\LKDN\316L_W021437_Pipe_2_LKDN.rdt

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>																				
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>											Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 MHz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 1464		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %																						
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pitch & Catch</td> <td>2</td> <td>2</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>											Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 564		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %																						

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 58 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -9.53 μ s Time base Range: 46.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	6 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.58 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %										
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -9.53 μ s Time base Range: 46.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	6 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.58 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 584		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %										

Probe Settings



Acquisition information

Tomoview 2.2R5 Hardware Used: pTomo Date: 11/09/2005 2:00:25 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_2\316L_W021437_Pipe_2_LKDN.rdt

Analysis information

Tomoview 2.2R5 FileSize: 102.9 MB Date: 11/11/2005 2:43:18 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_2\LKDN\316L_W021437_Pipe_2_LKDN.rdt

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Separ.	Orientation
45°_SW_1.5MHz_	KB-A_1.5_00X6	3073	5.16	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_03-050_2M	5638	11.12	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	-12.70	57.15	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo Date: 11/9/2006 2:09:25 PM
 C:\PDI\Fingerprints\Benny\316L_W021437_Pipe_2\316L_W021437_Pipe_2_LKDN.rdt

Analysis Information

Tomoview 2.2R9 FileSize: 102.9 MB Date: 1/11/2006 2:43:18 PM
 C:\PDI\Fingerprints\Benny\316L_W021437_Pipe_2\LKDN\316L_W021437_Pipe_2_LKDN.rdt

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	85875.38	<input type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-4.00	-1.32	0.04	0.98	In	Never	-2.0	
Index axis	Wheels	0.00	75.39	0.10	0.98	In	Never	0.0	

μTomo General Settings



Acquisition information

Tomoview: 2.2R9 Hardware Used: μTomo Date: 11/9/2006 4:52:36 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_2\316L_W021437_Pipe_2_LKUP.rdt

Analysis information

Tomoview: 2.2R9 FileSize: 187.4 MB Date: 1/11/2006 2:45:01 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_2\LKUP\316L_W021437_Pipe_2_LKUP.rdt

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 μs Time base Range: 117.12 μs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 MHz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz																					
Dig. Frequency: 12.50 MHz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 1464		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 μs Time base Range: 45.12 μs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pitch & Catch</td> <td>2</td> <td>2</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 MHz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz																					
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 564		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>				
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 6 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>				
AVG: 0		Samples: 564		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 6 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: gFomo Date: 11/5/2005 4:52:38 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_2\316L_W021437_Pipe_2_LKUP.rdt

Analysis information

Tomoview 2.2R9 FileSize: 167.4 MB Date: 1/11/2005 2:45:01 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_2\LKUP\316L_W021437_Pipe_2_LKUP.rdt

Channel	Probe Name	Snd. vel. [m/s]	Wt. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	SPP	
								Seper.	Orientation
45°_SW_1.5MHz_	KB-A_1.6_0006	3073	5.18	0.00	0.00	45	180	0	Perpendicular
90°_RL_2MHz_LK	60°_03-659_2M	5638	11.12	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 90°	Probe no.4	5638	12.70	12.70	-57.15	60	180	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: yTomo Date: 11/9/2005 4:52:36 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_Z\316L_W021437_Pipe_2_LKUP.rdt

Analysis information

Tomoview 2.2R9 File Size: 187.4 MB Date: 1/11/2005 2:46:01 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_Z\LKUP\316L_W021437_Pipe_2_LKUP.rdt

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	15916.88	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	65675.36	<input type="checkbox"/>					
Sequence Type: Bidirectional		Pulse on: Encoder		Index axis preset: None					
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.20	4.80	0.84	0.88	In	Never	2.0	
Index axis	Wheels	0.89	75.39	0.10	0.96	In	Never	6.0	

Appendix C-5: 316L HT94789-3

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_HT94789-3**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

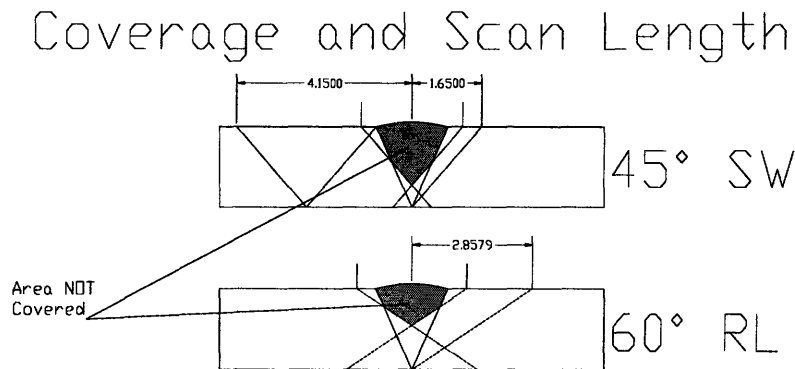


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° RL angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

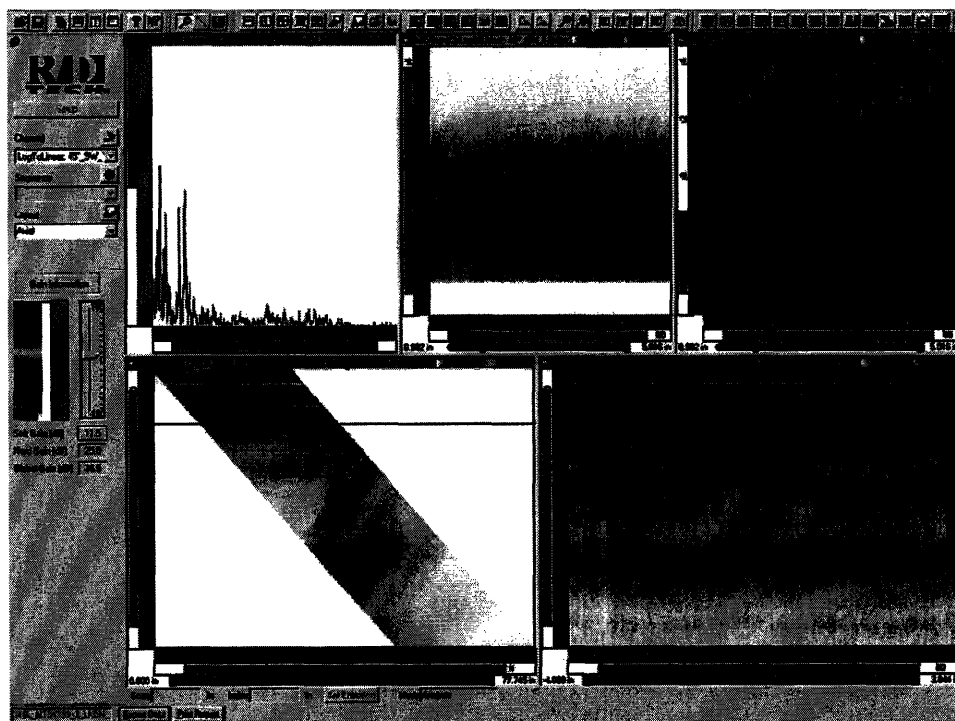


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

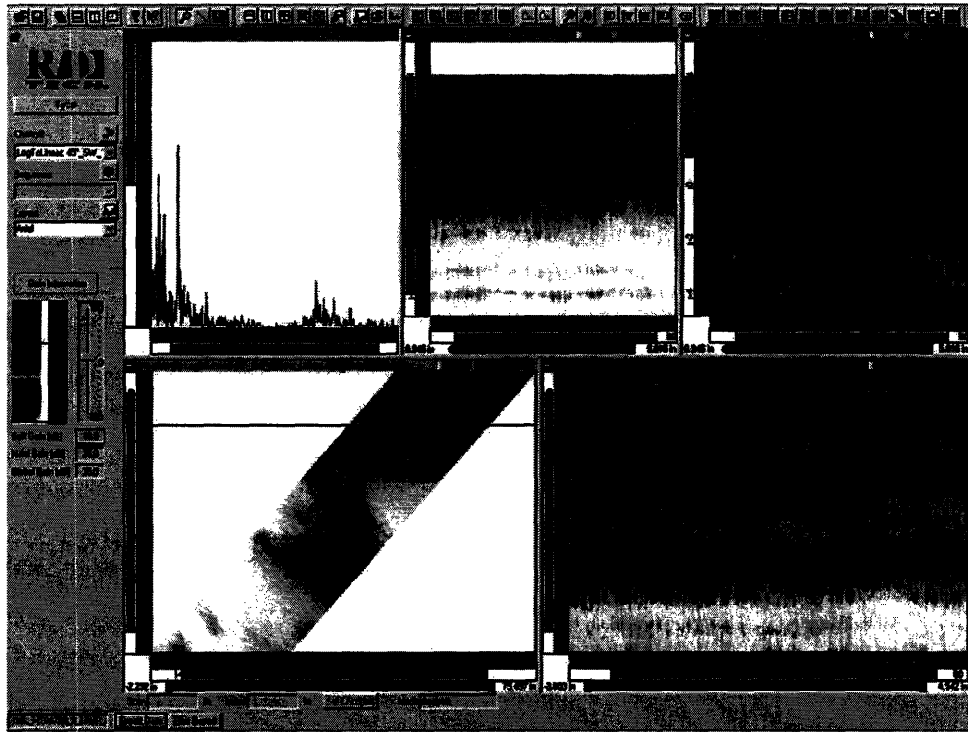


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

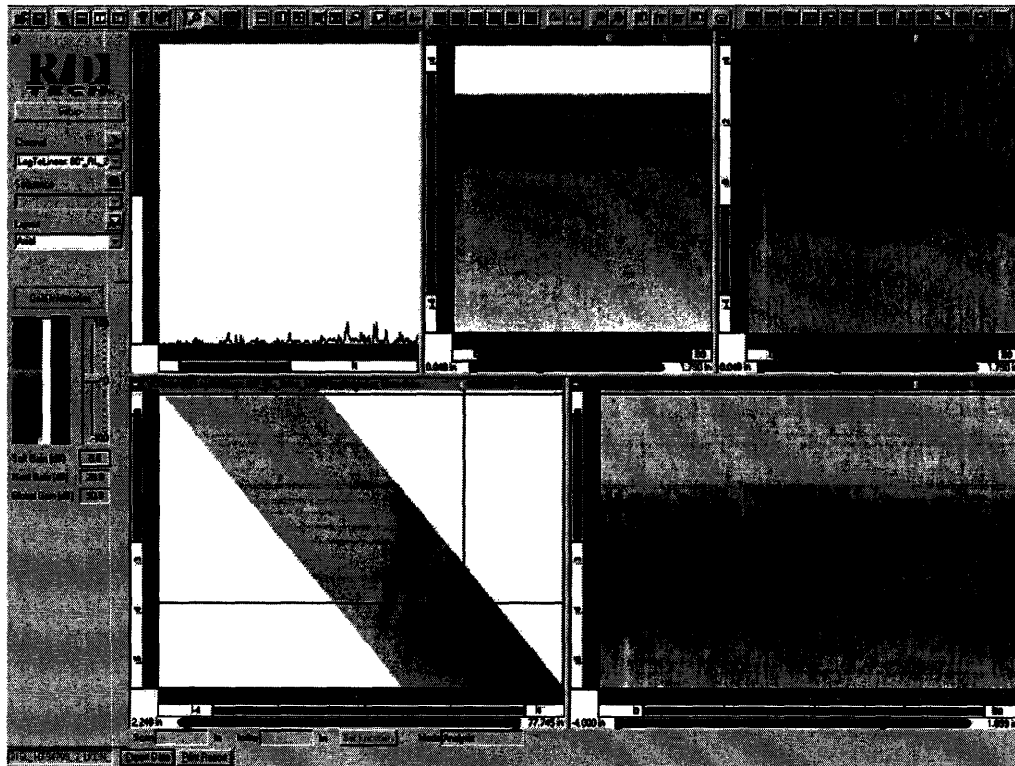


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

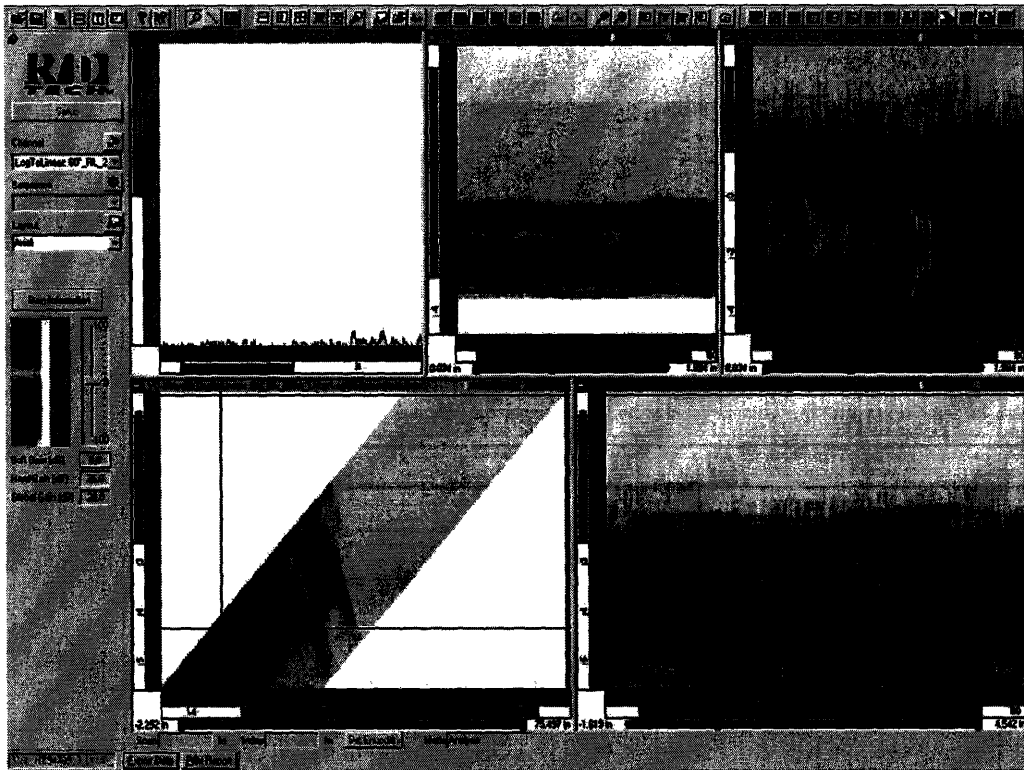


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L_HT94789-3 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1	#2			
	04-210	00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60° 1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3” per sec. either axis
Data Resolutions:	≤ 0.040”: data taking / 0.1”: indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all 24" Pipe Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sunny\316L_HTS4789_Flpo_316L_HTS4789_3_LKDN_1.rdt

Date: 11/4/2005 11:56:07 AM

Analysis Information

Tomoview 2.2Q14 FileSize: 167.4 MB
 C:\Documents and Settings\user\Desktop\316L_HTS4789_3_LKDN_1.rdt

Date: 11/4/2005 12:58:03 PM

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 8.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 2000 Hz Synchro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 1464 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 300 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
										M-P Threshold: 0 %
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 1211 Hz Synchro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 504 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 300 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN									DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None
Dig. Frequency: 12.80 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>			
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None			
Acq Rate: 300 Acq/s		Resolution: 5 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0			
						M-P Threshold: 0 %			
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN									DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None
Dig. Frequency: 12.80 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>			
AVG: 0		Samples: 884		A-scan <input type="checkbox"/>		None			
Acq Rate: 300 Acq/s		Resolution: 5 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0			
						M-P Threshold: 0 %			

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\PDI\Fingerprint\Sarany\316L_HTB4789_Pipe_3\316L_HTB4789_3_LKDN_1.rdt

Date: 14/2/2015 11:36:07 AM

Analysis information

Tomoview 2.2Q14 File Size: 187.4 MB
 C:\Documents and Settings\user\Desktop\316L_HTB4789_3_LKDN_1.rdt

Date: 14/2/2015 12:55:33 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Shew [°]	Probe Position	
								Seper.	Orientation
45°_SW_1.5Mhz_	KB-A_1.5_0006	3073	5.16	0.00	0.00	45	0	0	Perpendicular
60°_RL_2Mhz_LK	60°_03-650_2M	5638	11.12	12.70	57.15	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	57.15	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	12.70	57.15	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: yTomo
 C:\PDI\Fingerprint\Sammy\316L_HTB4788_Pipe_316L_HTB4788_3_LKDN_1.rdt

Date: 14/2005 11:56:57 AM

Analysis Information

Tomoview 2.5214 File Size: 187.4 MB
 C:\Documents and Settings\user\Desktop\316L_HTB4788_3_LKDN_1.rdt

Date: 14/2005 12:59:53 PM

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15916.88	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	54112.36	<input type="checkbox"/>				
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	-4.88	-1.20	0.04	0.58	in	Never	-2.0
Index axis	Wheels	0.88	78.48	0.10	0.58	in	Never	0.8

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 14/2005 10:00:51 AM
 C:\PDI\Fingerprint\Sanny\316L_HT04780_Pipe_3316L_HT04780_3_LKUP_1.rdt

Analysis information

Tomoview 2.2Q14 FileSize: 107.4 MB Date: 14/2005 12:57:40 PM
 C:\Documents and Settings\user\Desktop\316L_HT04780_3_LKUP_1.rdt

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1404		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1251 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 564		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 40.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurance:	0 Hz	Synchro: ON PULSE	Multi-Peak: <input type="checkbox"/>						
AVG: 0	Samples:	1404	A-scan <input type="checkbox"/>	None						
Acq Rate: 300 Acq/s	Resolution:	8 BIT	Video A-scan <input type="checkbox"/>	MS-P Qty: 0						
				MS-P Threshold: 0 %						
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 40.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurance:	0 Hz	Synchro: ON PULSE	Multi-Peak: <input type="checkbox"/>						
AVG: 0	Samples:	504	A-scan <input type="checkbox"/>	None						
Acq Rate: 300 Acq/s	Resolution:	8 BIT	Video A-scan <input type="checkbox"/>	MS-P Qty: 0						
				MS-P Threshold: 0 %						

Mechanical Settings



Acquisition information

Tomoview: 2.2R9 Hardware Used: µTomo Date: 14/2005 10:08:51 AM
 C:\PDI\Fingerprint\Sammy\316L_HTB4788_Pipe_3\316L_HTB4788_3_LJQUP_1.rdt

Analyse information

Tomoview: 2.2Q14 File Size: 187.4 MB Date: 14/2005 12:57:48 PM
 C:\Documents and Settings\user\Desktop\316L_HTB4788_3_LJQUP_1.rdt

Sequence 1 : Default Sequence									
Parameters									
	Name	Type	Resolution	Smart					
Scan axis	Arm	Quadrature	15018.96	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	56112.56	<input type="checkbox"/>					
Sequence									
Sequence Type:		Bidirectional	Fire on: Encoder		Index axis preset: None				
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.20	-4.00	0.04	0.00	In	Never	-2.0	
Index axis	Wheels	0.00	75.00	0.10	0.00	In	Never	0.0	

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\PDI\Fingerprints\Sammy\316L_HT94789_Pipe_316L_HT94789_3_LKUP_1.rdt

Date: 14/2695 10:58:51 AM

Analysis Information

Tomoview 2.2Q14 FileSize: 107.4 MB
 C:\Documents and Settings\user\Desktop\316L_HT94789_3_LKUP_1.rdt

Date: 14/2695 12:57:49 PM

Channel	Probe Name	Send vol. [mV]	W. Delay [ns]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Stew [°]	Seper.	Orientation
45°_SW_1.5MHz_	KB-A_1.5_0008	3073	5.16	0.00	0.00	45	180	0	Perpendicular
60°_RL_2MHz_LK	60°_03-858_2M	6636	11.12	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	6636	12.70	12.70	-57.15	60	180	0	Perpendicular

Appendix C-6: 316L W021437-3

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Pipe
ID# 316L_W021437-3**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

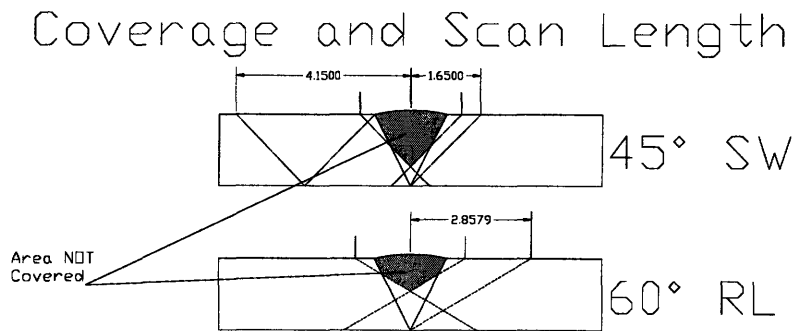


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° refracted longitudinal (RL) angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

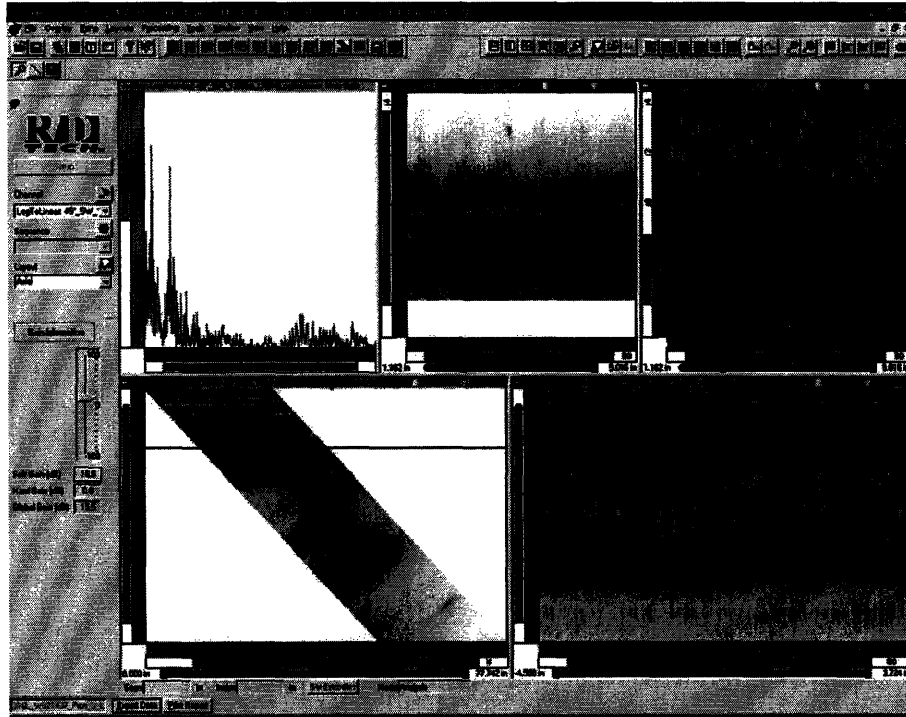


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

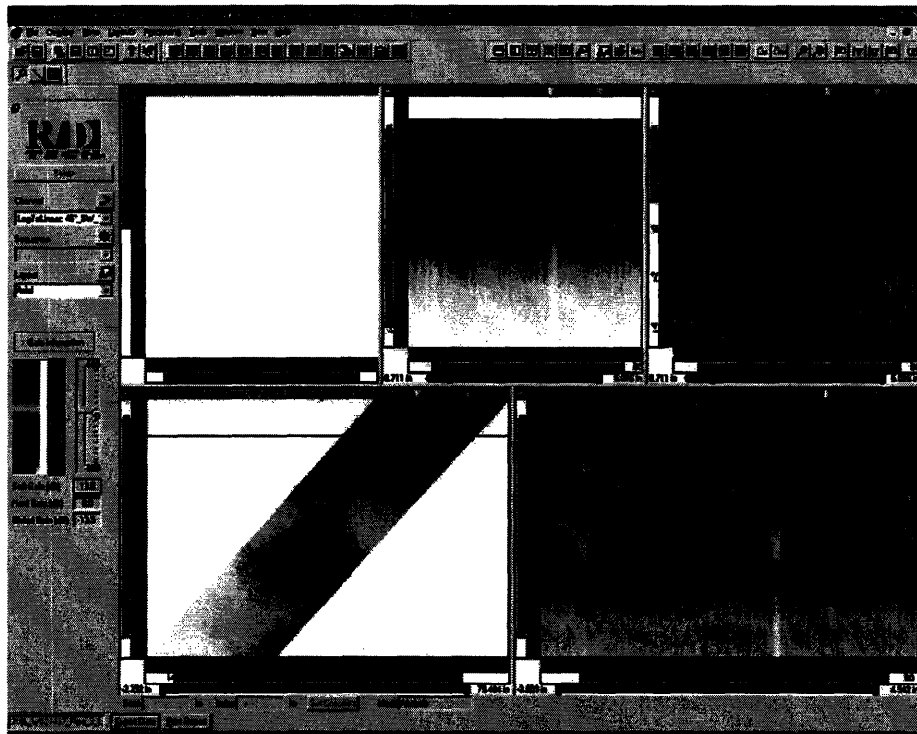


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

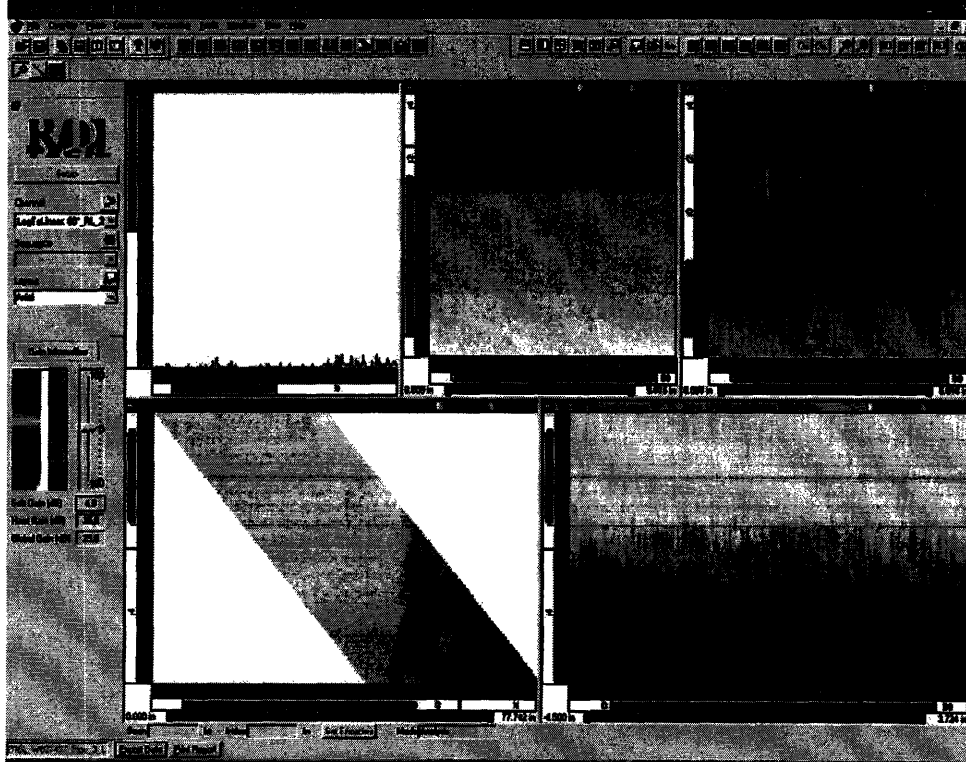


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

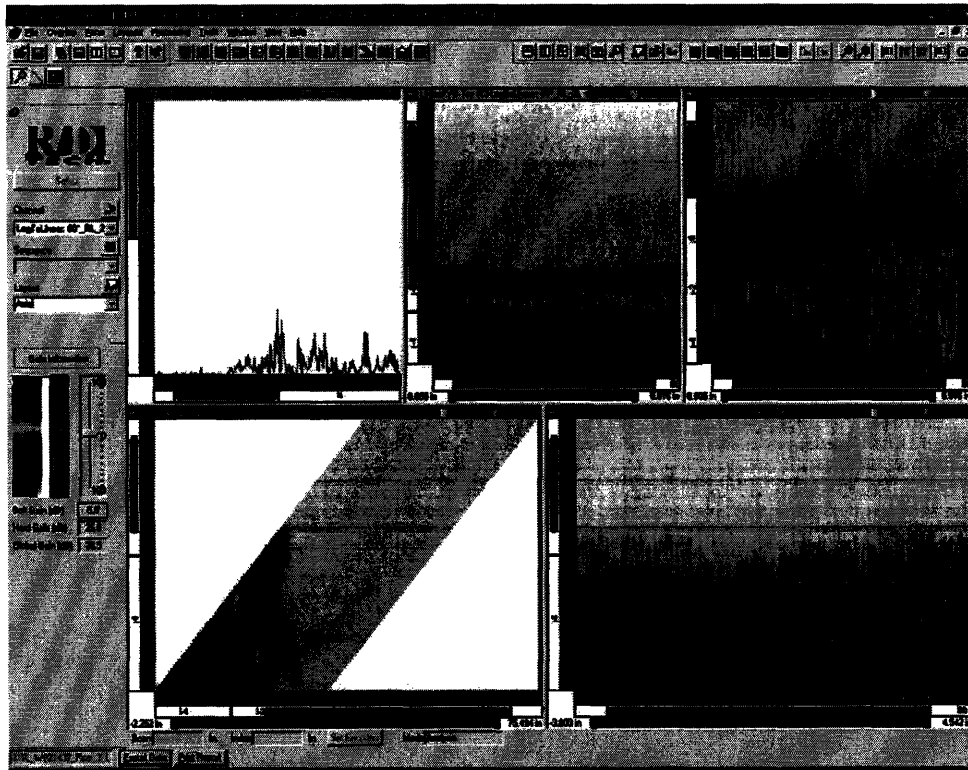


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Pipe Sample # 304L_HW021437-3 is free of recordable defects that would affect the cleanliness of the weld.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	24" Pipe Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ 24" OD
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulsar Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1 04-210	#2 00X6F			
Mode:	RL	SW			
Frequency:	2 Mhz	1.5Mhz			
Element Size:	2(20x34)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	24"	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/9/2005 2:53:52 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_2\316L_W021437_Pipe_3_LKDN.rdt

Analysis Information

Tomoview 2.2R9 File Size: 162.9 MB Date: 1/11/2005 2:56:55 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_3\LKDN\316L_W021437_Pipe_3_LKDN.rdt

Channel 1 : 45°_SW_1.5Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1464		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 564		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKDN											DAC <input type="checkbox"/>
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 40.96 μ s											
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz			Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0			Samples: 1464		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s			Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %											
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN											DAC <input type="checkbox"/>
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 40.96 μ s											
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz			Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0			Samples: 564		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s			Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
M-P Threshold: 0 %											

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/02/2005 2:53:02 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_3\316L_W021437_Pipe_3_LKDN.rdt

Analysis Information

Tomoview 2.2R9 FileSize: 102.9 MB Date: 11/11/2005 2:50:05 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_3\LKDN\316L_W021437_Pipe_3_LKDN.rdt

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Type/Position	
								Seper.	Orientation
45°_SW_1.5MHz_	KB-A_1.5_00X0	3073	5.16	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_03-060_2M	5638	11.12	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	-12.70	57.15	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.70	-12.70	57.15	60	0	0	Perpendicular

µTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/9/2005 4:07:20 PM
 C:\PDI\FingerprintSammy\316L_W021437_Pipe_3\316L_W021437_Pipe_3_LKUP.rdt

Analysis Information

Tomoview 2.2R9 FileSize: 167.4 MB Date: 1/11/2005 2:52:40 PM
 C:\PDI\FingerprintSammy\316L_W021437_Pipe_3\LKUP\316L_W021437_Pipe_3_LKUP.rdt

Channel 1 : 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 0 dB 25 dB Booster: <input type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 MHz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz																					
Dig. Frequency: 12.00 MHz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>																								
AVG: 1		Samples: 1464		A-scan: <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan: <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 2 : 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pitch & Catch</td> <td>2</td> <td>2</td> <td>300 V</td> <td>333 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 MHz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pitch & Catch	2	2	300 V	333 ns	LOG	Unsigned	None	None	2.0 MHz																					
Dig. Frequency: 12.00 MHz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>																								
AVG: 1		Samples: 584		A-scan: <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan: <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Channel 3 : LogToLinear: 45°_SW_1.5Mhz_LKup										DAC <input type="checkbox"/>	
Gain: 50 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -8.53 μ s	Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None					
Acq Rate: 300 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0					
										M-P Threshold: 0 %	
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKup										DAC <input type="checkbox"/>	
Gain: 75 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -8.53 μ s	Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 594		A-scan <input type="checkbox"/>		None					
Acq Rate: 300 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0					
										M-P Threshold: 0 %	

Mechanical Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/9/2005 2:53:52 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_3\316L_W021437_Pipe_3_LKDN.rdt

Analysis information

Tomoview 2.2R9 FileSize: 102.9 MB Date: 1/11/2005 2:50:05 PM
 C:\PDI\Fingerprint\Sammy\316L_W021437_Pipe_3\LKDN\316L_W021437_Pipe_3_LKDN.rdt

Sequence 1 : Default Sequence									
Encoder Settings									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	65875.38	<input type="checkbox"/>					
Sequence Settings									
Sequence Type: Bidirectional		Fire on: Encoder			Index axis preset: None				
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-4.00	-1.32	0.04	0.98	In	Never	-2.0	
Index axis	Wheels	0.00	75.39	0.10	0.98	In	Never	0.0	

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo Date: 11/9/2005 4:57:26 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_3\316L_W021437_Pipe_3_LKUP.rdt

Analysis information

Tomoview 2.2R9 File Size: 107.4 MB Date: 1/11/2005 2:52:48 PM
 C:\PDI\Fingerprints\Sammy\316L_W021437_Pipe_3\LKUP\316L_W021437_Pipe_3_LKUP.rdt

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Seper.	Orientation
45°_SW_1.5MHz_	KB-A_1.5_00X5	3073	5.16	0.00	0.00	45	180	0	Perpendicular
60°_RI_2MHz_LK	60°_03-660_2M	5838	11.12	12.70	-57.15	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	12.70	12.70	-57.15	60	190	0	Perpendicular
LogToLinear: 60°	Probe no.4	5838	12.70	12.70	-57.15	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/9/2005 4:07:26 PM
 C:\PDI Fingerprint\Sammy\316L_W021437_Pipe_3\316L_W021437_Pipe_3_LKUP.rdt

Analysis information

Tomoview 2.2R9 FileSize: 107.4 MB Date: 1/11/2005 2:52:40 PM
 C:\PDI Fingerprint\Sammy\316L_W021437_Pipe_3\LKUP\316L_W021437_Pipe_3_LKUP.rdt

Sequence 1 : Default Sequence								
Encoder Settings								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	15016.86	<input type="checkbox"/>				
Index axis	Wheels	Quadrature	65875.38	<input type="checkbox"/>				
Sequence Settings								
Sequence Type: Bidirectional		Fire on: Encoder			Index axis preset: None			
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	1.20	4.00	0.04	0.98	in	Never	2.0
Index axis	Wheels	0.00	75.39	0.10	0.98	in	Never	0.0

Appendix C-7: 316L W021437-4

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Flat Plate
ID# 316L_W021437-4**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

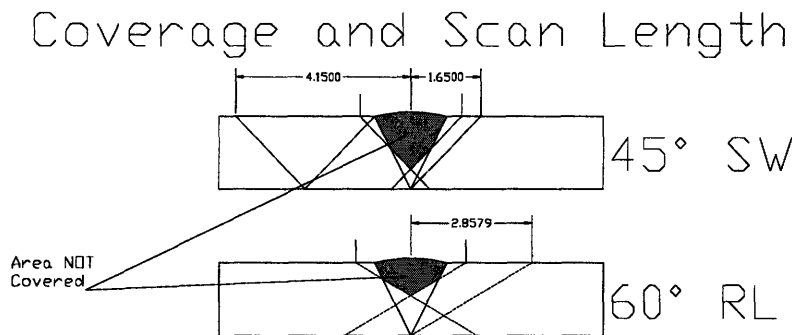


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° Refracted Longitudinal (RL) angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

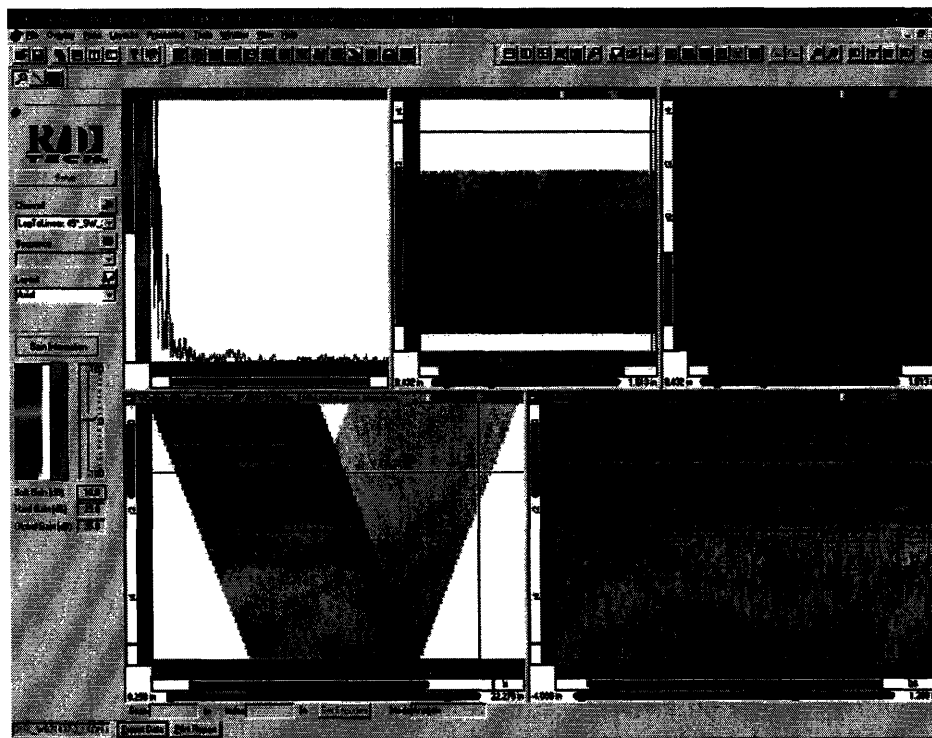


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

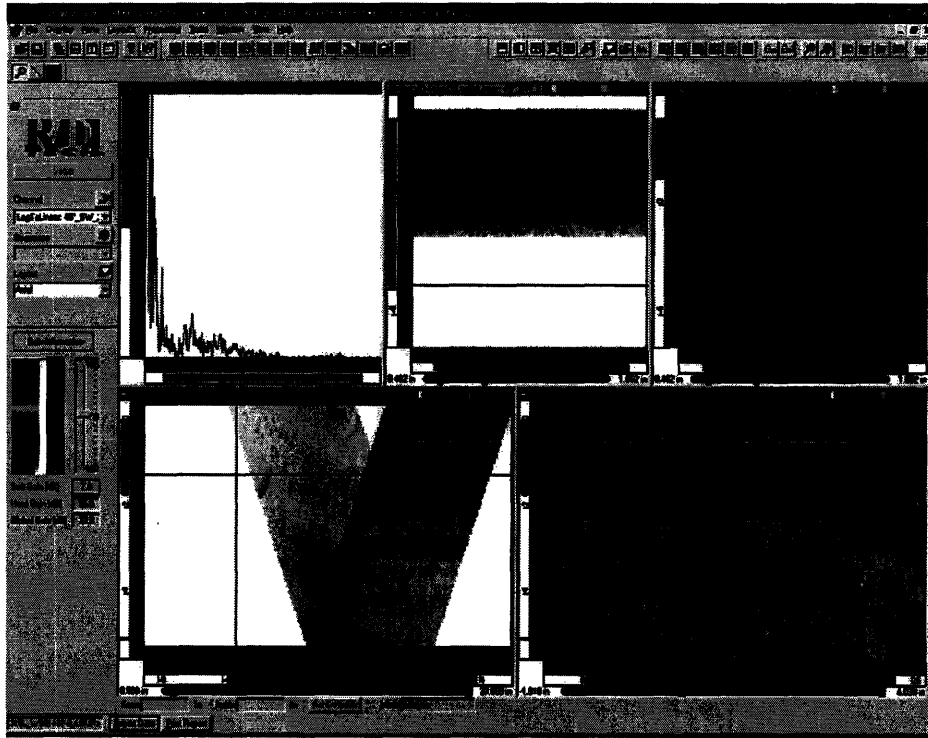


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

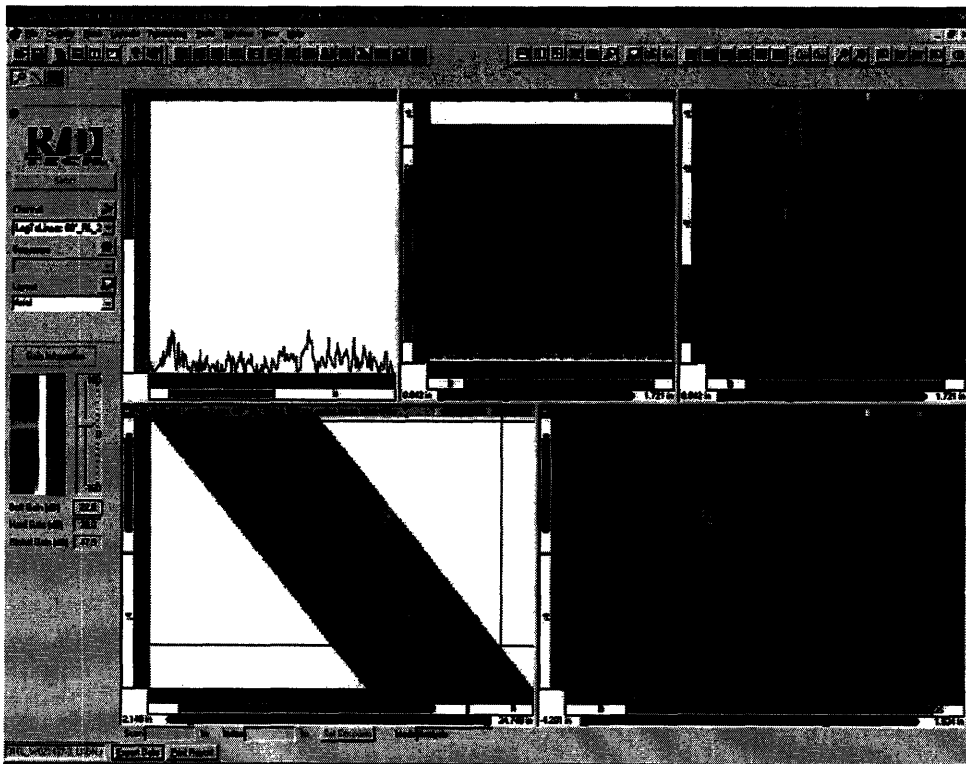


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

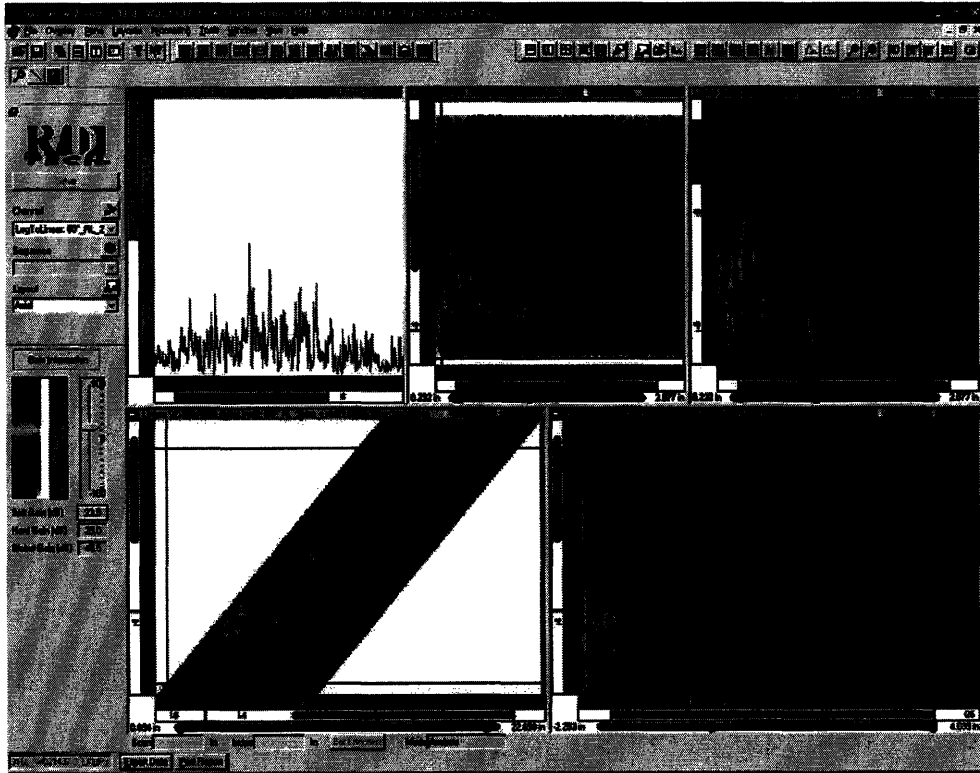


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Indications

Analysis of the ultrasonic data revealed two suspect areas contained within the weld at approximately half of the component thickness. Supplemental transducers were used to better characterize the type and location of the indications. The figures below are weld overviews using the supplemental transducers and prints magnified to show the dimensions of the indications.

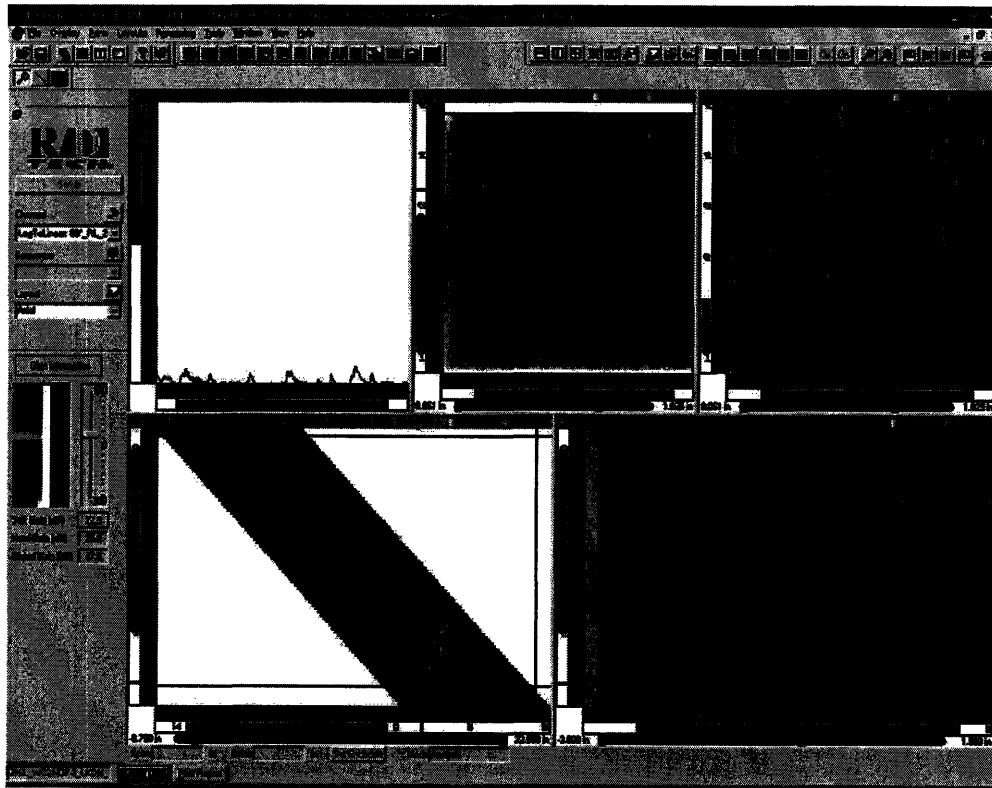


Figure 3-1 60° L-Wave Axial Scan Overview Looking Down Stream

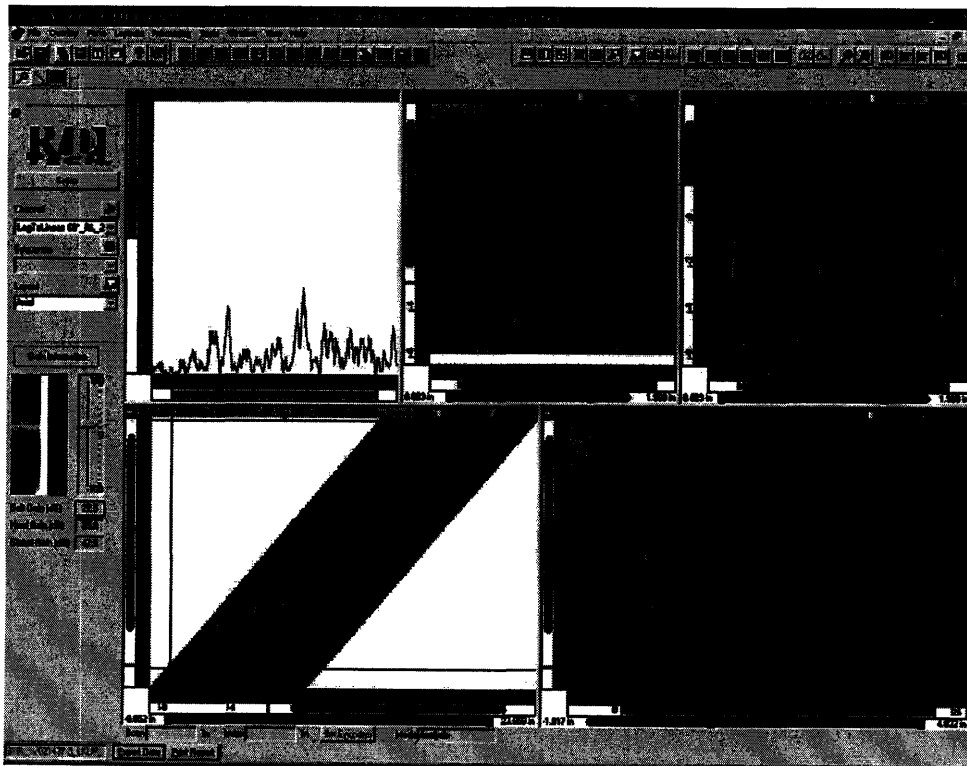


Figure 3-2 60° L-Wave Axial Scan Overview Looking Up Stream

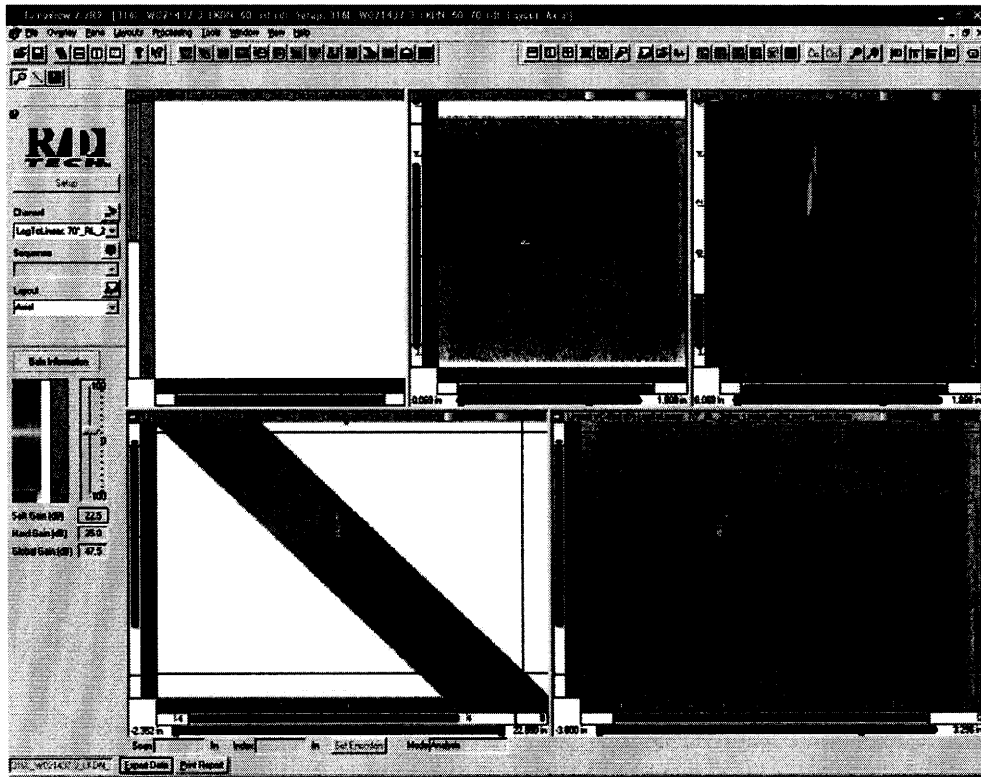


Figure 3-3 70° L-Wave Axial Scan Overview Looking Down Stream

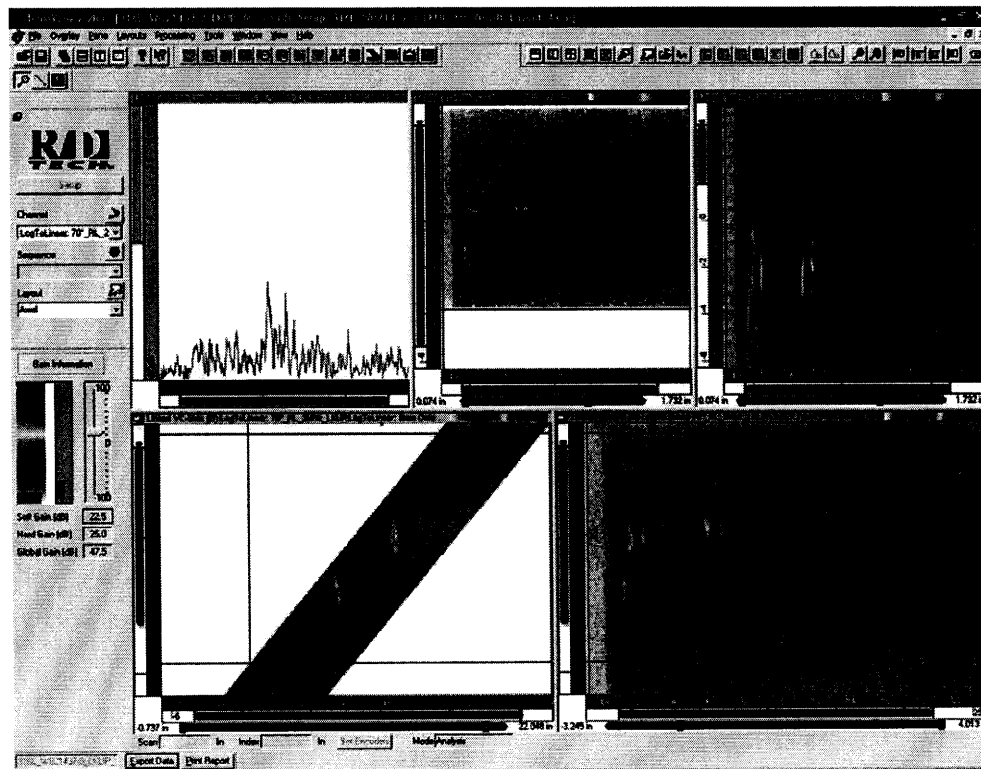


Figure 3-4 70° L-Wave Axial Scan Overview Looking Up Stream

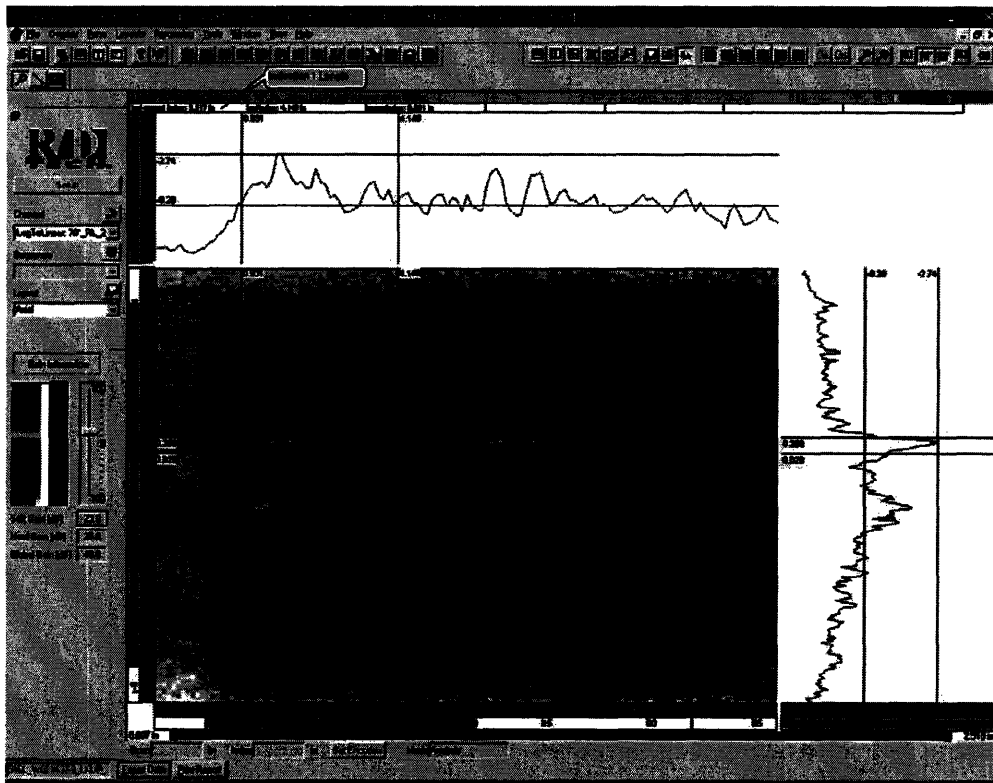


Figure 3-5 Indication 1 Length: Start-0.93" End-4.15" from Ref. End

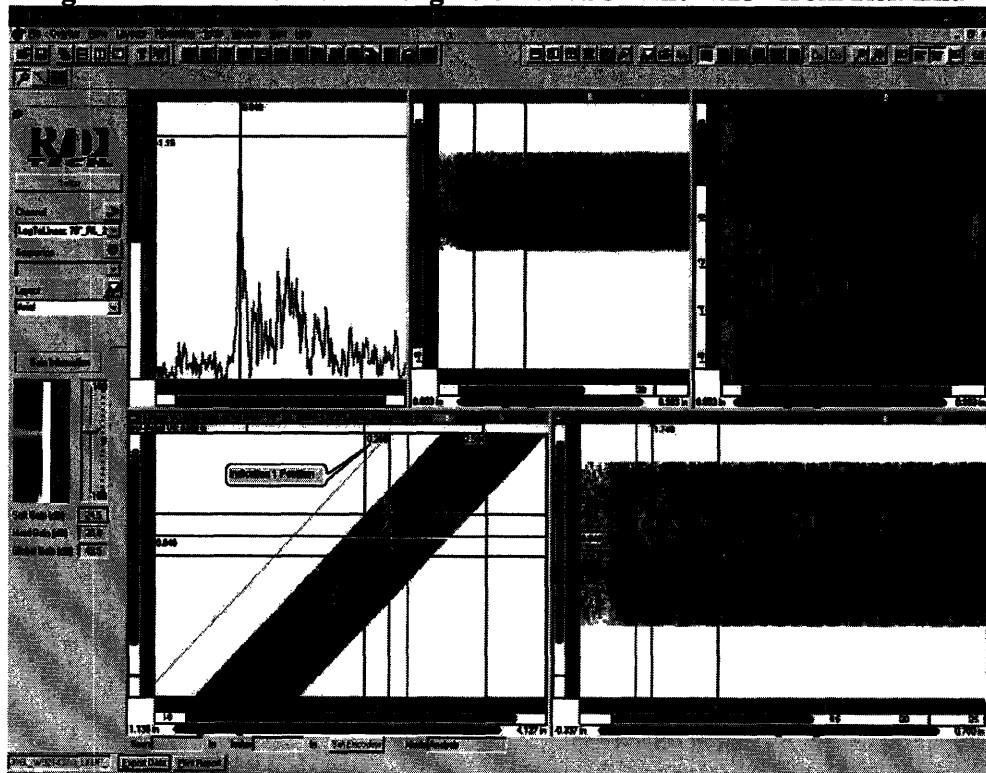


Figure 3-6 Indication 1 Position: .27" from Weld Centerline

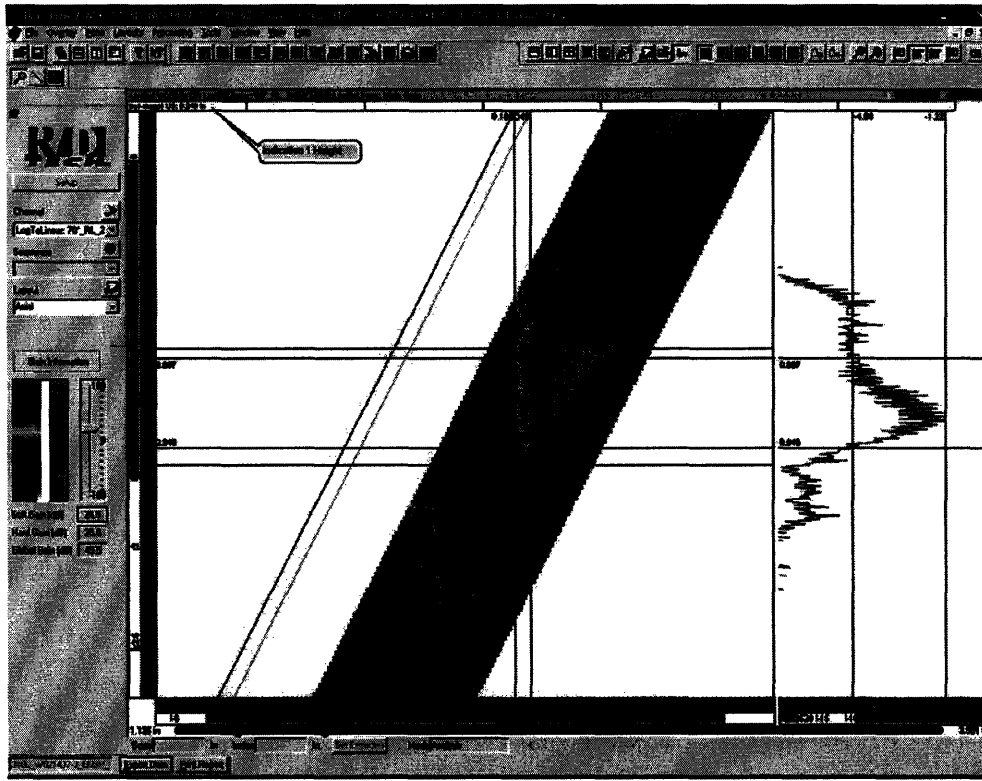


Figure 3-7 Indication 1 Maximum Height: Start~0.7" Stop~.95" from OD

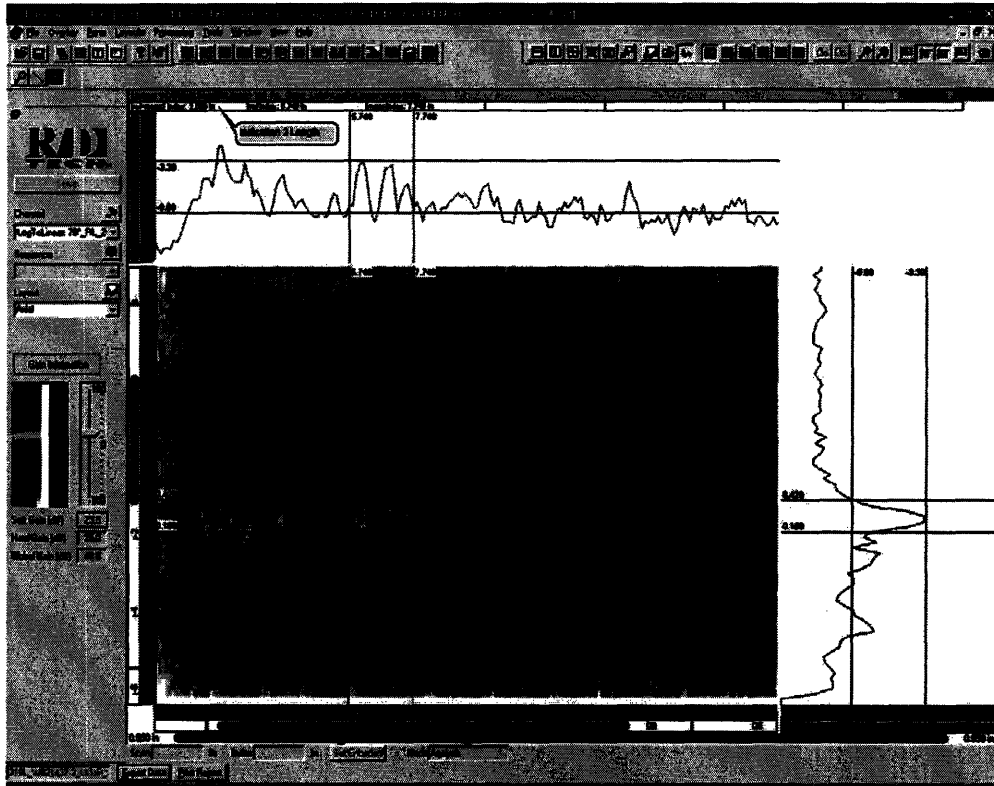


Figure 3-8 Indication 2 Length: Start-5.75" End-7.75" from Ref. End

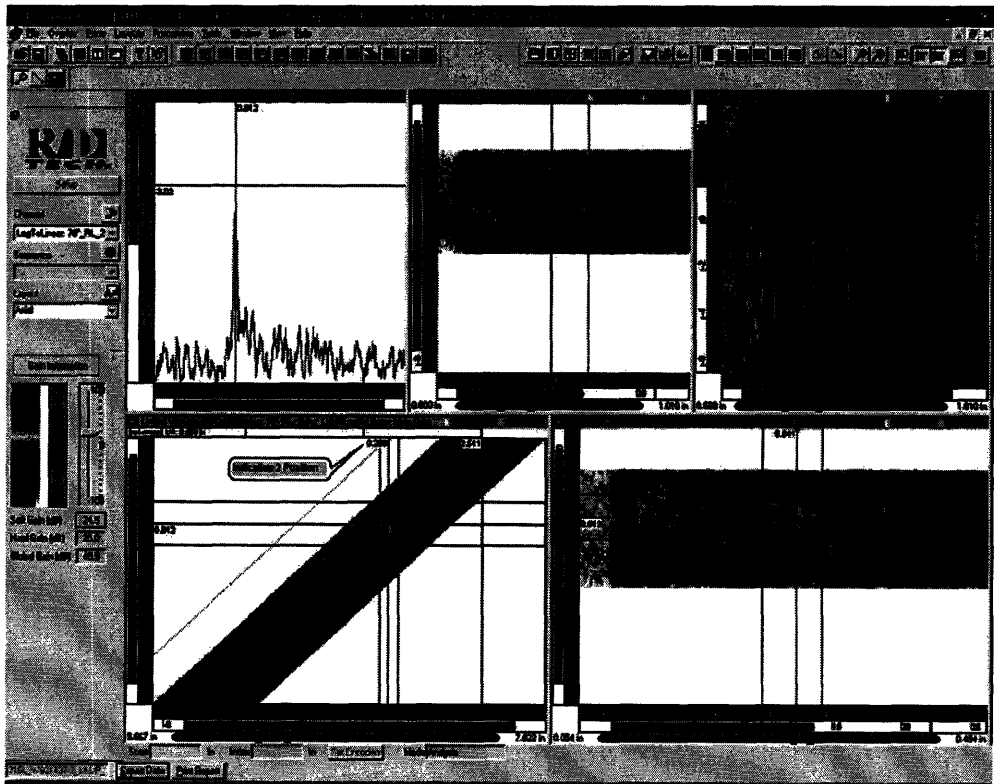


Figure 3-9 Indication 2 Position: .27" from Weld Centerline

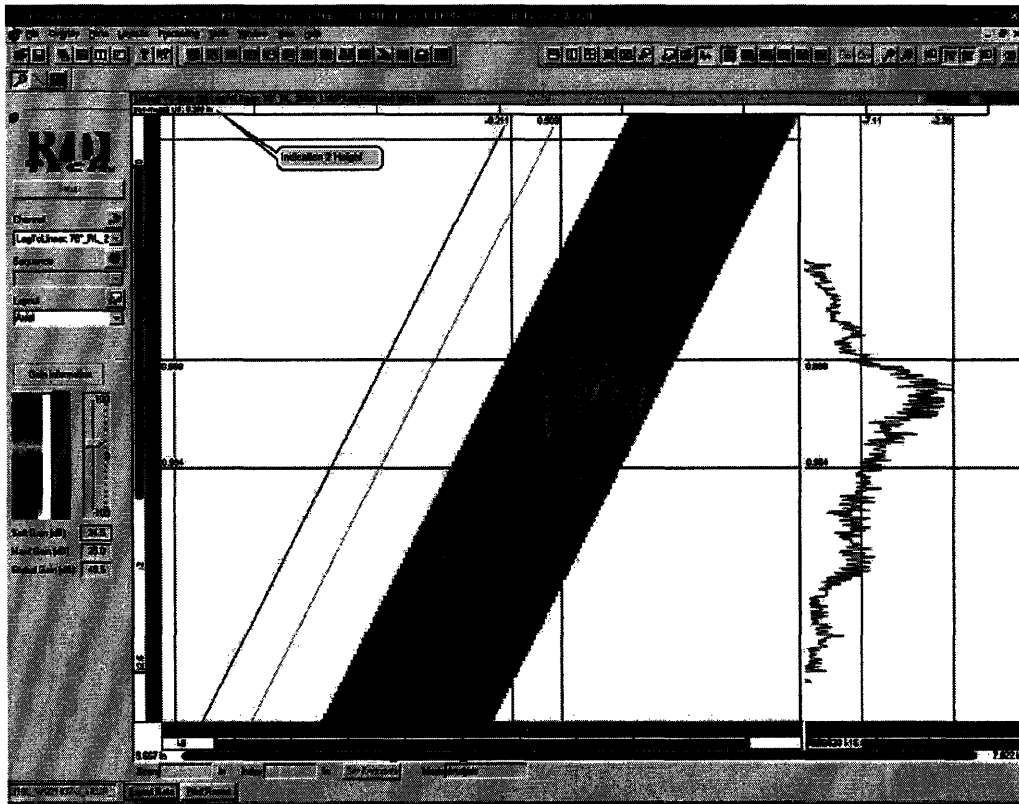


Figure 3-9 Indication 2 Maximum Height: Start~.67" Stop~.96" from OD

4. Summary of Results

As a result of the ultrasonic findings on the Flat Plate Sample 316L_W021437-3, a 1.4" section of the weld containing an indication was cut off of the end. The end removed was polished in hopes of identifying the cause of the indications. The plate has no indications past 6.35" from the reference end that would effect the cleanliness of the weld. The reference end is marked with a "0" stamp on the weld crown. This weld is free of defects excluding the area previously described in this summary.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	Flat Plate Configuration
Material Type(s):	316 Stainless Steel Base Material and 316 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ Flat Plate
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1	#2	#3	#4	
	04-210	46214	00-131	00-132	
Mode:	RL	SW	RL	RL	
Frequency:	2 Mhz	2.25Mhz	2 Mhz	2 Mhz	
Element Size:	2(10x18)	.5"	2(15x25)	2(15x25)	
Element Shape:	Rect.	Round	Rect.	Rect.	
Examination Angles:	60°	45°	60°	70°	
Wedge Requirements:	FLAT	FLAT	Flat	Flat	
Focusing Requirements:	≈1/2 "T"	N/A	≈ID	≈1/2 "T"	
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition Information

Tomoview 2.250 Hardware Used: µTomo
 GPIFI Fingerprint(Sammy0316L_W021437-3)S16L_W021437-3_LKDN_1.rdt

Date: 10/7/2005 6:00:30 PM

Analysis Information

Tomoview 2.250 File Size: 31.4 MB
 GPIFI Fingerprint(Sammy0316L_W021437-3)LKDN316L_W021437-3_LKDN.rdt

Date: 11/9/2005 6:27:47 PM

Channel 1 : 45°_SW_2.25Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.12 µs		Time base Range: 117.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LDG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1004		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.25 µs		Time base Range: 45.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	200 ns	LDG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 504		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKD										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -9.53 μ s		Time base Range: 40.96 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 1464		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -9.53 μ s		Time base Range: 40.96 μ s				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 564		A-scan <input type="checkbox"/>		None				
Acq Rate: 300 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				

Probe Settings



Acquisition Information

Tomoview 2.278 Hardware Used: pTomo
 C:\PDI\Fingerprint\Sammy\316L_W021437-3\316L_W021437-3_LKDN_1.rst

Date: 10/7/2005 6:00:30 PM

Analysis Information

Tomoview 2.278 Filter: 31.4 MB
 C:\PDI\Fingerprint\Sammy\316L_W021437-3\316L_W021437-3_LKDN.rst

Date: 11/02/05 6:27:47 PM

Channel	Probe Name	Send vel. [m/s]	W. Delay [ms]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Separ.	Orientation
45°_SW_2.25MHz	KS-A_2.25_402	3073	0.36	0.00	0.00	45	0	0	Perpendicular
60°_RL_25MHz_LK	60°_04-210_2M	6638	0.63	-5.08	-48.26	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	0.34	-4.88	-48.26	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	6638	0.34	-4.88	-48.26	60	0	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview 2.2SR Hardware Used: pFomo
 C:\PDI\Fingerprint\Benny\316L_W021437-3\316L_W021437-3_LKDN_1.rdt

Date: 10/7/2005 6:06:38 PM

Analysis information

Tomoview 2.2SR File Size: 31.4 MB
 C:\PDI\Fingerprint\Benny\316L_W021437-3\316L_W021437-3_LKDN.rdt

Date: 11/02/2005 8:27:47 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14716.20	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	8200.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-4.00	-1.32	0.04	0.00	In	Never	-2.0	
Index axis	Wheels	0.25	22.75	0.10	0.00	In	Never	2.0	

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 11/2/2005 4:08:36 PM
 C:\PDI\FingerprintSammy\316L_WR21437-3\316L_WR21437-3_LKDN_00_70.rdt

Analysis information

Tomoview 2.2R9 FileSize: 17.1 MB Date: 11/2/2005 6:48:56 PM
 C:\PDI\FingerprintSammy\316L_WR21437-3\316L_WR21437-3_LKDN_00_70.rdt

Channel 1 : 60°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.10 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	1	1	300 V	200 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 504		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 200 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 70°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.10 µs Time base Range: 65.92 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	200 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 824		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 200 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 60°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>
Gain: 50 dB 20 dB Booster: <input type="checkbox"/>										Time base Start: -0.53 μ s Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 504		A-scan <input type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %		
Channel 4 : LogToLinear: 70°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>
Gain: 75 dB 20 dB Booster: <input type="checkbox"/>										Time base Start: -0.53 μ s Time base Range: 40.96 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 504		A-scan <input type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %		

Probe Settings



Acquisition Information

Tomoview 2.289 Hardware Used: pFomo
 C:\PDI\FingerPrint\Sanny\016L_WB21437-3\016L_WB21437-3_LKDN_00_70.rdt

Date: 01/02/00 4:58:30 PM

Analysis Information

Tomoview 2.289 File Size: 17.1 MB
 C:\PDI\FingerPrint\Sanny\016L_WB21437-3\LKDN\016L_WB21437-3_LKDN_00_70.rdt

Date: 11/02/00 8:48:30 PM

Channel	Probe Name	Send vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Separ.	Orientation
00°_RL_2MHz_LK	00°_2MHz_00-1	6636	10.00	0.00	0.00	00	0	0	Perpendicular
70°_RL_2MHz_LK	70°_00-132_2M	5638	11.06	0.00	-40.04	70	0	0	Perpendicular
LogToLinear: 00°	Probe no.4	6636	12.64	0.00	-40.04	70	0	0	Perpendicular
LogToLinear: 70°	Probe no.4	5638	12.64	0.00	-40.04	70	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: gTomo
 C:\PDI\Fingerprint\Sammy\316L_W021437-3\316L_W021437-3_LJKDN_00_70.rdt

Date: 01/02/2005 4:58:30 PM

Analysis Information

Tomoview 2.2R9 File Size: 17.1 MB
 C:\PDI\Fingerprint\Sammy\316L_W021437-3\LJKDN\316L_W021437-3_LJKDN_00_70.rdt

Date: 11/02/2005 8:49:58 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	5259.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-3.00	-1.04	0.04	0.00	In	Never	-3.0	
Index axis	Wheels	-0.75	22.75	0.10	0.00	In	Never	2.0	

μTomo General Settings



Acquisition Information

Tomoview 2.280 Hardware Used: μTomo
 C:\PDI Files\pdi\Tommy\316L_W021437-3\316L_W021437-3_LKUP.rdt

Date: 10/7/2005 5:35:20 PM

Analysis Information

Tomoview 2.280 File Size: 35.0 MB
 C:\PDI Files\pdi\Tommy\316L_W021437-3\316L_W021437-3_LKUP.rdt

Date: 11/8/2005 6:59:20 PM

Channel 1 : 45°_SW_2.25MHz_LKUP										DAC <input type="checkbox"/>
Gain: 20 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.12 μs		Time base Range: 117.12 μs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Resonance: 2500 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>				
AVG: 1		Samples: 1464		A-scan: <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan: <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				
Channel 2 : 60°_RL_2MHz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.25 μs		Time base Range: 65.82 μs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	200 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Resonance: 1211 Hz		Synchro: ON PULSE		Multi-Peak: <input type="checkbox"/>				
AVG: 1		Samples: 324		A-scan: <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan: <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKU								DAC <input type="checkbox"/>	
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.94 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Null-Peak <input type="checkbox"/>			
AVG: 0		Samples: 1404		A-scan <input type="checkbox"/>		None			
Acq Rate: 205 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0			
M-P Threshold: 0 %									
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKUP								DAC <input type="checkbox"/>	
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.94 µs			
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Null-Peak <input type="checkbox"/>			
AVG: 0		Samples: 824		A-scan <input type="checkbox"/>		None			
Acq Rate: 205 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0			
M-P Threshold: 0 %									

Probe Settings



Acquisition information

Tomoview 2.270 Hardware Used: pFomo
 C:\FDI\Fingerprint\Sammy\316L_W021437-0316L_W021437-3_LKUP.rdt

Date: 10/7/2005 8:56:20 PM

Analysis information

Tomoview 2.270 FileSize: 35.0 MB
 C:\FDI\Fingerprint\Sammy\316L_W021437-0316L_W021437-3_LKUP.rdt

Date: 11/02/2005 8:56:20 PM

Channel	Probe Name	Spot vol. [pA]	W. Delay [ns]	Scan Offset [nm]	Index Offset [nm]	Angle [°]	Steer [°]	Orientation	
								Step	Orientation
45°_9W_2.258Hz	KD-A_2.25_402	3073	0.38	0.00	0.00	45	180	0	Perpendicular
89°_RL_28Hz_LK	89°_04-210_2M	5838	0.03	5.00	-22.00	70	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	0.54	4.00	-22.00	70	180	0	Perpendicular
LogToLinear: 89°	Probe no.4	5838	0.54	-4.00	-22.00	70	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\PDI\Fingerprint68mm\316L_W821437-3\316L_W821437-3_LKUP.rdt

Date: 10/7/2005 5:35:29 PM

Analysis Information

Tomoview 2.2R9 FileSize: 35.8 MB
 C:\PDI\Fingerprint68mm\316L_W821437-3\LKUP\316L_W821437-3_LKUP.rdt

Date: 11/6/2005 8:58:29 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	53899.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis present: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Present	Present value	
Scan axis	Arm	1.29	3.39	9.94	9.96	In	Never	2.0	
Index axis	Wheels	9.59	23.59	6.16	6.99	In	Never	2.0	

µTomo General Settings



Acquisition Information

Tomoview 2.2R0 Hardware Used: µTomo Date: 0/10/2005 2:50:25 PM
 C:\PDI\FingerprintSammy\316L_W021437-3\316L_W021437-3_LKUP_00_76.rdt

Analysis Information

Tomoview 2.2R0 File Size: 20.1 MB Date: 1/11/2005 2:50:50 PM
 C:\PDI\FingerprintSammy\316L_W021437-3\LKUP\316L_W021437-3_LKUP_00_76.rdt

Channel 1 : 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.10 µs		Time base Range: 45.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pkch & Catch	1	1	500 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.00 MHz		Recurrance: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 504		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				
Channel 2 : 70°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.10 µs		Time base Range: 65.28 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pkch & Catch	2	2	500 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.00 MHz		Recurrance: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 624		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
						M-P Threshold: 0 %				

Channel 3 : LogToLinear: 80°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 50 dB 20 dB Booster: <input type="checkbox"/> Time base Start: -0.55 µs Time base Range: 40.00 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	6 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz	Synclro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 504	A-scan <input type="checkbox"/>	None							
Acq Rate: 200 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
										M-P Threshold: 0 %
Channel 4 : LogToLinear: 70°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 70 dB 20 dB Booster: <input type="checkbox"/> Time base Start: -0.55 µs Time base Range: 40.00 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	6 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz	Synclro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 504	A-scan <input type="checkbox"/>	None							
Acq Rate: 200 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
										M-P Threshold: 0 %

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprints\Sammy\316L_W021437-3\316L_W021437-3_LKUP_60_70.rdt

Date: 9/10/2005 2:08:26 PM

Analysis Information

Tomoview 2.2R9 File Size: 20.1 MB
 C:\PDI\Fingerprints\Sammy\316L_W021437-3\JKUP\316L_W021437-3_LKUP_60_70.rdt

Date: 1/11/2005 2:30:30 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Probe Position	
								Separ.	Orientation
60°_RL_2Mhz_LK	60°_2Mhz_00-1	5638	10.86	0.00	0.00	60	180	0	Perpendicular
70°_RL_2Mhz_LK	70°_00-132_2M	5638	11.08	0.00	-40.64	70	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.64	0.00	-40.64	70	180	0	Perpendicular
LogToLinear: 70°	Probe no.4	5638	12.64	0.00	-40.64	70	180	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: gTomop Date: 0/10/2005 2:00:26 PM
 C:\PDI\Fingerprint8\Sammy\316L_W021437-3\316L_W021437-3_LKUP_00_70.rdt

Analysis information

Tomoview 2.2R9 FileSize: 26.1 MB Date: 1/11/2005 2:30:30 PM
 C:\PDI\Fingerprint8\Sammy\316L_W021437-3\KUP\316L_W021437-3_LKUP_00_70.rdt

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis:	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>					
Index axis:	Wheels	Quadrature	62800.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.55	1.99	0.04	0.98	in	Newer	2.0	
Index axis	Wheels	0.75	23.55	0.10	0.98	in	Newer	2.0	

Appendix C-8: 316L HT94789-4

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**316 Stainless Steel Flat Plate
ID# 316L_HT94789-4**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

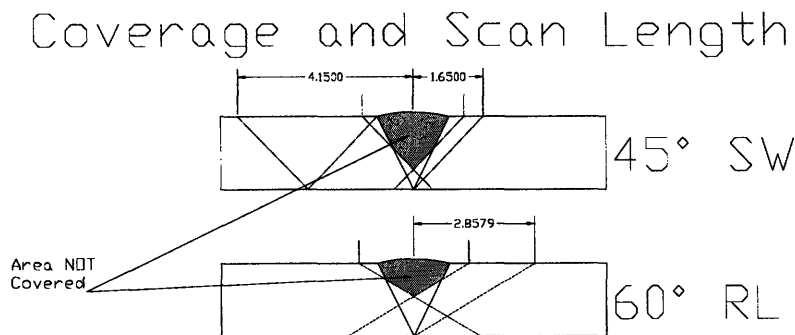


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° Refracted Longitudinal (RL) angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

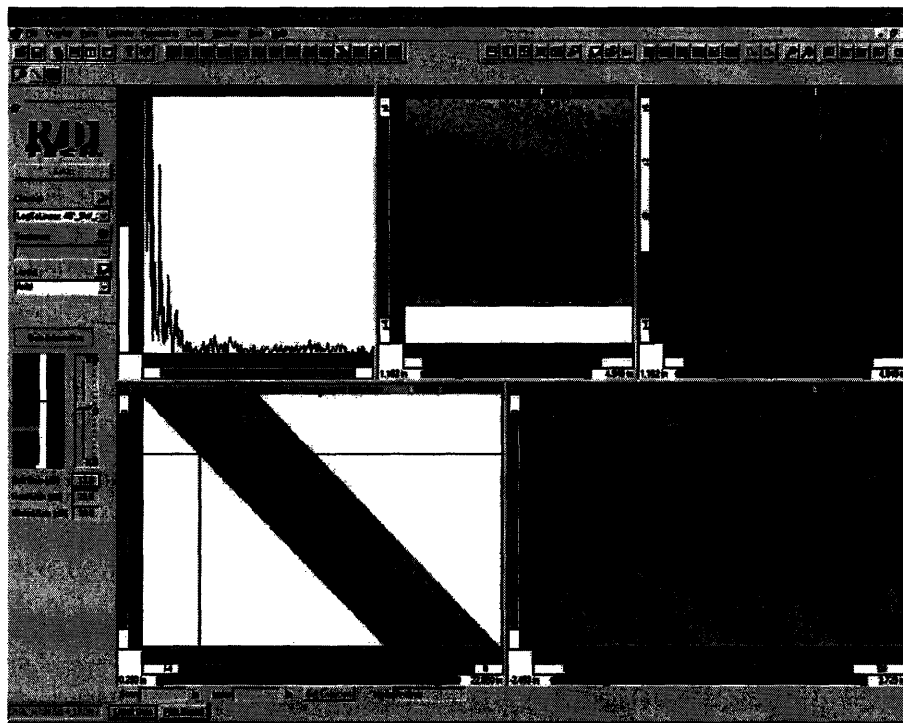


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

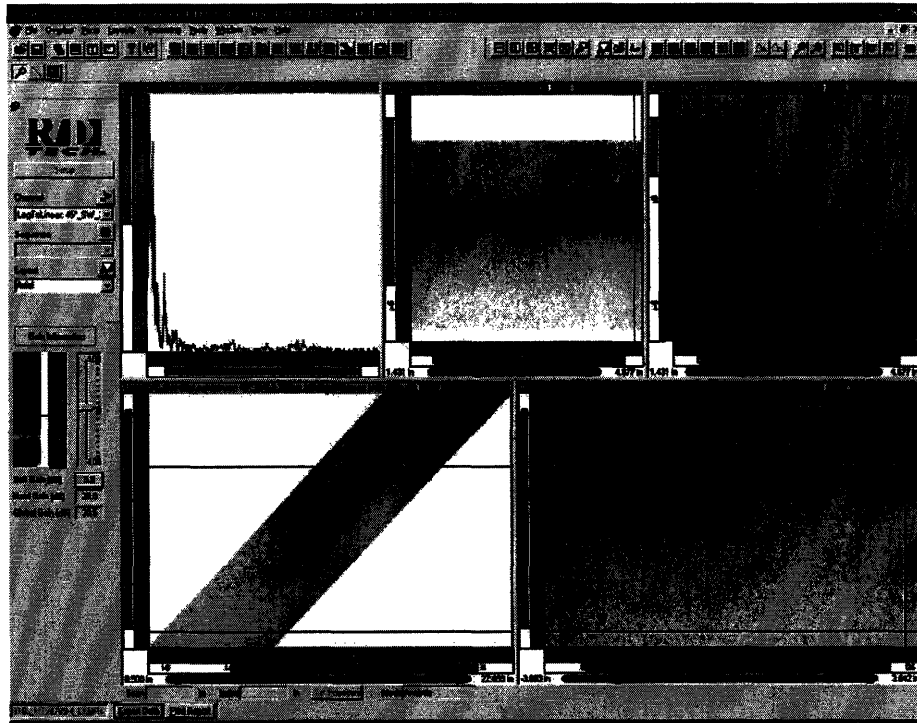


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream



Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

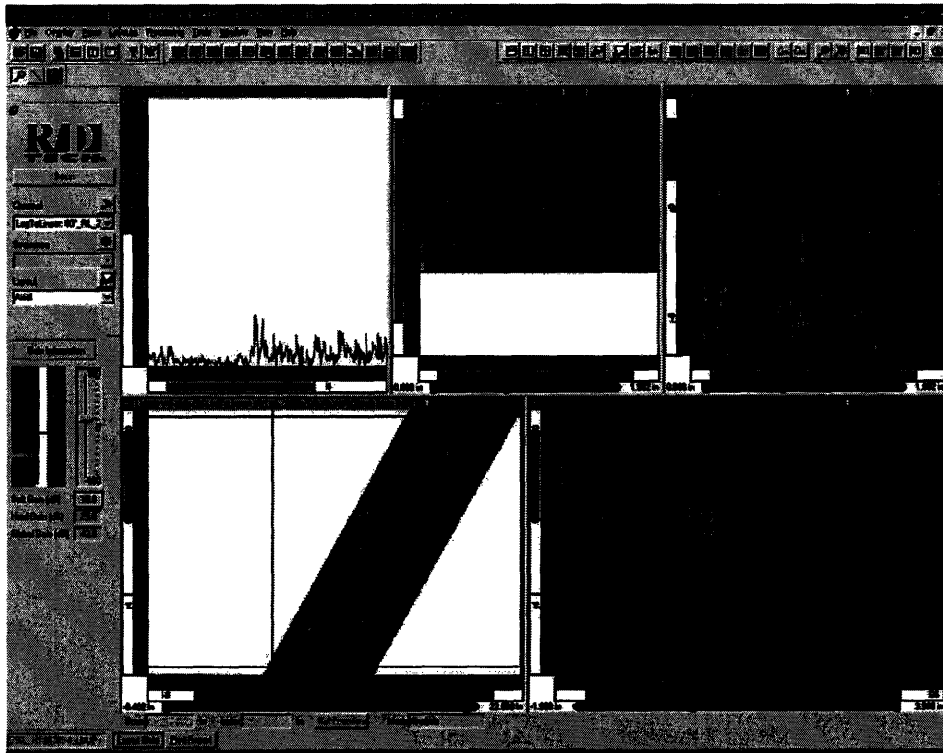


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Indications

Analysis of the ultrasonic data revealed two suspect areas contained within the weld root close to the inside surface of the component. Supplemental transducers were used to better characterize the type and location of the indications. The figures below are weld overviews using the supplemental transducers and prints magnified to show the dimensions of the indications.

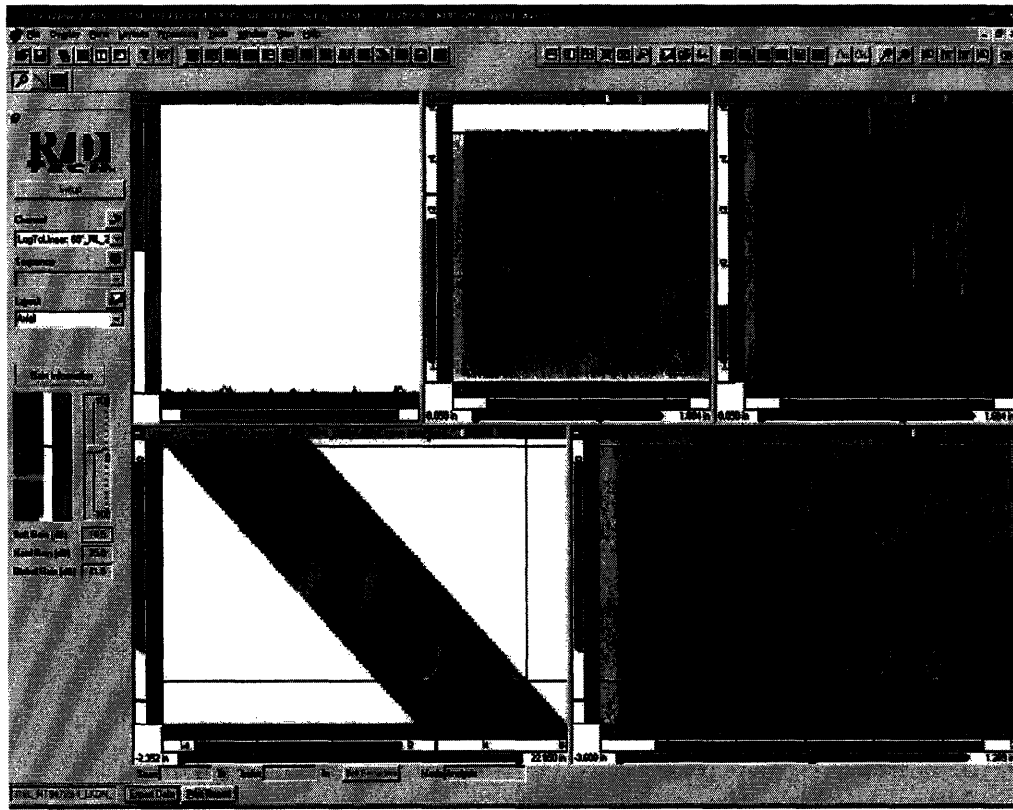


Figure 3-1 60° L-Wave Axial Scan Overview Looking Down Stream

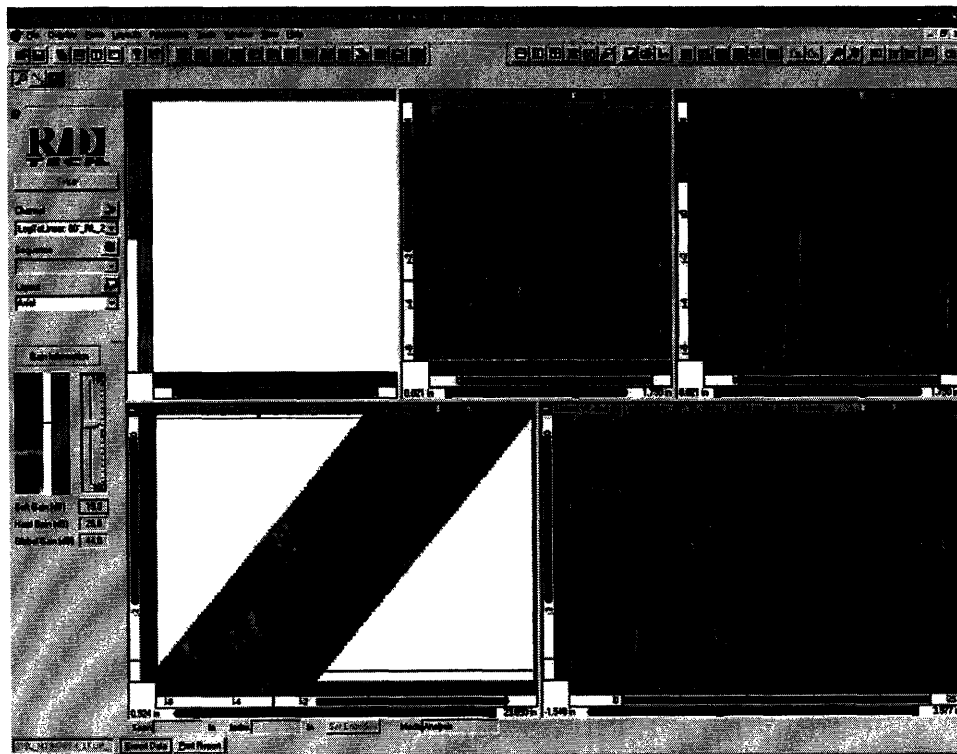


Figure 3-2 60° L-Wave Axial Scan Overview Looking Up Stream

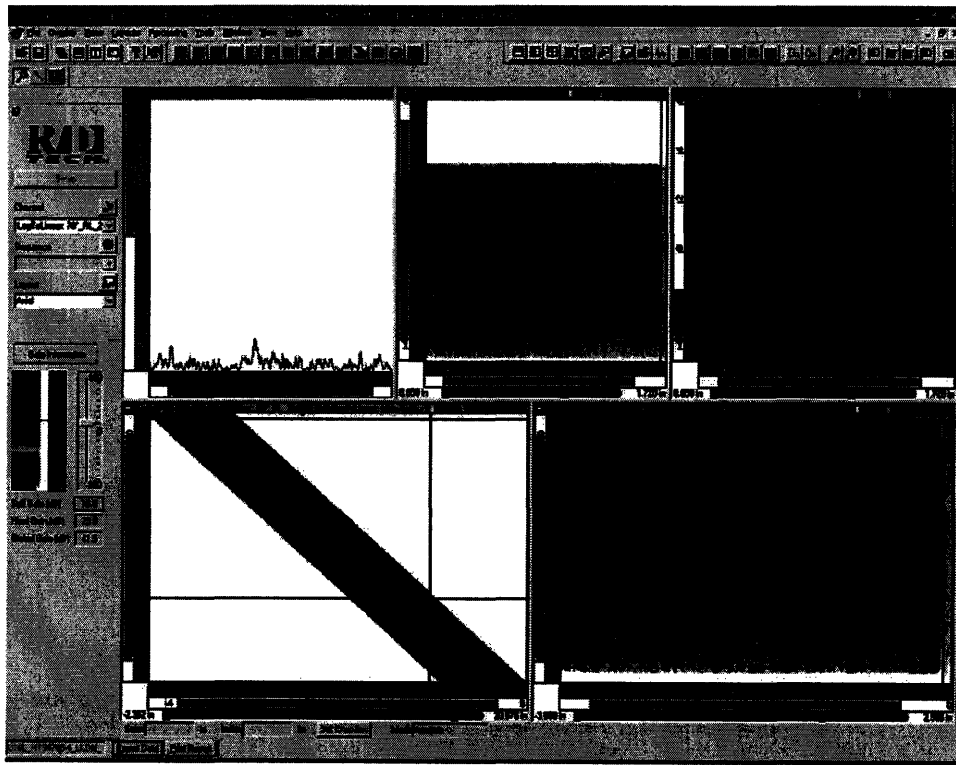


Figure 3-3 70° L-Wave Axial Scan Overview Looking Down Stream

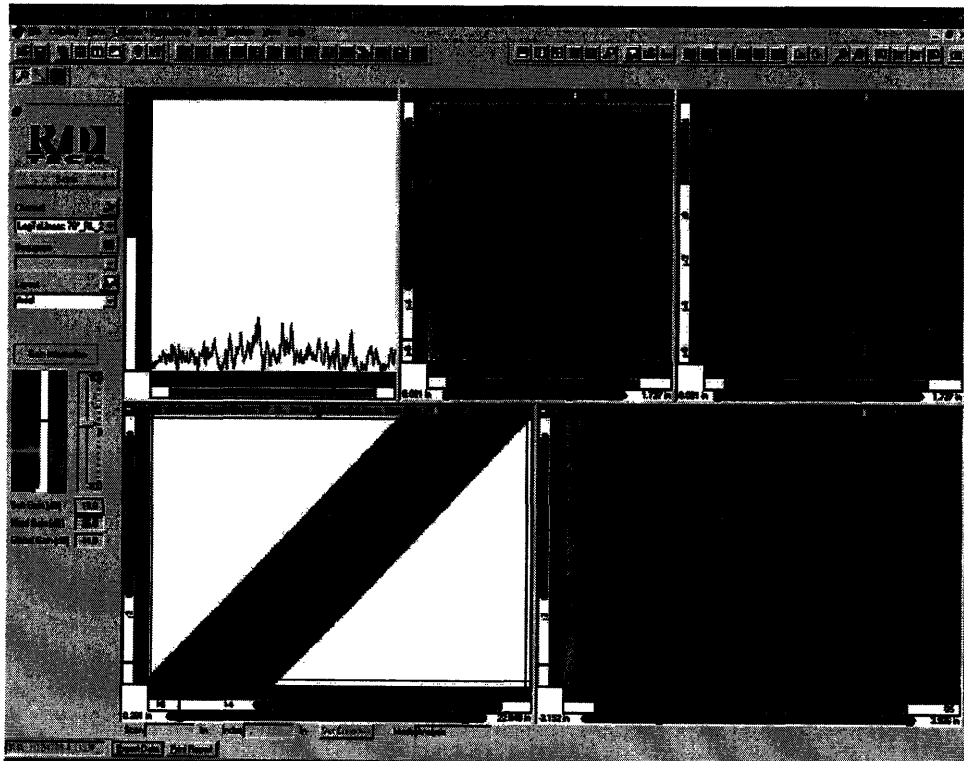


Figure 3-4 70° L-Wave Axial Scan Overview Looking Up Stream

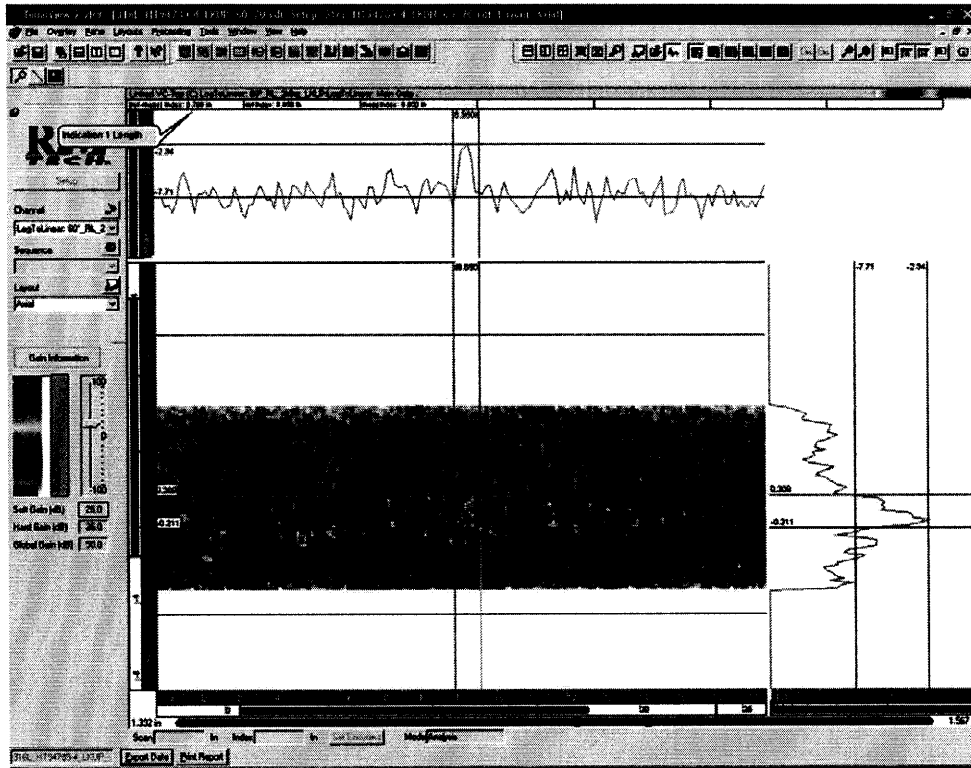


Figure 3-5 Indication 1 Length: Start-8.95" End-9.65" from Ref. End

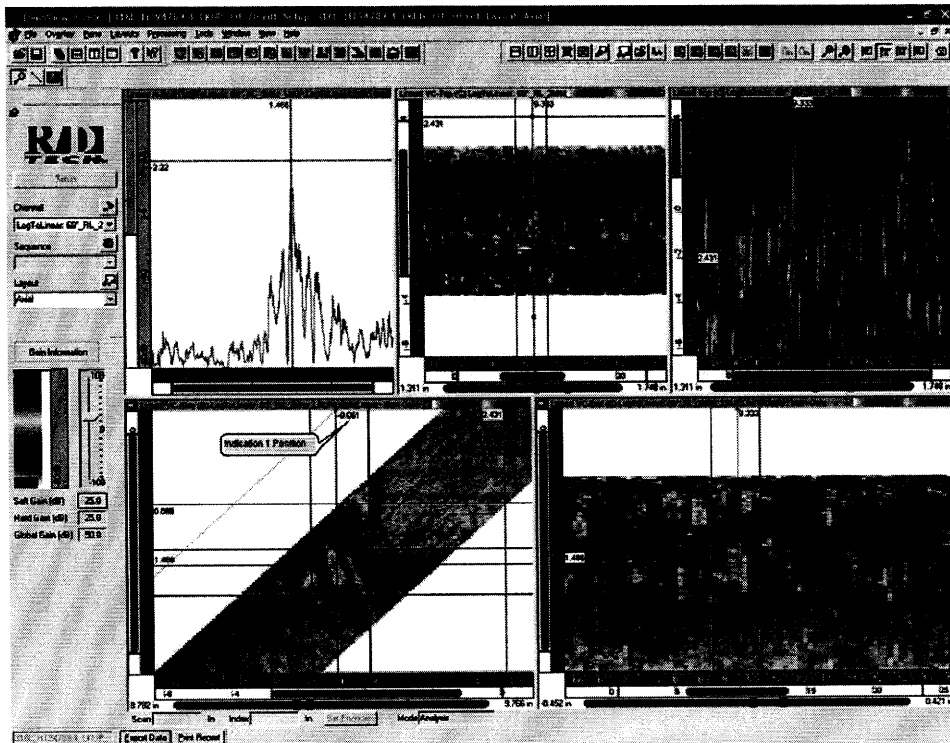


Figure 3-6 Indication 1 Position: -0.051" from Weld Centerline

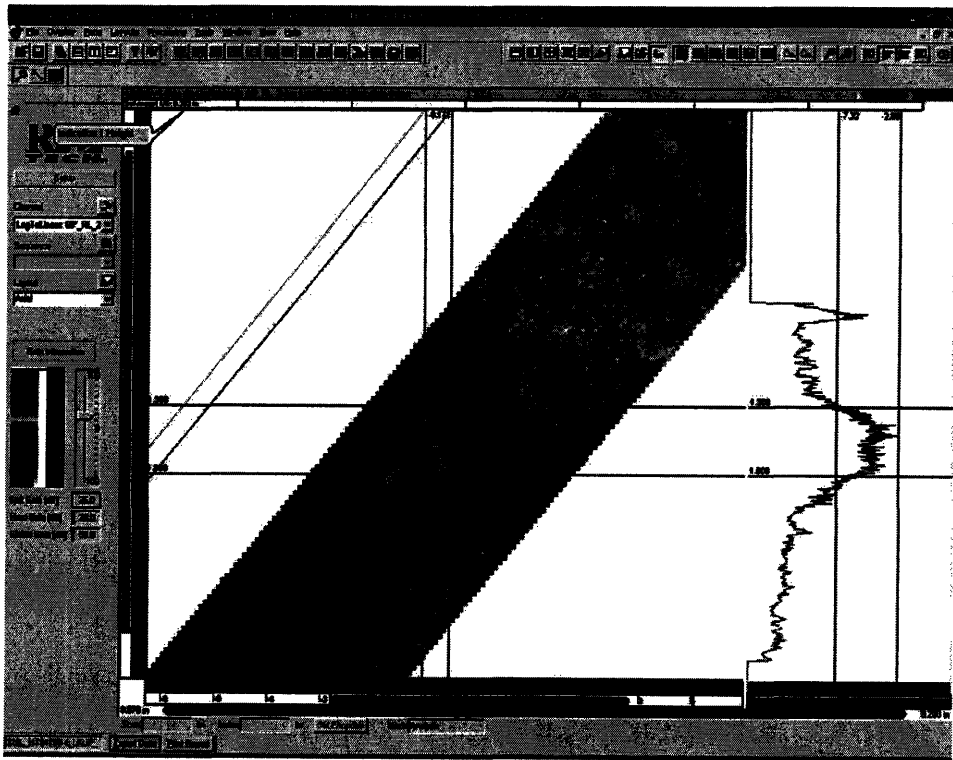


Figure 3-7 Indication 1 Maximum Height: Start~Near ID Stop~1.30" from OD

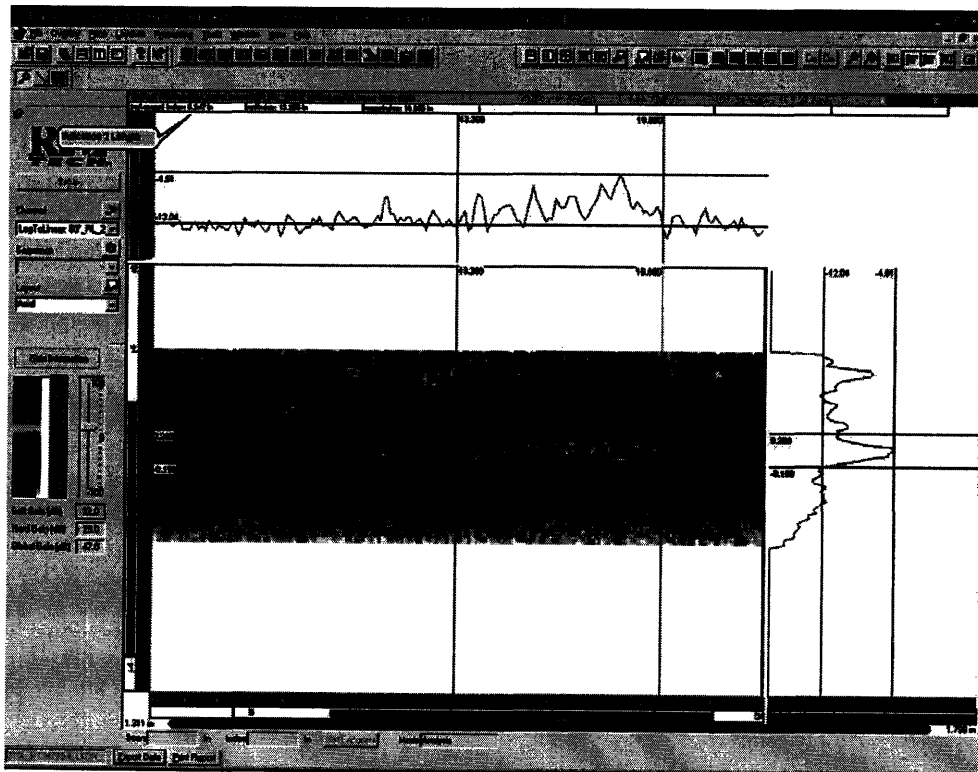


Figure 3-8 Indication 2 Length: Start-13.30" End-19.65" from Ref. End

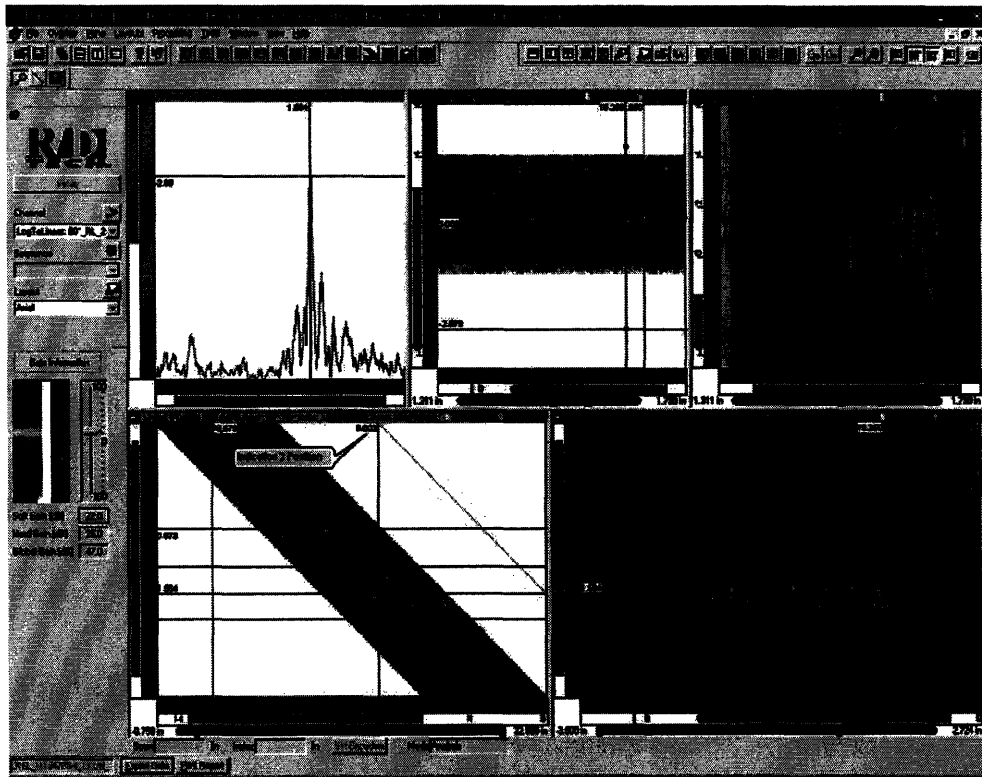


Figure 3-9 Indication 2 Position: 0.002" from Weld Centerline

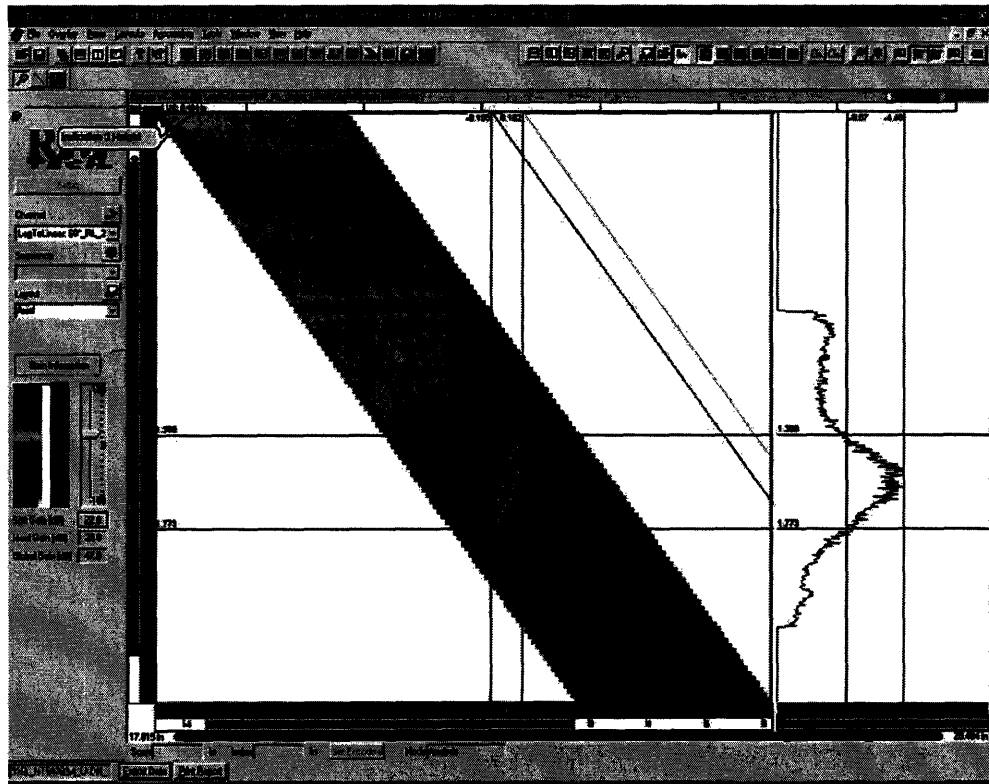


Figure 3-9 Indication 2 Maximum Height: Start~Near ID Stop~1.37" from OD

4. Summary of Results

As a result of the ultrasonic findings on the Flat Plate Sample 316L_HT94789-4, the areas of interest were excavated and repaired from the ID of the component. Using manual techniques, Indication 1 and the surrounding area were found to be free of indications. Manual inspection of the area containing the second indication showed that the initial indication was repaired; however a small defect near the ID was recorded from 19.7” to 21.5” from the reference end. The reference end is marked with a “0” stamp on the weld crown. This weld is free of defects excluding the small area previously described in this summary.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	Flat Plate Configuration
Material Type(s):	316 Stainless Steel Base Material and 316 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ Flat Plate
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1 04-210	#2 46214	#3 00-131	#4 00-132	
Mode:	RL	SW	RL	RL	
Frequency:	2 Mhz	2.25Mhz	2 Mhz	2 Mhz	
Element Size:	2(10x18)	.5"	2(15x25)	2(15x25)	
Element Shape:	Rect.	Round	Rect.	Rect.	
Examination Angles:	60°	45°	60°	70°	
Wedge Requirements:	FLAT	FLAT	Flat	Flat	
Focusing Requirements:	≈1/2 "T"	N/A	≈ID	≈1/2 "T"	
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60° 1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3” per sec. either axis
Data Resolutions:	≤ 0.040”: data taking / 0.1”: indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all Flat Plate Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

Probe Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4\316L_HT94789-4_LKUP_60_70.rdt

Date: 0/10/2005 2:43:18 PM

Analysis Information

Tomoview 2.2R9 FileSize: 28.1 MB
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4\316L_HT94789-4_LKUP_60_70.rdt

Date: 11/4/2005 4:05:40 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	TOP TO BOTTOM	
								Separ.	Orientation
60°_RL_2MHz_LK	60°_2MHz_00-1	5638	10.86	0.00	0.00	60	180	0	Perpendicular
70°_RL_2MHz_LK	70°_00-132_2M	5638	11.08	0.00	-40.64	70	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.84	0.00	-40.64	70	180	0	Perpendicular
LogToLinear: 70°	Probe no.4	5638	12.84	0.00	-40.64	70	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2FD Hardware Used: pTomo
 C:\PCI\Fingerprnt6\Sammy\316L_HTS4788_4316L_HTS4788-4_LJQP_08_78.rdt

Date: 0/18/2005 2:43:18 PM

Analysis Information

Tomoview 2.2FD FileSize: 26.1 MB
 C:\PCI\Fingerprnt6\Sammy\316L_HTS4788_4316L_HTS4788-4_LJQP_08_78.rdt

Date: 1/14/2005 4:55:45 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14718.20	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	8288.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.55	3.90	0.04	0.05	in	Never	2.0	
Index axis	Wheels	0.75	23.55	0.10	0.55	in	Never	2.0	

µTomo General Settings



Acquisition Information

Tomoview 2.2R3 Hardware Used: µTomo
 C:\PDI\Fingerprint\Samsung\New Folder (2)\316L_HT94789-4_LKDN_1.rdt

Date: 10/7/2005 4:43:19 PM

Analysis Information

Tomoview 2.2R3 File Size: 26.9 MB
 C:\PDI\Fingerprint\Samsung\316L_HT94789_4\316L_HT94789-4_LKDN.rdt

Date: 11/4/2005 4:58:54 PM

Channel 1 : 45°_SW_2.25Mhz_LKDN										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>300 V</td> <td>222 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 Mhz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 Mhz		Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 1464		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>																				
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pitch & Catch</td> <td>2</td> <td>2</td> <td>300 V</td> <td>250 ns</td> <td>LOG</td> <td>Unsigned</td> <td>None</td> <td>None</td> <td>2.0 Mhz</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 Mhz	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 Mhz																					
Dig. Frequency: 12.50 Mhz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 1		Samples: 364		A-scan <input checked="" type="checkbox"/>		None																								
Acq Rate: 300 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKD										DAC <input type="checkbox"/>																				
Gain: 60 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -0.55 µs	Time base Range: 40.34 µs																			
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>0 V</td> <td>0 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrance: 0 Hz		Synchron: ON PULSE		Multi-Peak: <input type="checkbox"/>																								
AVG: 0		Samples: 1404		A-Scan: <input type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 0 BIT		Video A-Scan: <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>																				
Gain: 75 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -0.55 µs	Time base Range: 40.34 µs																			
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>0 V</td> <td>0 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrance: 0 Hz		Synchron: ON PULSE		Multi-Peak: <input type="checkbox"/>																								
AVG: 0		Samples: 554		A-Scan: <input type="checkbox"/>		None																								
Acq Rate: 300 Acq/s		Resolution: 0 BIT		Video A-Scan: <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Probe Settings



Acquisition Information

Tomoview 2.2R3 Hardware Used: jfomo
 C:\PDI\Fingerprints\Sammy\New Folder (2)\316L_HTS4789-4_LKDN_1.rdt

Date: 10/7/2005 4:43:10 PM

Analysis Information

Tomoview 2.2R3 FileSize: 26.9 MB
 C:\PDI\Fingerprints\Sammy\316L_HTS4789_4\316L_HTS4789-4_LKDN.rdt

Date: 11/4/2005 4:06:04 PM

Channel	Probe Name	Sed vol. [ml]	W. Delay [ms]	Scan Offset [ms]	Inter Offset [ms]	Angle [°]	Shear [°]	Orientation	
								Seper.	Orientation
45°_SW_2.25MHz	KB-A_2.25_462	3073	8.96	0.00	0.00	45	0	0	Perpendicular
60°_RD_2.25MHz_LK	60°_04-210_2M	6636	9.09	-5.08	48.26	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	8.94	-4.86	48.26	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	6636	8.94	-4.86	48.26	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.870 Hardware Used: iTomio
 C:\PDI\FingerPrints\New Folder (2)\316L_HTB4788-4_LIGN_1.rdt

Date: 10/7/2005 4:43:10 PM

Analysis Information

Tomoview 2.870 FileSize: 20.9 MB
 C:\PDI\FingerPrints\New Folder (2)\316L_HTB4788_4\316L_HTB4788-4_LIGN.rdt

Date: 11/4/2005 4:59:04 PM

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Insert				
Scan axis	Arm	Quadrature	14716.29	<input checked="" type="checkbox"/>				
Index axis	Wheels	Quadrature	32000.45	<input checked="" type="checkbox"/>				
Sequence Type: Bidirectional		Pulse on: Encoder		Index axis preset: None				
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	-3.00	-1.32	0.04	0.00	in	Never	-3.0
Index axis	Wheels	0.25	22.75	0.10	0.00	in	Never	2.0

µTomo General Settings



Acquisition Information

TomoView 3.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sanny\316L_HT94789_4\316L_HT94789-4_LKDN_00_78.rdt

Date: 01/02/2005 4:35:09 PM

Analysis Information

TomoView 3.2R9 File Size: 17.1 MB
 C:\PDI\Fingerprint\Sanny\316L_HT94789_4\316L_HT94789-4_LKDN_00_78.rdt

Date: 11/02/2005 4:05:32 PM

Channel 1 : 60°_RL_2Mhz_LKdn										DAG <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.10 µs		Time base Range: 45.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	1	1	300 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 2500 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 564		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %
Channel 2 : 70°_RL_2Mhz_LKdn										DAG <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.10 µs		Time base Range: 55.92 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 824		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 60°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>	
Gain: 60 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -4.53 μ s	Time base Range: 40.00 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 504		A-scan <input type="checkbox"/>		None					
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 4 : LogToLinear: 70°_RL_2Mhz_LKdn										DAC <input type="checkbox"/>	
Gain: 75 dB 25 dB Booster: <input type="checkbox"/>										Time base Start: -5.53 μ s	Time base Range: 40.00 μ s
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing		
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None		
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0		Samples: 524		A-scan <input type="checkbox"/>		None					
Acq Rate: 200 Acqs		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: pTomo
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4\316L_HT94789-4_LKDN_60_70.rdt

Date: 8/18/2005 4:35:09 PM

Analysis information

Tomoview 2.2R9 FileSize: 17.1 MB
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4\316L_HT94789-4_LKDN_60_70.rdt

Date: 11/4/2005 4:05:32 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	TPO Position	
								Separ.	Orientation
60°_RL_2Mhz_LK	60°_2Mhz_00-1	5638	10.88	0.00	0.00	60	0	0	Perpendicular
70°_RL_2Mhz_LK	70°_00-132_2M	5638	11.06	0.00	-40.64	70	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	12.64	0.00	-40.64	70	0	0	Perpendicular
LogToLinear: 70°	Probe no.4	5638	12.64	0.00	-40.64	70	0	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview 2.2R3 Hardware Used: jfTome
 C:\PDI\Fingerprint\Sunny\316L_HTB4789_4\316L_HTB4789-4_LKDN_00_79.rdt

Date: 07/02/2005 4:35:30 PM

Analysis information

Tomoview 2.2R3 File Size: 17.1 MB
 C:\PDI\Fingerprint\Sunny\316L_HTB4789_4\316L_HTB4789-4_LKDN_00_79.rdt

Date: 11/16/2005 4:35:32 PM

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	14716.29	<input checked="" type="checkbox"/>				
Index axis	Wheels	Quadrature	52856.45	<input checked="" type="checkbox"/>				
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	-5.00	-1.04	0.04	0.06	In	Never	-2.0
Index axis	Wheels	-0.75	22.75	0.10	0.06	In	Never	2.0

µTomo General Settings



Acquisition information

Tomoview: 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sanny\New Folder (2)\S16L_HTB4789-4_LKUP.rdt

Date: 10/7/2006 9:12:03 PM

Analysis information

Tomoview: 2.2R9 FileSize: 35.0 MB
 C:\PDI\Fingerprint\Sanny\S16L_HTB4789_0S16L_HTB4789-4_LKUP.rdt

Date: 11/4/2006 4:00:24 PM

Channel 1 : 45°_SW_2.25Mhz_LKUP										DAG <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.12 µs		Time base Range: 117.12 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LDG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 2000 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 1444		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %
Channel 2 : 60°_RL_2Mhz_LKUP										DAG <input type="checkbox"/>
Gain: 25 dB		25 dB Booster: <input checked="" type="checkbox"/>		Time base Start: 0.25 µs		Time base Range: 65.02 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	200 ns	LDG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz		Recurrence: 1211 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 1		Samples: 824		A-scan <input checked="" type="checkbox"/>		None				
Acq Rate: 200 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 45°_SW_2.25MHz_LKU										DAC <input type="checkbox"/>
Gain: 50 dB 20 dB Booster: <input type="checkbox"/> Time base Start: -0.50 µs Time base Range: 40.00 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.00 MHz	Recurance: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0	Samples: 1004		A-scan <input type="checkbox"/>		None					
Acq Rate: 200 Acq	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 4 : LogToLinear: 60°_RL_2MHz_LKUP										DAC <input type="checkbox"/>
Gain: 75 dB 20 dB Booster: <input type="checkbox"/> Time base Start: -0.50 µs Time base Range: 40.00 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.00 MHz	Recurance: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 0	Samples: 524		A-scan <input type="checkbox"/>		None					
Acq Rate: 200 Acq	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Probe Settings



Acquisition Information

Tomoview 2.3R9 Hardware Used: yfomo
 C:\PDI\Fingerprint\Sammy\New Folder (2)\316L_NT94789-4_LKUP.rst

Date: 10/7/2005 5:12:05 PM

Analysis Information

Tomoview 2.3R9 File Size: 35.0 MB
 C:\PDI\Fingerprint\Sammy\316L_NT94789_4\316L_NT94789-4_LKUP.rst

Date: 11/4/2005 4:06:24 PM

Channel	Probe Name	Send vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	θ _{scan} [°]	θ _{separ.}	Orientation
45°_SW_2.95MHz	KB-A_2.25_482	3073	5.36	0.00	0.00	45	180	0	Perpendicular
60°_RL_2MHz_LK	60°_04-210_2M	5638	9.03	5.06	-22.88	70	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	5.34	4.88	-22.88	70	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638	5.54	4.88	-22.88	70	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PCI\Fingerprint\Sammy\New Folder (2)\316L_HT94789-4_LKUP.rdt

Date: 10/7/2005 6:12:53 PM

Analysis Information

Tomoview 2.2R9 File Size: 35.0 MB
 C:\PCI\Fingerprint\Sammy\316L_HT94789_4\316L_HT94789-4_LKUP.rdt

Date: 11/4/2005 4:06:24 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	8289.46	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional File on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.28	3.88	0.84	0.98	in	Never	2.0	
Index axis	Wheels	0.50	23.88	0.10	0.98	in	Never	2.0	

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4316L_HT94789-4_LKUP_60_70.rdt

Date: 01/02/2005 2:43:18 PM

Analysis information

Tomoview 2.2R9 FileSize: 20.1 MB
 C:\PDI\Fingerprint\Sammy\316L_HT94789_4316L_HT94789-4_LKUP_60_70.rdt

Date: 11/02/2005 4:05:46 PM

Channel 1 : 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.10 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	1	1	300 V	200 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 504		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 200 Acq/s	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 70°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.10 µs Time base Range: 55.92 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	200 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 824		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 200 Acq/s	Resolution: 0 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 60°_RL_2Mhz_LKUP DAC

Gain: 50 dB 25 dB Booster: Time base Start: -0.55 μ s Time base Range: 40.96 μ s

Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None

Dig. Frequency: 12.80 MHz Recurrence: 0 Hz Syncro: ON PULSE Multi-Peak:
 AVG: 0 Samples: 504 A-Scan: None
 Acq Rate: 205 Acq Resolution: 8 BIT Video A-Scan: M-P Qty: 0
 M-P Threshold: 0 %

Channel 4 : LogToLinear: 70°_RL_2Mhz_LKUP DAC

Gain: 75 dB 25 dB Booster: Time base Start: -0.55 μ s Time base Range: 40.96 μ s

Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None

Dig. Frequency: 12.80 MHz Recurrence: 0 Hz Syncro: ON PULSE Multi-Peak:
 AVG: 0 Samples: 504 A-Scan: None
 Acq Rate: 205 Acq Resolution: 8 BIT Video A-Scan: M-P Qty: 0
 M-P Threshold: 0 %

Appendix C-9: 308L HT2D280-1

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**304 Stainless Steel Flat Plate
ID# 308L_HT2D280-1**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

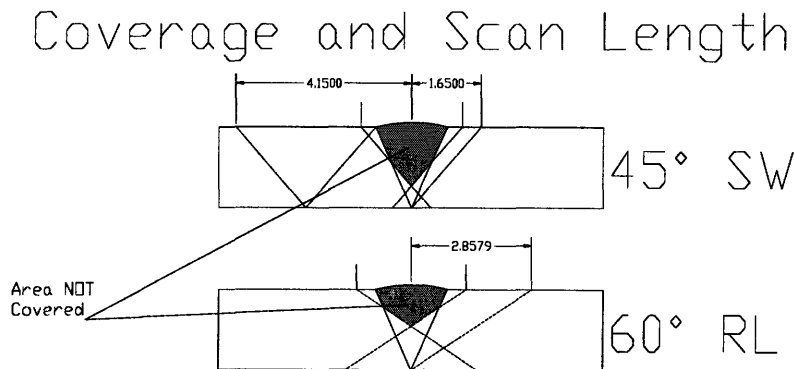


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° RL angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

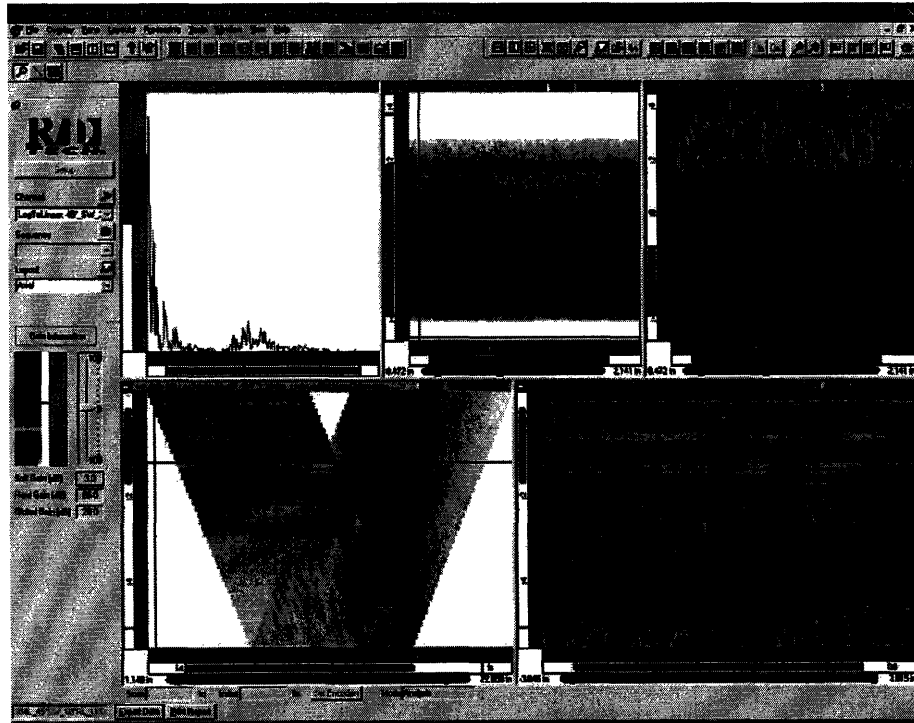


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

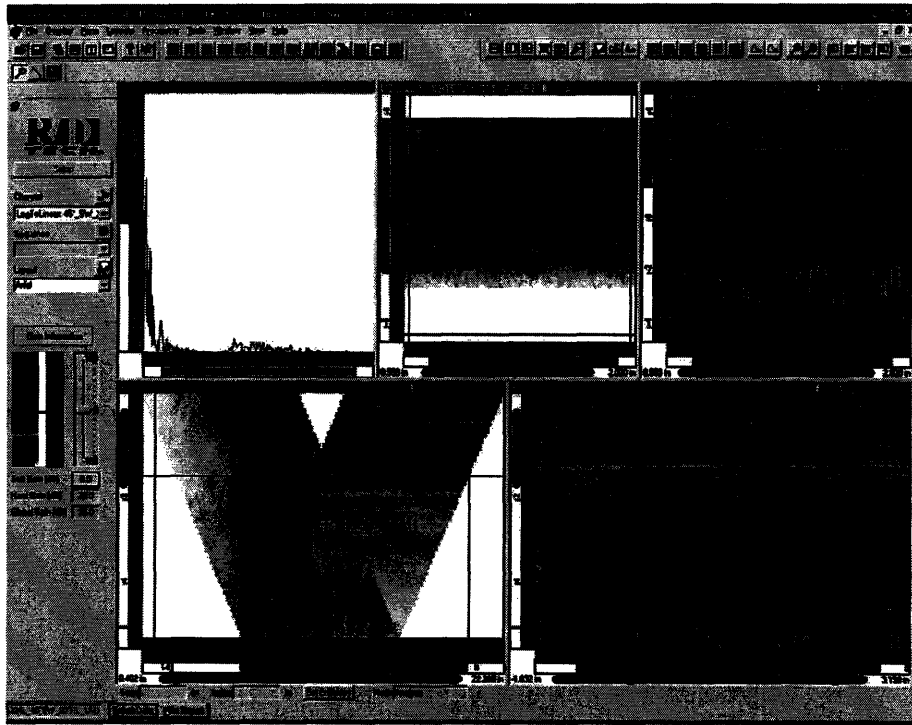


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

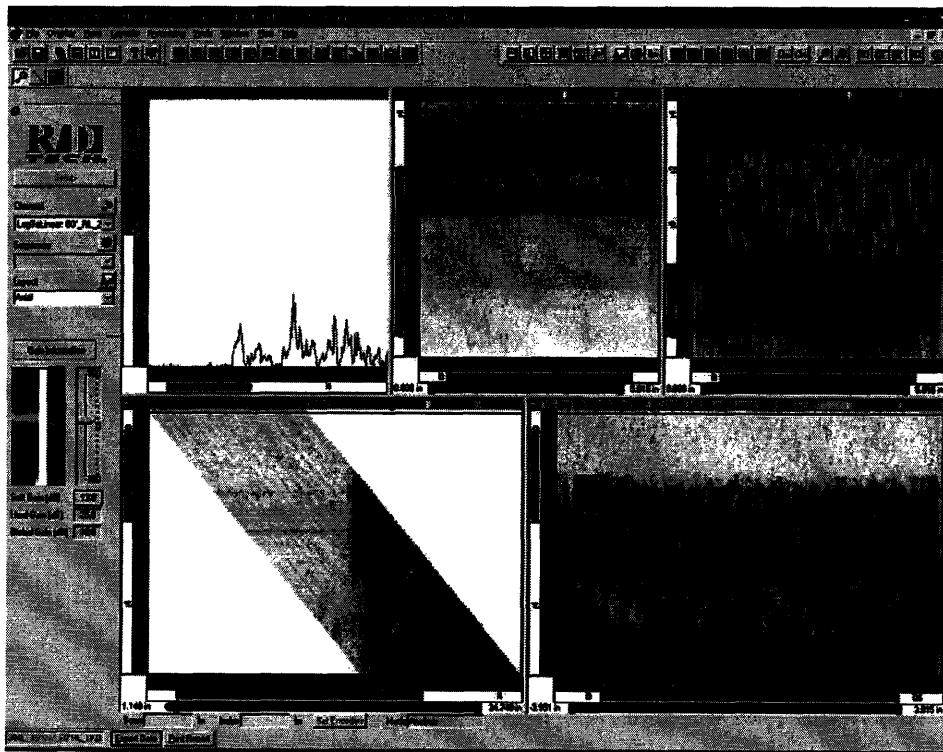


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

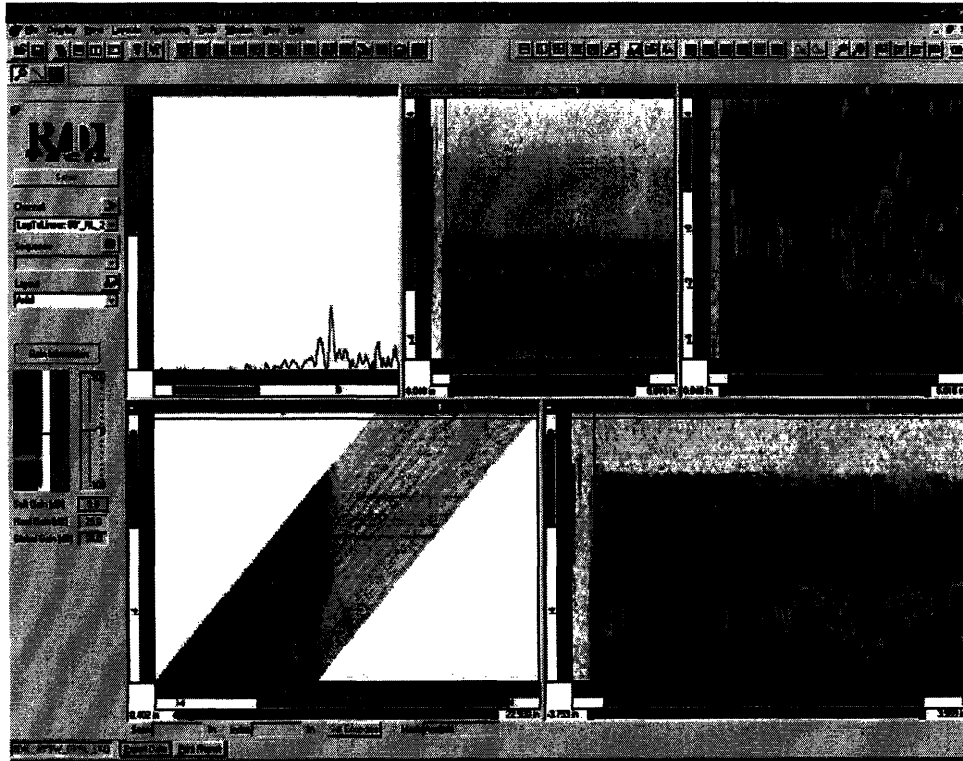


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Sample # 304L_HT20280-1 is free of recordable defects that would affect the cleanliness of the weld. Data collected on the two sides of the weld shows non-uniform root geometry, and a visual inspection of the ID supports this finding. The area of inconsistent weld root is isolated to the first and last ½ inch of the length sample.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	Flat Plate Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ Flat Plate
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1	#2			
	04-210	46214			
Mode:	RL	SW			
Frequency:	2 Mhz	2.25Mhz			
Element Size:	2(10x18)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	FLAT	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Synchro	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

μTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: μTomo
C:\PDI\Fingerprint\Sammy\304L_45°SW_60°RL_LKUP.rdt

Date: 9/17/2005 1:41:36 PM

Analysis Information

Tomoview 2.2R9 FileSize: 27.9 MB
C:\PDI\Fingerprint\Sammy\304L_45°SW_60°RL_LKUP.rdt

Date: 9/19/2005 1:54:13 PM

Channel 1 : 45°_SW_2.25Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.12 μs Time base Range: 117.12 μs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unaligned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 2000 Hz Syncro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 1464 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 317 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
M-P Threshold: 0 %										
Channel 2 : 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 μs Time base Range: 36.16 μs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unaligned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz Recurrence: 1211 Hz Syncro: ON PULSE Multi-Peak <input type="checkbox"/>										
AVG: 1 Samples: 452 A-scan <input checked="" type="checkbox"/> None										
Acq Rate: 317 Acq/s Resolution: 8 BIT Video A-scan <input type="checkbox"/> M-P Qty: 0										
M-P Threshold: 0 %										

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKU										DAC <input type="checkbox"/>																				
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -4.53 μ s Time base Range: 40.96 μ s																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>6 V</td> <td>8 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	6 V	8 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	6 V	8 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 0		Samples: 1404		A-scan <input type="checkbox"/>		None																								
Acq Rate: 317 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>																				
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -4.53 μ s Time base Range: 40.96 μ s																														
<table border="1"> <thead> <tr> <th>Configuration</th> <th>P</th> <th>R</th> <th>Voltage</th> <th>Pulse Width</th> <th>Type</th> <th>Rectification</th> <th>HP Filter</th> <th>LP Filter</th> <th>Smoothing</th> </tr> </thead> <tbody> <tr> <td>Conventional Pulse Echo</td> <td>1</td> <td>1</td> <td>6 V</td> <td>8 ns</td> <td>LOG</td> <td>Bipolar</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table>										Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	Conventional Pulse Echo	1	1	6 V	8 ns	LOG	Bipolar	None	None	None	
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing																					
Conventional Pulse Echo	1	1	6 V	8 ns	LOG	Bipolar	None	None	None																					
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>																								
AVG: 0		Samples: 432		A-scan <input type="checkbox"/>		None																								
Acq Rate: 317 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0																								
										M-P Threshold: 0 %																				

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: μ Tomo
 C:\PDI Fingerprint\Sammy\304L_45°SW_60°RL_LKUP.rdt

Date: 3/17/2005 1:41:36 PM

Analysis information

Tomoview 2.2R9 FileSize: 27.9 MB
 C:\PDI Fingerprint\Sammy\304L_45°SW_60°RL_LKUP.rdt

Date: 3/19/2005 1:54:13 PM

Channel	Probe Name	Snd vel. [m/s]	W. Delay [μ s]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	TOFD Position	
								Seper.	Orientation
45°_SW_2.25Mhz	KB-A_2.25_462	3073	6.36	0.00	0.00	45	180	0	Perpendicular
60°_RL_2Mhz_LK	60°_04-210_2M	5636	9.03	5.08	-22.86	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	8.54	4.88	-22.86	60	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5636	8.54	4.88	-22.86	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\FingerprintSammy\304L_45°SW_60°RL_LKUP.rdt

Date: 3/17/2008 1:41:36 PM

Analysis Information

Tomoview 2.2R9 File Size: 27.0 MB
 C:\PDI\FingerprintSammy\304L_45°SW_60°RL_LKUP.rdt

Date: 3/19/2008 1:54:13 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14718.29	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	62889.48	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	1.25	3.73	0.04	0.08	In	Never	1.3	
Index axis	Wheels	0.00	22.00	0.10	0.08	In	Never	2.0	

µTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprntf\Sammy\304L_45°SW_60°RL_LKDN.rdt

Date: 7/4/2005 10:14:45 AM

Analysis Information

Tomoview 2.2R9 File Size: 28.6 MB
 C:\PDI\Fingerprntf\Sammy\304L_45°SW_60°RL_LKDN.rdt

Date: 7/19/2005 1:53:45 PM

Channel 1 : 45°_SW_2.25Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1464		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 317 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 6		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 38.10 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 492		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 317 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 6		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKD										DAC <input type="checkbox"/>
Gain: 50 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 1464		A-Scan <input type="checkbox"/>		None				
Acq Rate: 317 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 75 dB		25 dB Booster: <input type="checkbox"/>		Time base Start: -0.53 µs		Time base Range: 40.96 µs				
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz		Recurrence: 0 Hz		Synchron: ON PULSE		Multi-Peak <input type="checkbox"/>				
AVG: 0		Samples: 492		A-scan <input type="checkbox"/>		None				
Acq Rate: 317 Acq/s		Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0				
										M-P Threshold: 0 %

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo
 C:\PDI\Fingerprint\Sammy\394L_45°SW_60°RL_LKDN.rdt

Date: 1/22/2005 10:14:45 AM

Analysis information

Tomoview 2.2R9 FileSize: 28.9 MB
 C:\PDI\Fingerprint\Sammy\394L_45°SW_60°RL_LKDN.rdt

Date: 3/19/2005 1:53:45 PM

Channel	Probe Name	Snd vol. [mV]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Orientation	
								Separ.	Orientation
45°_SW_2.25MHz	KB-A_2.25_462	3073	0.36	0.00	0.00	45	0	0	Perpendicular
60°_RL_2MHz_LK	60°_04-210_2M	5636	0.03	-5.06	48.26	60	0	0	Perpendicular
LogToLinear: 45°	Probe no.4	3073	0.54	-4.88	48.26	60	0	0	Perpendicular
LogToLinear: 60°	Probe no.4	5636	0.54	-4.88	48.26	60	0	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: jfTomv
 C:\PDI\Fingerprint\Sammy\304L_45°SW_60°RL_LKDN.rdt

Date: 1/4/2005 10:14:45 AM

Analysis Information

Tomoview 2.2R9 FileSize: 28.0 MB
 C:\PDI\Fingerprint\Sammy\304L_45°SW_60°RL_LKDN.rdt

Date: 9/19/2005 1:53:48 PM

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14715.29	<input type="checkbox"/>					
Index axis	Wheels	Quadrature	50889.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fin on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-3.75	-1.25	0.04	0.05	in	Never	-2.0	
Index axis	Wheels	0.25	22.75	0.10	0.05	in	Never	2.0	

Appendix C-10: 308L HT228052-2

**MIT/EPRI
Weld Wire Ferrite Content Study
Ultrasonic Examination Report**

**304 Stainless Steel Flat Plate
ID# 308L_HT228052-2**

1. Introduction

Massachusetts Institute of Technology (MIT) has requested that EPRI perform ultrasonic exams on four flat plates and twelve 24" diameter pipes with similar metal welds. The ultrasonic examination was designed to detect and characterize any unintentional flaws contained within and around the weld material. It was requested, by the Weld Wire Ferrite Content Study Project Manager, that the exams focus on the root and inner 1/3 of the weld, and as can be seen below the designed exam covers the required area. Figure 1.1 shows the estimated coverage obtained by the two probes used to evaluate these welds.

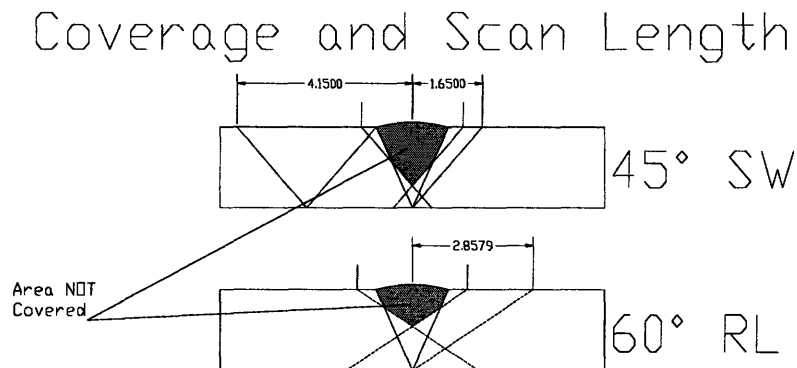


Figure 1-1 Coverage plots for the 45°SW & 60°RL Axial scans

Because of the large weld crown, the upper portion of the weld material was not evaluated during this exam. It should be noted that the drawings, in Figure 1-1, have been simplified to show only an estimation of the achievable coverage. The actual weld coverage may be slightly different, due to the 30°/10° angle weld preparation and differing weld crown conditions.

The welds were interrogated with a Full V 45° Shear Wave Probe and a 60° RL angle beam transducer scanning perpendicular to the weld in the axial direction. The components were inspected from both sides of the weld, in the axial direction, to obtain as much coverage as possible. Because an overall qualitative assessment is achieved with axial scans, no circumferential scans were performed on these components.

The screen captures, contained within this document, are captures of the actual data collected on the component for which this report was generated. The first sets of prints are overviews of the ultrasonic data across the entire weld for each angle and direction. When applicable, the second set of prints will include individual areas of interest and descriptions of the locations and depths of the indications.

Attachments to this document include a Technique Sheet and a Calibration/Settings packet. The Technique Sheet is Attachment 1 and was developed, prior to the inspection, to outline the required parameters and settings needed to interrogate the cleanliness of this weld. Attachment 2 is the Calibration/Settings packet that shows the actual settings

used during the inspection of the component for which this report was generated. Other Attachments may be referenced as needed throughout this report.

2. Ultrasonic Data Overviews

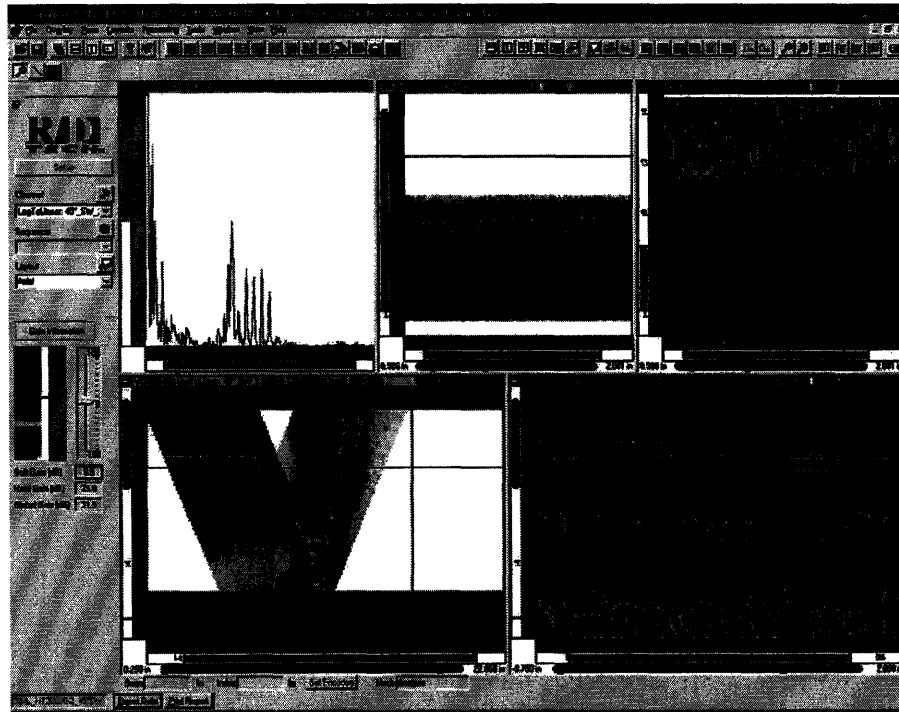


Figure 2-1 Full V 45° Shear Wave Axial Scan Overview Looking Down Stream

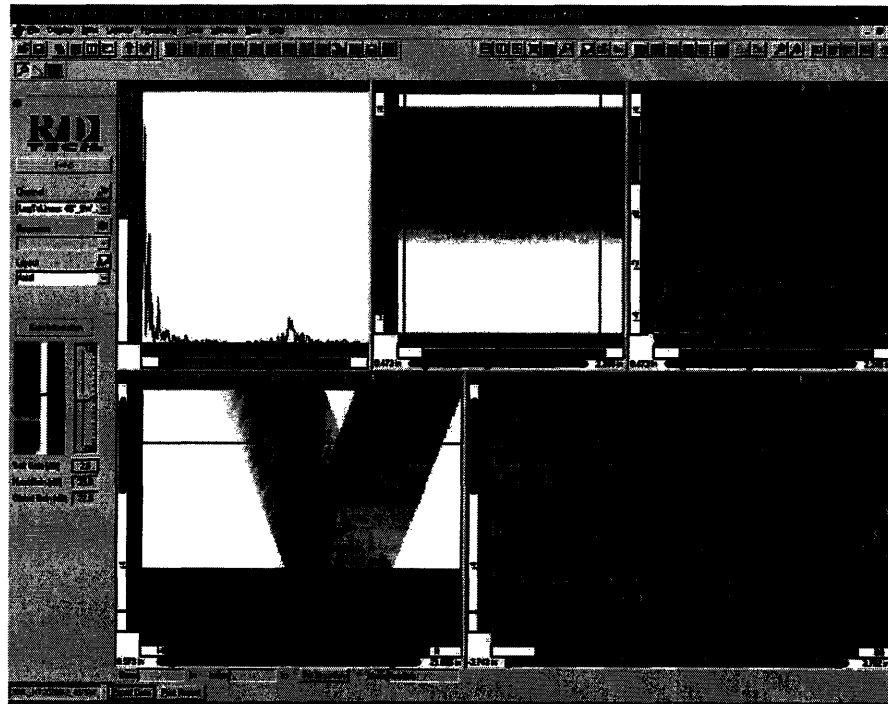


Figure 2-2 Full V 45° Shear Wave Axial Scan Overview Looking Up Stream

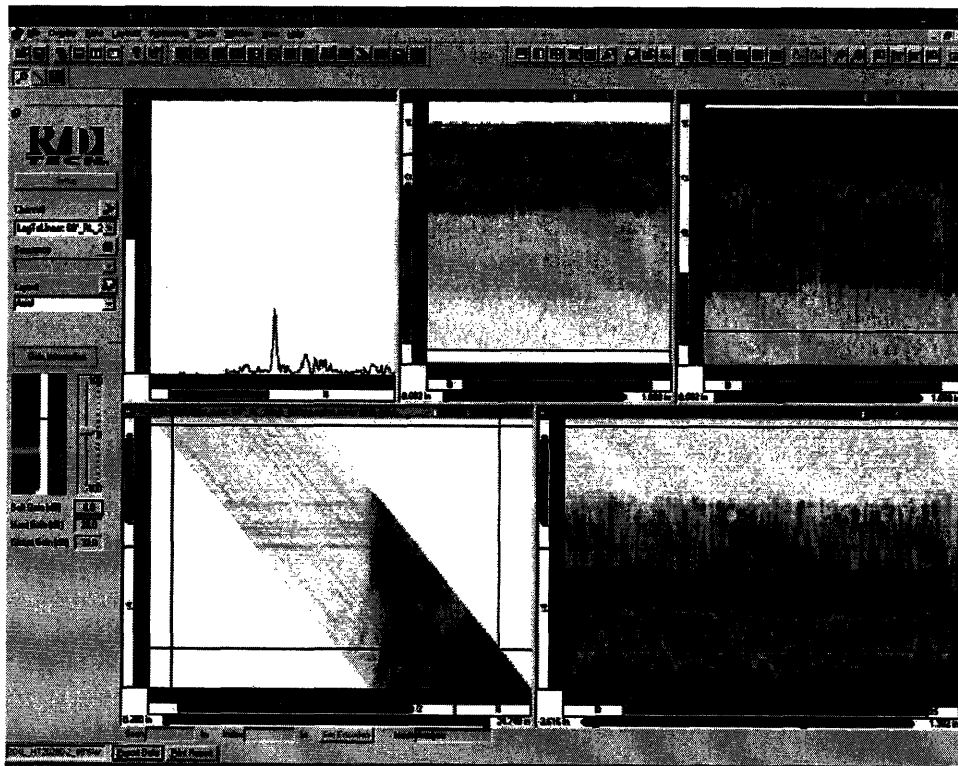


Figure 2-3 60° L-Wave Axial Scan Overview Looking Down Stream

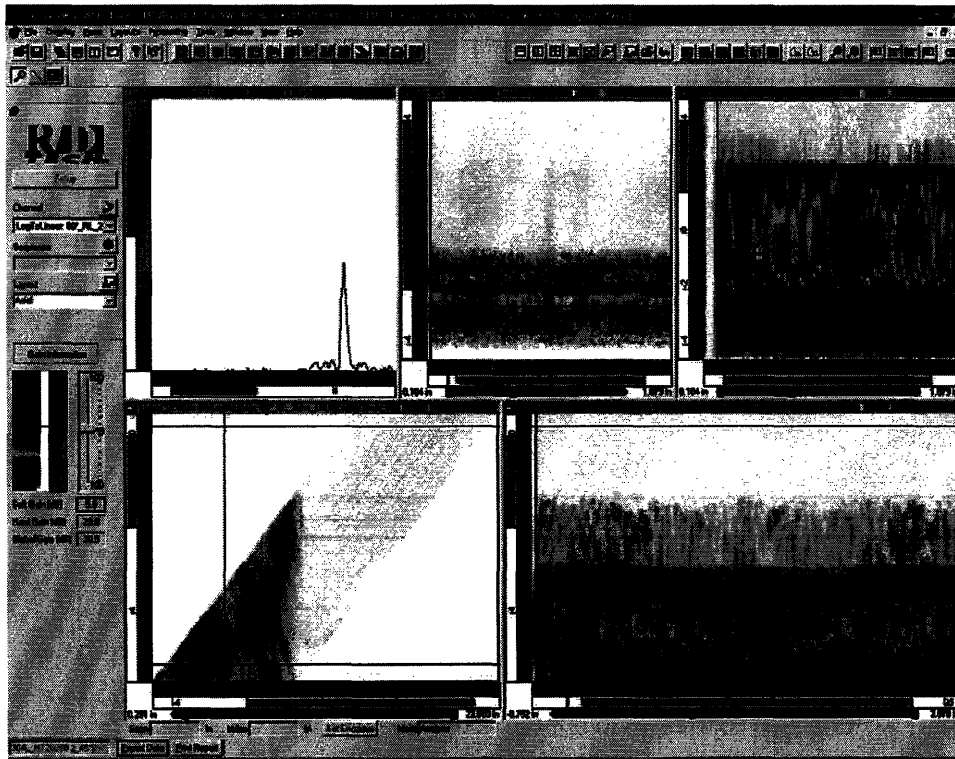


Figure 2-4 60° L-Wave Axial Scan Overview Looking Up Stream

3. Summary of Results

Analysis of the collected data shows that Sample # 304L_HT20280-2 is free of recordable defects that would affect the cleanliness of the weld. Data collected on the two sides of the weld shows non-uniform root geometry, and a visual inspection of the ID supports this finding. The area of inconsistent weld root is isolated to the first and last ½ inch of the samples length.

Attachment 1

Technique Sheet for

ULTRASONIC FINGERPRINTING OF MIT/EPRI Weld Wire Ferrite Content Study Samples

Project Information

Project Identification:	MIT/EPRI Weld Wire Ferrite Content Study
Project Supervisor:	Robert Z. Bouck
Project Description:	Collection of UT data to assess the cleanliness of the weld and adjacent areas.
Security Requirements:	Unsecured
Miscellaneous Info:	Essential Variables shall be set in accordance with the values defined in this document.
Procedure Used/Rev.	EPRI-FP-001 Rev.1

Component Information

Sample Description:	Flat Plate Configuration
Material Type(s):	304 Stainless Steel Base Material and 308 Stainless Steel Weld Material
Thickness/Diameter Info:	≈1.65" "T"/ Flat Plate
Examination Volume:	See Additional Requirements/Notes section
Reference System:	Weld centerline and 0° azimuth
Flaw Mechanism's	Fabrication Defects
Drawings numbers:	None
Miscellaneous Info:	See Additional Requirements/Notes section

APPROVED BY: _____ DATE: _____

Technique Information

Examination Method:	Contact testing
Examination Surface:	Outside Diameter surface
Miscellaneous Info:	

Equipment Requirements

UT System Requirements :	μTomo				
Pulser Type:	Unipolar Square				
Amplifier Type:	Log				
Software Version:	Tomoview 2.2R9 or later				
Specific Hardware:	None				
Essential Variables:	Include on Calibration Sheet				
Misc.:					
	Probes for DM weld inspection listed below:				
Search Unit Requirements:	#1 04-210	#2 46214			
Mode:	RL	SW			
Frequency:	2 Mhz	2.25Mhz			
Element Size:	2(10x18)	.5"			
Element Shape:	Rect.	Round			
Examination Angles:	60°	45°			
Wedge Requirements:	FLAT	FLAT			
Focusing Requirements:	≈1/2 "T"	N/A			
Misc:	-Apply other probes/angles as needed to characterize flaws.				
Scanner Requirements:	None				
Axis Requirements	X and Y movement				
Min/Max Scan Speeds:	Not to exceed 3" per sec. either axis				
Gimble Requirements:	None				
Misc.:					
Cabling Requirements:					
Cable Type:	RG 58 / RG 174				
Min/Max Length:	≤ 50' / ≤ 12'				
Int. Connectors:	Not to exceed 4 per channel				
Misc.:					

Calibration Information

Calibration Type:	Half path
Time base Info:	45° Full V-Path 60°1/2 V-Path
Calibration Block(s):	Standard Radius Block
Temp. Requirements:	Ambient
Miscellaneous Info:	

Examination Requirements

Scan Surface(s) :	As found
Scan Directions:	Perpendicular weld axis
Scan Pattern:	Raster
Scan Dimensions:	See Additional Requirements/notes section.
Scan Speeds:	Not to exceed 3" per sec. either axis
Data Resolutions:	≤ 0.040": data taking / 0.1": indexing
Examination Sensitivity:	Log data
Misc.:	

Data Recording

Storage Media:	See Additional Requirements/Notes Section
Maximum File Size:	≤ 200Mb
File Nomenclature :	Include: sample ID, probe angle, Probe s/n, scan direction
Example:	SampleName Angle S/N Dirrection
Misc.:	Channel name shall include the transducer serial number

Data Analysis Information

Software Version:	Tomoview 2.2R9 or later
Documentation Required	Calibration Package
Misc.:	Include Data Overview prints and Indication Prints as needed

Additional Requirements/Notes

The techniques described in this document are applicable to all Flat Plate Samples contained within this Project.
The examination volume is restricted by the large weld crown applied to the top of the weld. Coverage plots can be seen in Figure 1-1 of this document. Probes have been selected to accurately interrogate the lower 1/3 of the wetted surface.
Shear wave search unit(s) shall be run in addition to the RL techniques.
A CD(s) will be given to the Projects PM at the end of all scanning, containing all of the collected ultrasonic data.

Item	Required or Recommended/ Default Settings MicroTomo	Essential /NonEssential
General Tab		
Gain Window		
Channel dB	Only Available in Linear Mode. Set I.A.W. Tech. Sheet	Essential
Booster	Active, unless signal is saturated	Essential
Apply dB	Do Not Use	Essential
Ref. dB	Do Not Use	Essential
Auto Set	Do Not Use	Essential
Set Reference	Do Not Use	Essential
Time Base Window		
Start (mm)	Enter "0" value (Note 1)	Essential
Range (mm)	Set I.A.W. Technique Sheet	Essential
Mode	Half Path (if a ODCr is used set to depth)	Essential
Full Range	Do Not Use	Essential
Set Range	Do Not Use	Essential
Auto values Window		
Ref Amplitude (%)	Do Not Use	Essential
Full Range Start (mm)	Do Not Use	Essential
Full Range (mm)	Do Not Use	Essential
Auto values	Do Not Use	Essential
Calibrate	Use for Auto calibration	Essential
Gate Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
DAC Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Inactive - Not Used		Non Essential
Digitizer Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Digitizer		
Digitizing freq	≤ 2.0 MHz. = 12.5 MHz. / > 4.0 MHz. = 25 MHz.	Essential
Averaging	1	Essential
Acquisition rate (Hz) Max Button	Maximum rate based on averaging as calculated by MicroTomo. Use the MAX button feature AFTER all other essential variables are entered.	Non Essential
Data Sample Size	8 Bits	Essential
Recurrence	2000 Hz	Essential
Samples	Default Setting	Non-Essential
Resolution	Default Setting	Non-Essential
Data Window		
Syncho	Pulse	Essential
A-scan	Checked / Active	Essential
A-scan video	Unchecked / Inactive	Non-Essential
Multi-Peak	Unchecked / Inactive	Non-Essential
Compression	1 – Default Setting	Non-Essential

Item	Required or Recommended/ Default Settings MicroTomo	Essential / Non-Essential
Pulser/Receiver Tab		
Configuration Window		
Conventional Pitch & Catch	Dependant on probe type (Single or Dual)	Essential
Pulser Window		
Element Number	P1 through P4 (Determined by number of channels and search unit configuration)	Essential
Voltage (all channels)	300 V (Maximum Setting)	Essential
Pulse Width	(1000 / transducer frequency / 2)	Essential
Receiver Window		
Element Number	R1 through R4 (Determined by number of channels and search unit configuration)	Essential
Scale Type	LIN-used during calibration	Essential
Rectification	LIN = Bipolar, LOG = Unsigned	Essential
Filters Window		
High-pass	Inactive – Not Used	Non-Essential
Low-pass	Inactive – Not Used	Non-Essential
Smoothing	Nominal Probe Frequency	Essential
Probe Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
Material and interface Window		
Wave type:	Longitudinal (RL Wave)	Essential
Sound velocity: (m/s)	(Modify Probe must be active)	Essential
Wedge Delay: (m/s)	Automatically calculated & entered by the system during Calibration.	Essential
Selection Window (Modify Probe Active)		
Show Total	Unchecked / Inactive	Essential
Modify Probe	Checked / Active	Essential
Probe Name	Input Probe Angle, Probe SN	Non-Essential
T (active) R (Inactive)	Default Setting	Non-Essential
Position Window (Modify Probe Active)		
Scan axis offset (mm)	If needed enter offset to correct probe position	Essential
Index axis offset (mm)	If needed enter offset to correct probe position	Essential
Adjust resolution Button	Default Setting / Inactive	Non-Essential
Beam Orientation Window (Show Total Active)		
Refracted Angle	Enter Measured Probe Angle	Essential
Skew Angle	0 ° for LKDN & LKCW / 180 ° for LKUP & LKCCW	Essential
Alarms Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

I/O Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
DO NOT USE	All Fields Unchecked / Inactive	Essential

Sequence Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Type	Bi-directional or Unidirectional	Essential
Fire on	Encoder	Essential
Scan Encoder	Scan	Essential
Scan Start	Based on Technique Sheet	Essential
Scan Stop	Based on Technique Sheet	Essential
Scan Resolution	≤ 0.050"	Essential
Scan Speed	Based on Technique Sheet	Essential
Scan Unit	Inch	Non-essential
Scan Preset	Never	Non-essential
Scan Preset Value	Used with the adjacent "set" button to manually position the scan encoder.	Non-essential
Index Axis Preset	None (Active) – At Acquisition End (Inactive)	Essential
Index Encoder	Index	Essential
Index Start	Based on Technique Sheet	Essential
Index Stop	Based on Technique Sheet	Essential
Index Resolution	Based on Technique Sheet	Essential
Index Speed	Based on Technique Sheet	Non-essential
Index Unit	Inch	Non-essential
Index Preset	Never	Non-essential
Index Preset Value	Used with the following "set" button to manually position the index encoder.	Non-essential
Apply Button	Used to refresh changes made on the sequence tab.	Non-essential

Sequence Controls Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Sequences Order Window		
Sequence Order	Default Sequence	Non-essential
Special Settings Window		
Use Current Sequence Only	Checked	Essential
Prompt for Sequence Only	Unchecked	Non-essential
Show File Size	Checked or Unchecked	Non-essential
Enable Pause Acquisition	Checked or Unchecked	Non-essential
Test Sequence Window		
Control	All Fields Unchecked / Inactive	Non-essential
I/O	All Fields Unchecked / Inactive	Non-essential

Encoders Tab		
Item	Required or Recommended/ Default Settings	Essential / Non-Essential
	MicroTomo	
Scan Name	Encoder 1 (Scan)	Non-essential
Scan Type	Quadrature	Non-essential
Scan Resolution	Automatic entry by system while calibrating scanning encoder.	Non-essential
Scan Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Index Name	Encoder 2 (Index)	Non-essential
Index Type	Quadrature	Non-essential
Index Resolution	Automatic entry by system while calibrating Index encoder.	Non-essential
Index Invert	Checked or Unchecked, dependent on desired motion direction.	Non-essential
Save	Unchecked (deactivates all remaining fields)	Non-essential
Options Tab		
File Naming Options Window		
All entries blank	Default	Non-essential

Attachment 2

Settings and Calibration Information

µTomo General Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: µTomo Date: 9/28/2005 9:54:38 AM
 C:\PDI\Fingerprint\Sammy\304L_HT20280-2\304L_HT20280-2_45°SW_60°RL_LKDN.rdt

Analysis information

Tomoview 2.2R9 FileSize: 26.6 MB Date: 9/28/2005 1:50:14 PM
 C:\PDI\Fingerprint\Sammy\304L_HT20280-2\304L_HT20280-2_45°SW_60°RL_LKDN.rdt

Channel 1 : 45°_SW_2.25Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.12 µs Time base Range: 117.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 1464		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			
Channel 2 : 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 25 dB 25 dB Booster: <input checked="" type="checkbox"/> Time base Start: 0.25 µs Time base Range: 45.12 µs										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz		Synchro: ON PULSE		Multi-Peak <input type="checkbox"/>					
AVG: 1	Samples: 564		A-scan <input checked="" type="checkbox"/>		None					
Acq Rate: 300 Acq/s	Resolution: 8 BIT		Video A-scan <input type="checkbox"/>		M-P Qty: 0		M-P Threshold: 0 %			

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKD										DAC <input type="checkbox"/>
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 46.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 1484	A-scan <input type="checkbox"/>	None							
Acq Rate: 300 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
			M-P Threshold: 0 %							
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKDN										DAC <input type="checkbox"/>
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -0.53 μ s Time base Range: 46.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 0 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 564	A-scan <input type="checkbox"/>	None							
Acq Rate: 300 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
			M-P Threshold: 0 %							

Probe Settings



Acquisition information

Tomoview: 2.2R9 Hardware Used: µTomo Date: 3/28/2005 9:54:38 AM
 C:\PDI\Fingerprint\Sammy\3041_HT20280-2\3041_HT20280-2_45°SW_60°RL_LKDN.rdt

Analysis information

Tomoview: 2.2R9 FileSize: 28.9 MB Date: 3/28/2005 1:59:14 PM
 C:\PDI\Fingerprint\Sammy\3041_HT20280-2\3041_HT20280-2_45°SW_60°RL_LKDN.rdt

Channel	Probe Name	Send vel. [m/s]	W. Delay [µs]	Scan Offset [mm]	Index Offset [mm]	Angle [°]	Skew [°]	Separ.	Orientation
45°_SW_2.25Mhz	KB-A_2.25_462	3251.2	6.56	0.00	0.00	45	0	0	Perpendicular
60°_RL_2Mhz_LK	80°_04-210_2M	5636.6	9.09	-6.08	46.26	60	0	0	Perpendicular
LogTelLineer: 45°	Probe no.4	3251.2	6.54	-4.86	46.26	60	0	0	Perpendicular
LogTelLineer: 60°	Probe no.4	5636.6	8.54	-4.86	46.26	60	0	0	Perpendicular

Mechanical Settings



Acquisition information

Tomoview: 2.289 Hardware Used: pFomo Date: 9/28/2005 9:54:38 AM
 C:\PDI\Fingerprint\Sammy\304_HT20289-2\304_HT20289-2_45°SW_90°RL_LKDN.rdt

Analysis information

Tomoview: 2.289 FileSize: 26.6 MB Date: 9/28/2005 1:50:14 PM
 C:\PDI\Fingerprint\Sammy\304_HT20289-2\304_HT20289-2_45°SW_90°RL_LKDN.rdt

Sequence 1 : Default Sequence									
	Name	Type	Resolution	Invert					
Scan axis	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>					
Index axis	Wheels	Quadrature	52888.45	<input checked="" type="checkbox"/>					
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None									
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value	
Scan axis	Arm	-3.75	-1.27	0.94	0.98	In	Never	-2.0	
Index axis	Wheels	0.25	22.75	0.10	0.98	In	Never	2.0	

μTomo General Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: μTomo Date: 2/28/2005 10:30:05 AM
 C:\PDI\Fingerprint\Sammy\304L_HT20280-2\304L_HT20280-2_45°SW_60°RL_LKUP.rdt

Analysis information

Tomoview 2.2R9 FileSize: 28.3 MB Date: 9/28/2005 1:50:23 PM
 C:\PDI\Fingerprint\Sammy\304L_HT20280-2\304L_HT20280-2_45°SW_60°RL_LKUP.rdt

Channel 1 : 45°_SW_2.25Mhz_LKUP										DAC <input type="checkbox"/>
General Settings										
Gain: 25 dB	25 dB Booster: <input checked="" type="checkbox"/>	Time base Start: 0.12 μs	Time base Range: 117.12 μs							
Pulsar - Receiver Settings										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	300 V	222 ns	LOG	Unsigned	None	None	2.0 MHz	
Digitizing and Processing Settings										
Dig. Frequency: 12.50 MHz	Recurrence: 2000 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 1	Samples: 1464	A-scan <input checked="" type="checkbox"/>	None							
Acq Rate: 317 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
										M-P Threshold: 0 %
Channel 2 : 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
General Settings										
Gain: 25 dB	25 dB Booster: <input checked="" type="checkbox"/>	Time base Start: 0.25 μs	Time base Range: 36.16 μs							
Pulsar - Receiver Settings										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pitch & Catch	2	2	300 V	250 ns	LOG	Unsigned	None	None	2.0 MHz	
Digitizing and Processing Settings										
Dig. Frequency: 12.50 MHz	Recurrence: 1211 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 1	Samples: 452	A-scan <input checked="" type="checkbox"/>	None							
Acq Rate: 317 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
										M-P Threshold: 0 %

Channel 3 : LogToLinear: 45°_SW_2.25Mhz_LKU										DAC <input type="checkbox"/>
Gain: 50 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -6.53 μ s Time base Range: 40.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 6 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 1464	A-scan <input type="checkbox"/>	None							
Acq Rate: 317 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
			M-P Threshold: 0 %							
Channel 4 : LogToLinear: 60°_RL_2Mhz_LKUP										DAC <input type="checkbox"/>
Gain: 75 dB 25 dB Booster: <input type="checkbox"/> Time base Start: -6.53 μ s Time base Range: 40.96 μ s										
Configuration	P	R	Voltage	Pulse Width	Type	Rectification	HP Filter	LP Filter	Smoothing	
Conventional Pulse Echo	1	1	0 V	0 ns	LOG	Bipolar	None	None	None	
Dig. Frequency: 12.50 MHz	Recurrence: 6 Hz	Synchro: ON PULSE	Multi-Peak <input type="checkbox"/>							
AVG: 0	Samples: 452	A-scan <input type="checkbox"/>	None							
Acq Rate: 317 Acq/s	Resolution: 8 BIT	Video A-scan <input type="checkbox"/>	M-P Qty: 0							
			M-P Threshold: 0 %							

Probe Settings



Acquisition information

Tomoview 2.2R9 Hardware Used: pTomo Date: 2/2/2005 16:30:55 AM
 C:\PDI\Fingerprints\Sammy\304L_HT20200-2\304L_HT20200-2_45°SW_60°RL_LKUP.rdt

Analysis information

Tomoview 3.2R9 FileSize: 28.3 MB Date: 2/2/2005 1:50:23 PM
 C:\PDI\Fingerprints\Sammy\304L_HT20200-2\304L_HT20200-2_45°SW_60°RL_LKUP.rdt

Channel	Probe Name	End vol. [mV]	Vt. Delay [µs]	Scan Offset [µm]	Index Offset [mm]	Angle [°]	Skew [°]	Probe Position	
								Seper.	Orientation
45°_SW_2.25MHz	KB-A_2.25_482	3098.8	0.36	0.00	0.60	45	180	0	Perpendicular
60°_RL_2MHz_LJC	60°_04-210_2M	5638.8	0.03	5.08	-22.88	60	180	0	Perpendicular
LogToLinear: 45°	Probe no.4	3098.8	0.54	4.68	-22.88	60	180	0	Perpendicular
LogToLinear: 60°	Probe no.4	5638.8	0.54	4.68	-22.88	60	180	0	Perpendicular

Mechanical Settings



Acquisition Information

Tomoview 2.2R9 Hardware Used: pTomo Date: 2/20/2005 10:36:05 AM
 C:\PDI\Fingerprint\Sammy\304_HT20200-2\304L_HT20200-2_45°SW_00°RL_LKUP.rdt

Analysis Information

Tomoview 2.2R9 FileSize: 30.3 MB Date: 3/20/2005 1:00:23 PM
 C:\PDI\Fingerprint\Sammy\304_HT20200-2\304L_HT20200-2_45°SW_00°RL_LKUP.rdt

Sequence 1 : Default Sequence								
	Name	Type	Resolution	Invert				
Scan axis	Arm	Quadrature	14715.29	<input checked="" type="checkbox"/>				
Index axis	Wheels	Quadrature	52000.45	<input checked="" type="checkbox"/>				
Sequence Type: Bidirectional Fire on: Encoder Index axis preset: None								
	Encoder	Start	Stop	Resolution	Speed	Units	Preset	Preset value
Scan axis	Arm	1.30	3.74	0.04	0.90	in	Never	2.0
Index axis	Wheels	0.00	23.50	0.10	0.90	in	Never	2.0

Appendix D: Charpy Impact Toughness Certification

Inst. No. 60005771



UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
325 Broadway
Boulder, Colorado 80505-3328

August 5, 2005

Frank Peszka
Laboratory Testing, Inc.
2331 Topaz Drive
Hatfield, PA 19440

Dear Mr. Peszka:

Charpy verification specimens tested on the 407.0 J (300.0 ft-lbf) capacity Tinius Olsen Machine, Serial No. 145682, have been received for evaluation along with the completed questionnaire. We have analyzed the results (see attached table) and find that the average values fall within the acceptable ranges at the energy levels tested. The following paragraphs describe further analysis of the questionnaire, the test results, and the fractured specimens.

This machine satisfies the indirect verification requirements of the current ASTM Standard E 23 to 80% of the capacity of your machine.

Enclosed is a Charpy Verification Sticker to attach to your machine.

If the machine is moved or undergoes any major repairs or adjustments, this verification becomes invalid and the machine must be rechecked. Removing the pendulum, replacing the anvils or striker, and adjusting the height of drop are examples of such major repairs or adjustments. If a specimen stops the pendulum during a test, the machine should be checked to assure that the pendulum is straight, the anvils and striker have not been damaged, and that all bolts are still tight.

This verification is valid for one year from the date of the test. If you have any questions concerning the verification of your machine, you may contact me by phone at (303) 497-3351, by fax at (303) 497-5939, or by email at charpy@boulder.nist.gov.

Sincerely,


Raymond L. Santoyo
Materials Reliability Division

2 Enclosures

LTI
QA REVIEW
DATE *8/5*

NIST

National Institute of Standards and Technology
 Materials Reliability Division
 325 Broadway
 Boulder, CO 80305-3328

Facility: Laboratory Testing, Inc., 2331 Topaz Drive
 Hatfield, PA 19440

Machine Manufacturer: Tinius Olsen Serial Number: 145682

Test Date: 8/4/2005

TEST RESULTS		VARIANCE	STATUS			
13.6	13.6	14.9	13.6	J	0.2 J	
103.0	103.0	101.7	100.3	103.0	1.2%	
230.5	222.4	219.6	219.6	225.1	-2.1%	

Allowable Variance is 1.4 J or 5%, whichever is greater (ASTM Standard E 23)
 NT = NOT TESTED

LTI
 QA REVIEW
 INF: [Signature]
 DATE: 8/10/05

TEST NO. 60005971

Appendix E: Tensile Data

Specimen No.	41B	Temperature			
Init. Width	0.251	Init. Thick.			
Final Width	0.18	Final Thick.			
Init. Gage	1	Final Gage	1.21		
Init. Area	0.0495	Final Area	0.0254		
Pct. Red.	48.69	Pct. Elong.	21		
Modulus	32.9	Xhead Rate	0.05		
Yield	76	Ultimate	92.3		
Full Scale	3.00001	22480.90247	0.05		
Time	Stroke	Load	Strain	Strain (%)	Stress (PSI)
	-2.295987153	-1.257581684	-0.001217006	0	-25.40569059
	-2.295987153	-1.257581684	-0.001217006	0	-25.40569059
	-2.295987153	-1.84361385	-0.001217267	-5.214E-05	-37.24472424
	-2.295987153	-1.84361385	-0.001217267	-5.214E-05	-37.24472424
	-2.295987153	-1.84361385	-0.001217267	-5.214E-05	-37.24472424
	-2.29473581	-1.374774629	-0.001217267	-5.214E-05	-27.77322482
	-2.29473581	-1.374774629	-0.001217267	-5.214E-05	-27.77322482
	-2.29473581	-1.374774629	-0.001217267	-5.214E-05	-27.77322482
	-2.292983963	-1.374774629	-0.001215181	0.00036497	-27.77322482
	-2.292983963	-1.374774629	-0.001215181	0.00036497	-27.77322482
	-2.291357286	-1.023195795	-0.001216485	0.00010427	-20.67062212
	-2.291357286	-1.023195795	-0.001216485	0.00010427	-20.67062212
	-2.291357286	-1.023195795	-0.001216485	0.00010427	-20.67062212
	-2.289480273	-1.84361385	-0.00121466	0.00046926	-37.24472424
	-2.289480273	-1.84361385	-0.00121466	0.00046926	-37.24472424
	-2.289480273	-1.84361385	-0.00121466	0.00046926	-37.24472424
	-2.287853415	5.657364068	-0.001214399	0.00052137	114.2901832
	-2.287853415	5.657364068	-0.001214399	0.00052137	114.2901832
	-2.287853415	5.657364068	-0.001214399	0.00052137	114.2901832
	-2.286101571	21.59690842	-0.001202668	0.00286763	436.3011803
	-2.286101571	21.59690842	-0.001202668	0.00286763	436.3011803
	-2.284474894	83.71427221	-0.001172427	0.00891576	1691.197418
	-2.284474894	83.71427221	-0.001172427	0.00891576	1691.197418
	-2.284474894	83.71427221	-0.001172427	0.00891576	1691.197418
	-2.282848039	229.9830494	-0.001127588	0.01788365	4646.122209
	-2.282848039	229.9830494	-0.001127588	0.01788365	4646.122209
	-2.282848039	229.9830494	-0.001127588	0.01788365	4646.122209
	-2.281221365	454.5431655	-0.001077534	0.02789432	9182.690212
	-2.281221365	454.5431655	-0.001077534	0.02789432	9182.690212
	-2.279219179	767.4739333	-0.000995416	0.04431808	15504.5239
	-2.279219179	767.4739333	-0.000995416	0.04431808	15504.5239
	-2.279219179	767.4739333	-0.000995416	0.04431808	15504.5239
	-2.277717671	1083.920849	-0.000902608	0.06287955	21897.39089
	-2.277717671	1083.920849	-0.000902608	0.06287955	21897.39089
	-2.277717671	1083.920849	-0.000902608	0.06287955	21897.39089
	-2.275965828	1422.519007	-0.00080172	0.0830573	28737.75773
	-2.275965828	1422.519007	-0.00080172	0.0830573	28737.75773

-2.275965828	1422.519007	-0.00080172	0.0830573	28737.75773
-2.273963639	1737.793791	-0.000694313	0.10453856	35106.94528
-2.273963639	1737.793791	-0.000694313	0.10453856	35106.94528
-2.272587126	2110.73236	-0.000559013	0.13159865	42641.05778
-2.272587126	2110.73236	-0.000559013	0.13159865	42641.05778
-2.272587126	2110.73236	-0.000559013	0.13159865	42641.05778
-2.27071011	2478.826924	-0.000402857	0.16282988	50077.31159
-2.27071011	2478.826924	-0.000402857	0.16282988	50077.31159
-2.27071011	2478.826924	-0.000402857	0.16282988	50077.31159
-2.268958263	2800.665209	-0.000239662	0.19546885	56579.09514
-2.268958263	2800.665209	-0.000239662	0.19546885	56579.09514
-2.268958263	2800.665209	-0.000239662	0.19546885	56579.09514
-2.267456578	3095.312214	-6.03039E-05	0.23134043	62531.55989
-2.267456578	3095.312214	-6.03039E-05	0.23134043	62531.55989
-2.265704734	3331.358318	0.000134174	0.27023607	67300.16804
-2.265704734	3331.358318	0.000134174	0.27023607	67300.16804
-2.265704734	3331.358318	0.000134174	0.27023607	67300.16804
-2.263952887	3481.377584	0.000320832	0.30756755	70330.86029
-2.263952887	3481.377584	0.000320832	0.30756755	70330.86029
-2.263952887	3481.377584	0.000320832	0.30756755	70330.86029
-2.261950702	3613.113357	0.000515571	0.34651533	72992.18903
-2.261950702	3613.113357	0.000515571	0.34651533	72992.18903
-2.260449197	3691.873221	0.000697275	0.38285616	74583.29739
-2.260449197	3691.873221	0.000697275	0.38285616	74583.29739
-2.260449197	3691.873221	0.000697275	0.38285616	74583.29739
-2.258947512	3750.005979	0.000873504	0.41810209	75757.69655
-2.258947512	3750.005979	0.000873504	0.41810209	75757.69655
-2.258947512	3750.005979	0.000873504	0.41810209	75757.69655
-2.257195665	3791.026702	0.001055469	0.45449505	76586.39803
-2.257195665	3791.026702	0.001055469	0.45449505	76586.39803
-2.257195665	3791.026702	0.001055469	0.45449505	76586.39803
-2.255443818	3821.733704	0.001246558	0.49271287	77206.7415
-2.255443818	3821.733704	0.001246558	0.49271287	77206.7415
-2.253816964	3854.550471	0.001450161	0.53343339	77869.70649
-2.253816964	3854.550471	0.001450161	0.53343339	77869.70649
-2.253816964	3854.550471	0.001450161	0.53343339	77869.70649
-2.251940127	3862.520266	0.001679312	0.57926351	78030.71244
-2.251940127	3862.520266	0.001679312	0.57926351	78030.71244
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-2.250313273	3905.416256	0.001933228	0.63004682	78897.2981
-2.250313273	3905.416256	0.001933228	0.63004682	78897.2981
-2.250313273	3905.416256	0.001933228	0.63004682	78897.2981
-2.248561426	3923.46561	0.002198876	0.68317639	79261.93152
-2.248561426	3923.46561	0.002198876	0.68317639	79261.93152
-2.246183909	3688.122979	0.008560316	1.95546431	74507.53493
-2.245933567	3688.591638	0.008490449	1.94149105	74517.0028
-2.245933567	3688.591638	0.008490449	1.94149105	74517.0028
-2.245933567	3688.591638	0.008490449	1.94149105	74517.0028
-2.244682224	3983.473321	0.008505049	1.94441093	80474.20851
-2.244682224	3983.473321	0.008505049	1.94441093	80474.20851

-2.244682224	3983.473321	0.008505049	1.94441093	80474.20851
-2.242930377	3991.911753	0.008486278	1.94065688	80644.68188
-2.242930377	3991.911753	0.008486278	1.94065688	80644.68188
-2.240928192	3999.412888	0.008644781	1.97235731	80796.21996
-2.240928192	3999.412888	0.008644781	1.97235731	80796.21996
-2.240928192	3999.412888	0.008644781	1.97235731	80796.21996
-2.239301517	4017.461883	0.008425797	1.92856057	81160.84612
-2.239301517	4017.461883	0.008425797	1.92856057	81160.84612
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-2.23767484	4039.261794	0.008571786	1.9577585	81601.24836
-2.23767484	4039.261794	0.008571786	1.9577585	81601.24836
-2.23767484	4039.261794	0.008571786	1.9577585	81601.24836
-2.235922996	4034.573604	0.008467508	1.93690283	81506.53746
-2.235922996	4034.573604	0.008467508	1.93690283	81506.53746
-2.233920807	4060.592731	0.008549888	1.95337875	82032.17638
-2.233920807	4060.592731	0.008549888	1.95337875	82032.17638
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-2.232419125	4076.532298	0.008419541	1.92730931	82354.18783
-2.232419125	4076.532298	0.008419541	1.92730931	82354.18783
-2.232419125	4076.532298	0.008419541	1.92730931	82354.18783
-2.230792448	4087.783652	0.008538418	1.95108471	82581.48792
-2.230792448	4087.783652	0.008538418	1.95108471	82581.48792
-2.229165594	4101.613431	0.008466466	1.93669436	82860.8774
-2.229165594	4101.613431	0.008466466	1.93669436	82860.8774
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-2.227413747	4110.989519	0.008594728	1.96234671	83050.29331
-2.227413747	4110.989519	0.008594728	1.96234671	83050.29331
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-2.225912242	4133.961224	0.008555102	1.95442153	83514.36817
-2.225912242	4133.961224	0.008555102	1.95442153	83514.36817
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-2.223910056	4117.787496	0.008525904	1.94858191	83187.62619
-2.223910056	4117.787496	0.008525904	1.94858191	83187.62619
-2.222158209	4147.556865	0.008490449	1.94149105	83789.02757
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-2.220656524	4152.245077	0.008491492	1.94169966	83883.73893
-2.220656524	4152.245077	0.008491492	1.94169966	83883.73893
-2.220656524	4152.245077	0.008491492	1.94169966	83883.73893
-2.21890468	4155.526637	0.008550931	1.95358736	83950.03307
-2.21890468	4155.526637	0.008550931	1.95358736	83950.03307
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-2.217278003	4178.029368	0.008564486	1.95629848	84404.63371
-2.217278003	4178.029368	0.008564486	1.95629848	84404.63371
-2.215526159	4179.435998	0.008538418	1.95108471	84433.05047
-2.215526159	4179.435998	0.008538418	1.95108471	84433.05047
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-2.213774132	4190.687353	0.008470637	1.93752853	84660.35057
-2.213774132	4190.687353	0.008470637	1.93752853	84660.35057
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-2.211897296	4188.108928	0.008538418	1.95108471	84608.26118
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-2.210395611	4184.124211	0.008588471	1.96109531	84527.76184
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-2.208643764	4212.721425	0.00852799	1.94899915	85105.48333
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-2.20689192	4220.69122	0.008545717	1.95254458	85266.48929
-2.20689192	4220.69122	0.008545717	1.95254458	85266.48929
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-2.205390235	4233.817864	0.00853946	1.95129318	85531.67401
-2.205390235	4233.817864	0.00853946	1.95129318	85531.67401
-2.203638388	4242.256632	0.008482108	1.93982271	85702.15419
-2.203638388	4242.256632	0.008482108	1.93982271	85702.15419
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-2.201886542	4231.942574	0.008538418	1.95108471	85493.78938
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-2.200134698	4252.101694	0.008547802	1.95296166	85901.04432
-2.200134698	4252.101694	0.008547802	1.95296166	85901.04432
-2.198382671	4261.946418	0.008565529	1.9565071	86099.92764
-2.198382671	4261.946418	0.008565529	1.9565071	86099.92764
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-2.196755996	4270.38521	0.00845708	1.93481727	86270.40828
-2.196755996	4270.38521	0.00845708	1.93481727	86270.40828
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-2.19487898	4270.619685	0.008515476	1.94649635	86275.14516
-2.19487898	4270.619685	0.008515476	1.94649635	86275.14516
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-2.193252306	4286.559252	0.008530075	1.94941623	86597.15661
-2.193252306	4286.559252	0.008530075	1.94941623	86597.15661
-2.191625451	4287.496571	0.008570743	1.95754988	86616.09234
-2.191625451	4287.496571	0.008570743	1.95754988	86616.09234
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-2.189873605	4273.901268	0.008489407	1.94128258	86341.43975
-2.189873605	4273.901268	0.008489407	1.94128258	86341.43975
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-2.188246927	4306.249061	0.008553016	1.95400445	86994.93052
-2.188246927	4306.249061	0.008553016	1.95400445	86994.93052
-2.188246927	4306.249061	0.008553016	1.95400445	86994.93052
-2.186369911	4308.827485	0.008494621	1.94232536	87047.01991
-2.186369911	4308.827485	0.008494621	1.94232536	87047.01991
-2.184743236	4318.20391	0.008462294	1.93586005	87236.44263
-2.184743236	4318.20391	0.008462294	1.93586005	87236.44263
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-2.183116382	4321.719968	0.008482108	1.93982271	87307.47411
-2.183116382	4321.719968	0.008482108	1.93982271	87307.47411
-2.183116382	4321.719968	0.008482108	1.93982271	87307.47411
-2.181364535	4327.111338	0.008460209	1.93544296	87416.39067

-2.181364535	4327.111338	0.008460209	1.93544296	87416.39067
-2.179612688	4329.455265	0.008538418	1.95108471	87463.74272
-2.179612688	4329.455265	0.008538418	1.95108471	87463.74272
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-2.177860845	4353.130128	0.008492535	1.94190813	87942.02278
-2.177860845	4353.130128	0.008492535	1.94190813	87942.02278
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-2.176108998	4338.831352	0.008481064	1.9396141	87653.15863
-2.176108998	4338.831352	0.008481064	1.9396141	87653.15863
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-2.174607313	4345.394831	0.008484193	1.9402398	87785.75417
-2.174607313	4345.394831	0.008484193	1.9402398	87785.75417
-2.172855469	4351.957996	0.008603069	1.96401505	87918.34335
-2.172855469	4351.957996	0.008603069	1.96401505	87918.34335
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-2.171103622	4359.459109	0.008519647	1.94733066	88069.88099
-2.171103622	4359.459109	0.008519647	1.94733066	88069.88099
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-2.169351775	4365.553614	0.008486278	1.94065688	88193.0023
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-2.167724921	4371.882618	0.008521733	1.94774775	88320.86096
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-2.165847904	4355.708552	0.0085697	1.95734126	87994.11217
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-2.164346399	4383.83713	0.008517562	1.94691358	88562.36626
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-2.162594553	4387.587686	0.008573872	1.95817558	88638.13507
-2.162594553	4387.587686	0.008573872	1.95817558	88638.13507
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-2.160842529	4382.430837	0.008565529	1.9565071	88533.9563
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-2.159090682	4396.026118	0.008502962	1.9439937	88808.60844
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-2.157338838	4395.322982	0.008502962	1.9439937	88794.40369
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-2.155712161	4402.12096	0.008529032	1.94920761	88931.73657
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-2.153835144	4383.133972	0.008524861	1.94837345	88548.16105
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-2.152333459	4408.449626	0.008538418	1.95108471	89059.58841
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-2.150581616	4416.653897	0.008506091	1.9446194	89225.33125
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-2.148829769	4418.529186	0.008574914	1.95838405	89263.21588
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-2.143824393	4428.13975	0.00841537	1.92647515	89457.36868
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-2.142072546	4434.703251	0.008588471	1.96109531	89589.96468
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-2.140320699	4441.500892	0.008554059	1.95421291	89727.29074
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-2.131811633	4448.064056	0.008554059	1.95421291	89859.87993
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-2.129809444	4444.782474	0.008531117	1.9496247	89793.58534
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-2.128307762	4471.035762	0.008519647	1.94733066	90323.95479
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-2.123302384	4481.34982	0.008515476	1.94649635	90532.3196
-2.123302384	4481.34982	0.008515476	1.94649635	90532.3196
-2.12155054	4490.960383	0.0085697	1.95734126	90726.47239
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-2.119798693	4474.083183	0.008505049	1.94441093	90385.51885
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-2.108036095	4496.021104	0.008526947	1.94879053	90828.70918
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-2.106159079	4512.429668	0.008538418	1.95108471	91160.19531
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-2.104532401	4515.242254	0.008519647	1.94733066	91217.01522
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-2.102780557	4509.616745	0.008507134	1.94482801	91103.36858
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-2.101153703	4526.024949	0.008490449	1.94149105	91434.84745
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-2.099401856	4523.681022	0.00846438	1.93627713	91387.4954
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-2.097775182	4511.960671	0.008538418	1.95108471	91150.72063
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-2.095772993	4523.212026	0.008565529	1.9565071	91378.02072
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-2.090767617	4533.05711	0.008538418	1.95108471	91576.91131
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-2.090767617	4533.05711	0.008538418	1.95108471	91576.91131
-2.089266112	4543.371146	0.008545717	1.95254458	91785.27567
-2.089266112	4543.371146	0.008545717	1.95254458	91785.27567
-2.089266112	4543.371146	0.008545717	1.95254458	91785.27567
-2.087263927	4545.246098	0.008482108	1.93982271	91823.15349

-2.087263927	4545.246098	0.008482108	1.93982271	91823.15349
-2.085762242	4523.681022	0.008469594	1.93731992	91387.4954
-2.085762242	4523.681022	0.008469594	1.93731992	91387.4954
-2.085762242	4523.681022	0.008469594	1.93731992	91387.4954
-2.084010395	4541.495879	0.008488364	1.94107396	91747.39149
-2.084010395	4541.495879	0.008488364	1.94107396	91747.39149
-2.084010395	4541.495879	0.008488364	1.94107396	91747.39149
-2.082258548	4532.58845	0.008563444	1.95609001	91567.44344
-2.082258548	4532.58845	0.008563444	1.95609001	91567.44344
-2.082258548	4532.58845	0.008563444	1.95609001	91567.44344
-2.080631873	4547.121387	0.008521733	1.94774775	91861.03813
-2.080631873	4547.121387	0.008521733	1.94774775	91861.03813
-2.07887985	4549.93431	0.008622883	1.96797771	91917.86485
-2.07887985	4549.93431	0.008622883	1.96797771	91917.86485
-2.07887985	4549.93431	0.008622883	1.96797771	91917.86485
-2.077253172	4552.747233	0.008538418	1.95108471	91974.69158
-2.077253172	4552.747233	0.008538418	1.95108471	91974.69158
-2.077253172	4552.747233	0.008538418	1.95108471	91974.69158
-2.075501328	4552.747233	0.008509219	1.9452451	91974.69158
-2.075501328	4552.747233	0.008509219	1.9452451	91974.69158
-2.073749481	4522.743389	0.008555102	1.95442153	91368.55331
-2.073749481	4522.743389	0.008555102	1.95442153	91368.55331
-2.073749481	4522.743389	0.008555102	1.95442153	91368.55331
-2.071997635	4554.153526	0.008505049	1.94441093	92003.10153
-2.071997635	4554.153526	0.008505049	1.94441093	92003.10153
-2.071997635	4554.153526	0.008505049	1.94441093	92003.10153
-2.070245611	4554.622522	0.008515476	1.94649635	92012.57621
-2.070245611	4554.622522	0.008515476	1.94649635	92012.57621
-2.070245611	4554.622522	0.008515476	1.94649635	92012.57621
-2.068618933	4551.340603	0.008475851	1.93857131	91946.27481
-2.068618933	4551.340603	0.008475851	1.93857131	91946.27481
-2.066992259	4553.684867	0.008547802	1.95296166	91993.63367
-2.066992259	4553.684867	0.008547802	1.95296166	91993.63367
-2.066992259	4553.684867	0.008547802	1.95296166	91993.63367
-2.065240412	4565.873877	0.008505049	1.94441093	92239.8763
-2.065240412	4565.873877	0.008505049	1.94441093	92239.8763
-2.065240412	4565.873877	0.008505049	1.94441093	92239.8763
-2.063613558	4562.592295	0.008502962	1.9439937	92173.58171
-2.063613558	4562.592295	0.008502962	1.9439937	92173.58171
-2.063613558	4562.592295	0.008502962	1.9439937	92173.58171
-2.061986883	4545.246098	0.008509219	1.9452451	91823.15349
-2.061986883	4545.246098	0.008509219	1.9452451	91823.15349
-2.060235036	4562.123321	0.008521733	1.94774775	92164.10749
-2.060235036	4562.123321	0.008521733	1.94774775	92164.10749
-2.060235036	4562.123321	0.008521733	1.94774775	92164.10749
-2.05848319	4562.123321	0.008550931	1.95358736	92164.10749
-2.05848319	4562.123321	0.008550931	1.95358736	92164.10749
-2.05848319	4562.123321	0.008550931	1.95358736	92164.10749
-2.056731166	4562.123321	0.008490449	1.94149105	92164.10749
-2.056731166	4562.123321	0.008490449	1.94149105	92164.10749

-2.054979319	4565.40488	0.008511305	1.94566218	92230.40162
-2.054979319	4565.40488	0.008511305	1.94566218	92230.40162
-2.054979319	4565.40488	0.008511305	1.94566218	92230.40162
-2.053477814	4564.467584	0.008538418	1.95108471	92211.46635
-2.053477814	4564.467584	0.008538418	1.95108471	92211.46635
-2.053477814	4564.467584	0.008538418	1.95108471	92211.46635
-2.051600798	4563.998588	0.008588471	1.96109531	92201.99167
-2.051600798	4563.998588	0.008588471	1.96109531	92201.99167
-2.051600798	4563.998588	0.008588471	1.96109531	92201.99167
-2.049723781	4487.113676	0.008480021	1.93940548	90648.76114
-2.049723781	4487.113676	0.008480021	1.93940548	90648.76114
-2.048222096	4560.717028	0.008463337	1.93606866	92135.69753
-2.048222096	4560.717028	0.008463337	1.93606866	92135.69753
-2.048222096	4560.717028	0.008463337	1.93606866	92135.69753
-2.046595422	4564.936243	0.008567615	1.95692418	92220.93421
-2.046595422	4564.936243	0.008567615	1.95692418	92220.93421
-2.046595422	4564.936243	0.008567615	1.95692418	92220.93421
-2.044718406	4559.310398	0.008538418	1.95108471	92107.28076
-2.044718406	4559.310398	0.008538418	1.95108471	92107.28076
-2.044718406	4559.310398	0.008538418	1.95108471	92107.28076
-2.043091728	4567.749166	0.008465423	1.93648575	92277.76094
-2.043091728	4567.749166	0.008465423	1.93648575	92277.76094
-2.041464874	4569.155459	0.008480021	1.93940548	92306.17089
-2.041464874	4569.155459	0.008480021	1.93940548	92306.17089
-2.041464874	4569.155459	0.008480021	1.93940548	92306.17089
-2.039587858	4555.560156	0.008523818	1.94816483	92031.5183
-2.039587858	4555.560156	0.008523818	1.94816483	92031.5183
-2.039587858	4555.560156	0.008523818	1.94816483	92031.5183
-2.037961183	4552.747233	0.008434139	1.93022905	91974.69158
-2.037961183	4552.747233	0.008434139	1.93022905	91974.69158
-2.037961183	4552.747233	0.008434139	1.93022905	91974.69158
-2.036209336	4558.372742	0.008571786	1.9577585	92088.33822
-2.036209336	4558.372742	0.008571786	1.9577585	92088.33822
-2.034582482	4557.904105	0.008538418	1.95108471	92078.8708
-2.034582482	4557.904105	0.008538418	1.95108471	92078.8708
-2.034582482	4557.904105	0.008538418	1.95108471	92078.8708
-2.032830638	4558.372742	0.008484193	1.9402398	92088.33822
-2.032830638	4558.372742	0.008484193	1.9402398	92088.33822
-2.032830638	4558.372742	0.008484193	1.9402398	92088.33822
-2.031203961	4563.060954	0.008577	1.95880113	92183.04958
-2.031203961	4563.060954	0.008577	1.95880113	92183.04958
-2.029452114	4555.560156	0.008603069	1.96401505	92031.5183
-2.029452114	4555.560156	0.008603069	1.96401505	92031.5183
-2.029452114	4555.560156	0.008603069	1.96401505	92031.5183
-2.02770027	4536.33867	0.008563444	1.95609001	91643.20545
-2.02770027	4536.33867	0.008563444	1.95609001	91643.20545
-2.02770027	4536.33867	0.008563444	1.95609001	91643.20545
-2.026073416	4536.807666	0.008472722	1.93794561	91652.68013
-2.026073416	4536.807666	0.008472722	1.93794561	91652.68013
-2.026073416	4536.807666	0.008472722	1.93794561	91652.68013

-2.024196399	4541.495879	0.008515476	1.94649635	91747.39149
-2.024196399	4541.495879	0.008515476	1.94649635	91747.39149
-2.022569722	4541.495879	0.008563444	1.95609001	91747.39149
-2.022569722	4541.495879	0.008563444	1.95609001	91747.39149
-2.022569722	4541.495879	0.008563444	1.95609001	91747.39149
-2.020817878	4538.682956	0.008522776	1.94795636	91690.56476
-2.020817878	4538.682956	0.008522776	1.94795636	91690.56476
-2.020817878	4538.682956	0.008522776	1.94795636	91690.56476
-2.019066031	4529.775528	0.008521733	1.94774775	91510.61672
-2.019066031	4529.775528	0.008521733	1.94774775	91510.61672
-2.019066031	4529.775528	0.008521733	1.94774775	91510.61672
-2.017689516	4548.059021	0.008559272	1.9552557	91879.98022
-2.017689516	4548.059021	0.008559272	1.9552557	91879.98022
-2.01568733	4497.427734	0.008492535	1.94190813	90857.12595
-2.01568733	4497.427734	0.008492535	1.94190813	90857.12595
-2.01568733	4497.427734	0.008492535	1.94190813	90857.12595
-2.014060656	4504.459873	0.008495663	1.94253383	90999.18936
-2.014060656	4504.459873	0.008495663	1.94253383	90999.18936
-2.014060656	4504.459873	0.008495663	1.94253383	90999.18936
-2.012433801	4496.490101	0.008514433	1.94628788	90838.18386
-2.012433801	4496.490101	0.008514433	1.94628788	90838.18386
-2.010681954	4479.612878	0.008496706	1.94274245	90497.22986
-2.010681954	4479.612878	0.008496706	1.94274245	90497.22986
-2.010681954	4479.612878	0.008496706	1.94274245	90497.22986
-2.009055277	4465.548601	0.00855823	1.95504723	90213.10305
-2.009055277	4465.548601	0.00855823	1.95504723	90213.10305
-2.009055277	4465.548601	0.00855823	1.95504723	90213.10305
-2.007178261	4449.609034	0.008546759	1.95275305	89891.0916
-2.007178261	4449.609034	0.008546759	1.95275305	89891.0916
-2.007178261	4449.609034	0.008546759	1.95275305	89891.0916
-2.005551406	4443.983188	0.008523818	1.94816483	89777.43814
-2.005551406	4443.983188	0.008523818	1.94816483	89777.43814
-2.003924732	4404.603256	0.008492535	1.94190813	88981.88397
-2.003924732	4404.603256	0.008492535	1.94190813	88981.88397
-2.003924732	4404.603256	0.008492535	1.94190813	88981.88397
-2.002172885	4363.348035	0.008480021	1.93940548	88148.44516
-2.002172885	4363.348035	0.008480021	1.93940548	88148.44516
-2.002172885	4363.348035	0.008480021	1.93940548	88148.44516
-2.000421041	4325.374059	0.008588471	1.96109531	87381.29412
-2.000421041	4325.374059	0.008588471	1.96109531	87381.29412
-2.000421041	4325.374059	0.008588471	1.96109531	87381.29412
-1.998669194	4266.772978	0.008541545	1.95171026	86197.4339
-1.998669194	4266.772978	0.008541545	1.95171026	86197.4339
-1.996917167	4182.387269	0.008563444	1.95609001	84492.6721
-1.996917167	4182.387269	0.008563444	1.95609001	84492.6721
-1.996917167	4182.387269	0.008563444	1.95609001	84492.6721
-1.995165324	4077.84244	0.008546759	1.95275305	82380.65535
-1.995165324	4077.84244	0.008546759	1.95275305	82380.65535
-1.995165324	4077.84244	0.008546759	1.95275305	82380.65535
-1.993538646	3971.891318	0.008538418	1.95108471	80240.22864

-1.993538646	3971.891318	0.008538418	1.95108471	80240.22864
-1.993538646	3971.891318	0.008538418	1.95108471	80240.22864
-1.99166163	3841.093201	0.008450824	1.93356601	77597.84244
-1.99166163	3841.093201	0.008450824	1.93356601	77597.84244
-1.989909786	3602.937646	0.008512348	1.9458708	72786.61912
-1.989909786	3602.937646	0.008512348	1.9458708	72786.61912
-1.989909786	3602.937646	0.008512348	1.9458708	72786.61912
-1.988408101	3480.109302	0.00848315	1.94003118	70305.23842
-1.988408101	3480.109302	0.00848315	1.94003118	70305.23842
-1.988408101	3480.109302	0.00848315	1.94003118	70305.23842
-1.986656254	3368.532671	0.008561359	1.95567293	68051.16507
-1.986656254	3368.532671	0.008561359	1.95567293	68051.16507
-1.985154749	3286.021914	0.008572829	1.95796696	66384.28109
-1.985154749	3286.021914	0.008572829	1.95796696	66384.28109
-1.985154749	3286.021914	0.008572829	1.95796696	66384.28109
-1.983152563	3089.121581	0.008538418	1.95108471	62406.49658
-1.983152563	3089.121581	0.008538418	1.95108471	62406.49658
-1.983152563	3089.121581	0.008538418	1.95108471	62406.49658
-1.981400717	2788.944858	0.008492535	1.94190813	56342.32037
-1.981400717	2788.944858	0.008492535	1.94190813	56342.32037
-1.981400717	2788.944858	0.008492535	1.94190813	56342.32037
-1.97964887	2416.240788	0.008486278	1.94065688	48812.94521
-1.97964887	2416.240788	0.008486278	1.94065688	48812.94521
-1.978272357	2165.661748	0.008591599	1.96172101	43750.74237
-1.978272357	2165.661748	0.008591599	1.96172101	43750.74237
-1.978272357	2165.661748	0.008591599	1.96172101	43750.74237
-1.976395341	1802.099446	0.008496706	1.94274245	36406.04942
-1.976395341	1802.099446	0.008496706	1.94274245	36406.04942
-1.976395341	1802.099446	0.008496706	1.94274245	36406.04942
-1.974643494	1502.060914	0.008518604	1.94712205	30344.66493
-1.974643494	1502.060914	0.008518604	1.94712205	30344.66493
-1.974643494	1502.060914	0.008518604	1.94712205	30344.66493
-1.973141809	1248.004415	0.008494621	1.94232536	25212.21041
-1.973141809	1248.004415	0.008494621	1.94232536	25212.21041
-1.971389965	1050.166516	0.008593684	1.9621381	21215.48517
-1.971389965	1050.166516	0.008593684	1.9621381	21215.48517
-1.971389965	1050.166516	0.008593684	1.9621381	21215.48517
-1.969638118	871.081039	0.008516519	1.94670496	17597.59675
-1.969638118	871.081039	0.008516519	1.94670496	17597.59675
-1.969638118	871.081039	0.008516519	1.94670496	17597.59675
-1.967886272	650.6230132	0.008476894	1.93877993	13143.89926
-1.967886272	650.6230132	0.008476894	1.93877993	13143.89926
-1.966134248	504.4714065	0.008496706	1.94274245	10191.34154
-1.966134248	504.4714065	0.008496706	1.94274245	10191.34154
-1.966134248	504.4714065	0.008496706	1.94274245	10191.34154
-1.964632743	364.4143724	0.008560316	1.95546431	7361.906514
-1.964632743	364.4143724	0.008560316	1.95546431	7361.906514
-1.964632743	364.4143724	0.008560316	1.95546431	7361.906514
-1.962880896	184.2740692	0.008577	1.95880113	3722.708468
-1.962880896	184.2740692	0.008577	1.95880113	3722.708468

-1.962880896	184.2740692	0.008577	1.95880113	3722.708468
-1.961254041	103.6386914	0.008502962	1.9439937	2093.710938
-1.961254041	103.6386914	0.008502962	1.9439937	2093.710938
-1.959502195	-0.90598037	0.008506091	1.9446194	-18.30263373
-1.959502195	-0.90598037	0.008506091	1.9446194	-18.30263373
-1.959502195	-0.90598037	0.008506091	1.9446194	-18.30263373
-1.957625178	-2.312408109	0.008531117	1.9496247	-46.71531533
-1.957625178	-2.312408109	0.008531117	1.9496247	-46.71531533
-1.957625178	-2.312408109	0.008531117	1.9496247	-46.71531533
-1.955998504	-1.60920548	0.008547802	1.95296166	-32.50920161
-1.955998504	-1.60920548	0.008547802	1.95296166	-32.50920161
-1.955998504	-1.60920548	0.008547802	1.95296166	-32.50920161
-1.954371827	-2.312408109	0.00852799	1.94899915	-46.71531533
-1.954371827	-2.312408109	0.00852799	1.94899915	-46.71531533
				92306.17089

Specimen No.	41T	Temperature		
Init. Width		0.251Init. Thick.		
Final Width		0.16Final Thick.		
Init. Gage		1Final Gage	1.31	
Init. Area	0.0495Final Area		0.0201	
Pct. Red.	59.39Pct. Elong.		31	
Modulus	28.35Xhead Rate		0.05	
Yield	68.1Ultimate		87.3	
Full Scale	3.00001	22480.90247	0.05	
Time	Stroke	Load	Strain	
	-1.504640765	0.617662795	0.002448882	
	-1.504640765	0.266039	0.002453314	
	-1.504640765	0.266039	0.002453314	
	-1.504640765	0.266039	0.002453314	
	-1.503389422	1.20367248	0.002455921	
	-1.503389422	1.20367248	0.002455921	
	-1.503389422	1.20367248	0.002455921	
	-1.501512406	1.20367248	0.002458788	
	-1.501512406	1.20367248	0.002458788	
	-1.501512406	1.20367248	0.002458788	
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-1.189929069 3958.157667 0.005252846
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-1.181294834 3852.90968 0.005253889
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-1.179542987 3833.922692 0.005253889
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-1.179542987	3833.922692	0.005253889
-1.178041302	3800.871764	0.005254932
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-1.176289455	3783.994564	0.005253889
-1.176289455	3783.994564	0.005253889
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-1.174287359	3755.865986	0.005252325
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-1.172785764	3706.640993	0.005252846
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-1.170783579	3685.778715	0.005253889
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-1.169407153	3651.555633	0.005252325
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-1.167655216	3618.738866	0.005252846
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-1.166028452	3580.296568	0.00525441
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-1.164276608	3530.133941	0.005252846
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-1.162524761	3416.681683	0.005252325
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-1.156768633	0.266039	0.005251803
-1.156768633	0.266039	0.005251803
-1.156768633	0.266039	0.005251803
-1.157143964	-2.195192683	0.005252846
-1.157143964	-2.195192683	0.005252846
-1.157143964	-1.374774629	0.005251282

Specimen No.	72B	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.12	Final Thick.	
Init. Gage	1	Final Gage	1.2
Init. Area	0.0495	Final Area	0.0113
Pct. Red.	77.17	Pct. Elong.	20
Modulus	34.06	Xhead Rate	0.05
Yield	72.9	Ultimate	97.6
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.282973212	-1.257581684	0.001306779
	-2.282973212	1.320865425	0.001307561
	-2.282973212	1.320865425	0.001307561
	-2.281847035	0.148846055	0.001309907

-2.281847035	0.148846055	0.001309907
-2.281847035	0.148846055	0.001309907
-2.279970019	0.50044737	0.001311732
-2.279970019	0.50044737	0.001311732
-2.279970019	0.50044737	0.001311732
-2.278343344	0.734878221	0.001313296
-2.278343344	0.734878221	0.001313296
-2.278343344	0.734878221	0.001313296
-2.27671649	16.90880846	0.00132216
-2.27671649	16.90880846	0.00132216
-2.274964643	85.12069995	0.001344058
-2.274964643	85.12069995	0.001344058
-2.274964643	85.12069995	0.001344058
-2.273337969	274.1684089	0.001407407
-2.273337969	274.1684089	0.001407407
-2.273337969	274.1684089	0.001407407
-2.271711114	540.2181771	0.001486137
-2.271711114	540.2181771	0.001486137
-2.269959268	843.5383815	0.001574773
-2.269959268	843.5383815	0.001574773
-2.269959268	843.5383815	0.001574773
-2.268207421	1235.815315	0.001688957
-2.268207421	1235.815315	0.001688957
-2.268207421	1235.815315	0.001688957
-2.266455577	1617.426813	0.001801577
-2.266455577	1617.426813	0.001801577
-2.266455577	1617.426813	0.001801577
-2.26470373	2021.658438	0.001925147
-2.26470373	2021.658438	0.001925147
-2.262951883	2415.303155	0.00205784
-2.262951883	2415.303155	0.00205784
-2.262951883	2415.303155	0.00205784
-2.261325029	2791.757781	0.002210868
-2.261325029	2791.757781	0.002210868
-2.261325029	2791.757781	0.002210868
-2.259573182	3073.044004	0.002381623
-2.259573182	3073.044004	0.002381623
-2.259573182	3073.044004	0.002381623
-2.257821338	3253.535773	0.002542993
-2.257821338	3253.535773	0.002542993
-2.256069491	3344.484962	0.002702017
-2.256069491	3344.484962	0.002702017
-2.256069491	3344.484962	0.002702017
-2.254442637	3417.150658	0.00284957
-2.254442637	3417.150658	0.00284957
-2.254442637	3417.150658	0.00284957
-2.25269079	3483.721533	0.002998426
-2.25269079	3483.721533	0.002998426
-2.251064116	3523.335941	0.00314598
-2.251064116	3523.335941	0.00314598
-2.251064116	3523.335941	0.00314598

-2.249437438	3582.640516	0.003300571
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-2.249437438	3582.640516	0.003300571
-2.247435252	3623.895715	0.003460377
-2.247435252	3623.895715	0.003460377
-2.247435252	3623.895715	0.003460377
-2.245933567	3648.274073	0.003621226
-2.245933567	3648.274073	0.003621226
-2.243931562	3694.920642	0.003802148
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-2.243931562	3694.920642	0.003802148
-2.241929376	3684.372423	0.003955437
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-2.241929376	3684.372423	0.003955437
-2.24067803	3751.880932	0.004158779
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-2.24067803	3751.880932	0.004158779
-2.238926186	3780.243985	0.004338918
-2.238926186	3780.243985	0.004338918
-2.237424501	3818.68662	0.004534179
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-2.237424501	3818.68662	0.004534179
-2.235672654	3842.83012	0.004737521
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-2.235672654	3842.83012	0.004737521
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-2.233920807	3832.985396	0.004934084
-2.233920807	3832.985396	0.004934084
-2.232293953	3886.898264	0.005183501
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-2.230667279	3911.745259	0.005416562
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-2.230667279	3911.745259	0.005416562
-2.228790262	3930.02909	0.005660573
-2.228790262	3930.02909	0.005660573
-2.228790262	3930.02909	0.005660573
-2.227163585	3947.843609	0.005921267
-2.227163585	3947.843609	0.005921267
-2.225411741	3970.346677	0.006179876
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-2.225411741	3970.346677	0.006179876
-2.223784887	3983.004662	0.006468726
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-2.223784887	3983.004662	0.006468726
-2.22190787	3981.363534	0.006753926
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-2.22190787	3981.363534	0.006753926
-2.220281193	4025.666176	0.007077709
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-2.218654518	4036.91753	0.007387414
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-2.215150648	4066.218239	0.008045928
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-2.215150648	4066.218239	0.008045928
-2.213398801	4084.501733	0.008390045
-2.213398801	4084.501733	0.008390045
-2.211646954	4097.15974	0.008745112
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-2.20989511	4057.779808	0.00905221
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-2.194628818	4218.81593	0.012628195
-2.194628818	4218.81593	0.012628195
-2.192876795	4219.988062	0.013036963
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-2.177485333	4353.364626	0.01688586
-2.175858659	4312.109405	0.017318612
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-2.174106812	4334.612136	0.017757623
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-2.172479958	4343.988201	0.018198718
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-2.17085328	4355.943051	0.018634599
-2.169101436	4368.835196	0.019072567
-2.169101436	4368.835196	0.019072567
-2.167349589	4369.538354	0.01951679
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-2.167349589	4369.538354	0.01951679
-2.165597743	4383.83713	0.019952671
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-2.165597743	4383.83713	0.019952671
-2.164096058	4371.648119	0.02040434
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-2.162344214	4386.181393	0.020852736
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-2.162344214	4386.181393	0.020852736
-2.160592367	4405.402542	0.021299045
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-2.157088496	4421.342109	0.022191663
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-1.914203826	4736.520922	0.005151697
-1.912451979	4732.770343	0.005151697
-1.912451979	4732.770343	0.005151697
-1.910825124	4726.675861	0.005150132
-1.910825124	4726.675861	0.005150132
-1.910825124	4726.675861	0.005150132
-1.908948108	4722.925282	0.005150654
-1.908948108	4722.925282	0.005150654
-1.908948108	4722.925282	0.005150654
-1.907321434	4709.329664	0.005150132
-1.907321434	4709.329664	0.005150132
-1.907321434	4709.329664	0.005150132
-1.905569587	4663.855227	0.005150654
-1.905569587	4663.855227	0.005150654
-1.90381774	4691.515145	0.005150654
-1.90381774	4691.515145	0.005150654
-1.90381774	4691.515145	0.005150654
-1.902316058	4681.670083	0.005151175
-1.902316058	4681.670083	0.005151175
-1.902316058	4681.670083	0.005151175
-1.900564211	4672.762655	0.005151175
-1.900564211	4672.762655	0.005151175
-1.900564211	4672.762655	0.005151175
-1.898562026	4660.104648	0.005150132

-1.898562026	4660.104648	0.005150132
-1.897060518	4646.978004	0.005151175
-1.897060518	4646.978004	0.005151175
-1.897060518	4646.978004	0.005151175
-1.897060518	4646.978004	0.005151175
-1.895433663	4633.382723	0.005150654
-1.895433663	4633.382723	0.005150654
-1.895433663	4633.382723	0.005150654
-1.893556647	4606.191442	0.005149611
-1.893556647	4606.191442	0.005149611
-1.891929972	4609.942021	0.005150654
-1.891929972	4609.942021	0.005150654
-1.891929972	4609.942021	0.005150654
-1.890052956	4597.753011	0.005150654
-1.890052956	4597.753011	0.005150654
-1.890052956	4597.753011	0.005150654
-1.888551271	4574.781305	0.005150132
-1.888551271	4574.781305	0.005150132
-1.888551271	4574.781305	0.005150132
-1.886799427	4566.811151	0.005150654
-1.886799427	4566.811151	0.005150654
-1.88517275	4553.215892	0.005149611
-1.88517275	4553.215892	0.005149611
-1.88517275	4553.215892	0.005149611
-1.883420903	4534.932377	0.005149611
-1.883420903	4534.932377	0.005149611
-1.883420903	4534.932377	0.005149611
-1.881919221	4492.739522	0.005150132
-1.881919221	4492.739522	0.005150132
-1.881919221	4492.739522	0.005150132
-1.880042205	4498.834027	0.005150132
-1.880042205	4498.834027	0.005150132
-1.878290358	4478.206248	0.005151697
-1.878290358	4478.206248	0.005151697
-1.878290358	4478.206248	0.005151697
-1.876538511	4447.733745	0.005151697
-1.876538511	4447.733745	0.005151697
-1.876538511	4447.733745	0.005151697
-1.875036826	4441.170265	0.005151697
-1.875036826	4441.170265	0.005151697
-1.87315981	4435.544757	0.005150132
-1.87315981	4435.544757	0.005150132
-1.87315981	4435.544757	0.005150132
-1.871407966	4393.351879	0.005151697
-1.871407966	4393.351879	0.005151697
-1.871407966	4393.351879	0.005151697
-1.86953095	4357.722189	0.005150654
-1.86953095	4357.722189	0.005150654
-1.86953095	4357.722189	0.005150654
-1.868029445	4338.032044	0.005152739
-1.868029445	4338.032044	0.005152739
-1.866277598	4322.561473	0.005151175

-1.866277598	4322.561473	0.005151175
-1.866277598	4322.561473	0.005151175
-1.864525574	4288.80705	0.005152739
-1.864525574	4288.80705	0.005152739
-1.864525574	4288.80705	0.005152739
-1.863024066	4267.241638	0.005151697
-1.863024066	4267.241638	0.005151697
-1.863024066	4267.241638	0.005151697
-1.86114705	4243.332613	0.005151697
-1.86114705	4243.332613	0.005151697
-1.859520375	4198.795495	0.005152218
-1.859520375	4198.795495	0.005152218
-1.859520375	4198.795495	0.005152218
-1.858269032	4129.411719	0.005149611
-1.858269032	4129.411719	0.005149611
-1.858269032	4129.411719	0.005149611
-1.856016505	4140.663074	0.005151175
-1.856016505	4140.663074	0.005151175
-1.856016505	4140.663074	0.005151175
-1.854389827	4116.284738	0.005151175
-1.854389827	4116.284738	0.005151175
-1.852637983	4075.029517	0.005150654
-1.852637983	4075.029517	0.005150654
-1.852637983	4075.029517	0.005150654
-1.851011129	4042.681724	0.005149611
-1.851011129	4042.681724	0.005149611
-1.851011129	4042.681724	0.005149611
-1.849259282	4014.553169	0.005151697
-1.849259282	4014.553169	0.005151697
-1.847507435	3946.575663	0.005150654
-1.847507435	3946.575663	0.005150654
-1.847507435	3946.575663	0.005150654
-1.845755591	3923.603958	0.005151697
-1.845755591	3923.603958	0.005151697
-1.845755591	3923.603958	0.005151697
-1.844003745	3877.660524	0.005150654
-1.844003745	3877.660524	0.005150654
-1.844003745	3877.660524	0.005150654
-1.84250206	3832.654747	0.005149611
-1.84250206	3832.654747	0.005149611
-1.840750213	3782.49212	0.005150654
-1.840750213	3782.49212	0.005150654
-1.840750213	3782.49212	0.005150654
-1.838998369	3733.735763	0.005151175
-1.838998369	3733.735763	0.005151175
-1.838998369	3733.735763	0.005151175
-1.837371515	3693.418198	0.005151697
-1.837371515	3693.418198	0.005151697
-1.837371515	3693.418198	0.005151697
-1.835494675	3622.627792	0.005150654
-1.835494675	3622.627792	0.005150654

-1.833867821	3579.497282	0.005150654
-1.833867821	3579.497282	0.005150654
-1.833867821	3579.497282	0.005150654
-1.832241146	3526.052735	0.005151697
-1.832241146	3526.052735	0.005151697
-1.832241146	3526.052735	0.005151697
-1.83036413	3466.982658	0.005150132
-1.83036413	3466.982658	0.005150132
-1.828737276	3401.818098	0.005152218
-1.828737276	3401.818098	0.005152218
-1.828737276	3401.818098	0.005152218
-1.827110598	3337.591171	0.005151697
-1.827110598	3337.591171	0.005151697
-1.827110598	3337.591171	0.005151697
-1.825483924	3271.957614	0.005151697
-1.825483924	3271.957614	0.005151697
-1.825483924	3271.957614	0.005151697
-1.823732077	3199.760915	0.005151697
-1.823732077	3199.760915	0.005151697
-1.821980053	3133.190062	0.005151175
-1.821980053	3133.190062	0.005151175
-1.821980053	3133.190062	0.005151175
-1.820228206	3059.117714	0.005150654
-1.820228206	3059.117714	0.005150654
-1.820228206	3059.117714	0.005150654
-1.81847636	2972.388078	0.005150654
-1.81847636	2972.388078	0.005150654
-1.81847636	2972.388078	0.005150654
-1.816724516	2891.283951	0.005153261
-1.816724516	2891.283951	0.005153261
-1.815097838	2785.194459	0.005151697
-1.815097838	2785.194459	0.005151697
-1.815097838	2785.194459	0.005151697

Specimen No.	72T	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.15	Final Thick.	
Init. Gage	1	Final Gage	1.33
Init. Area	0.0495	Final Area	0.0177
Pct. Red.	64.24	Pct. Elong.	33
Modulus	36.78	Xhead Rate	0.05
Yield	72.5	Ultimate	95.1
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.287478084	0.03163063	0.000494194
	-2.287478084	-0.437163629	0.000493412
	-2.287478084	-0.437163629	0.000493412
	-2.287478084	-0.437163629	0.000493412
	-2.285976402	0.734878221	0.00049654
	-2.285976402	0.734878221	0.00049654

-2.284224555	4.485344699	0.00049654
-2.284224555	4.485344699	0.00049654
-2.284224555	4.485344699	0.00049654
-2.282472708	9.876669768	0.000499668
-2.282472708	9.876669768	0.000499668
-2.282472708	9.876669768	0.000499668
-2.280720861	22.65173485	0.000494715
-2.280720861	22.65173485	0.000494715
-2.280720861	22.65173485	0.000494715
-2.279219179	63.78983053	0.000514528
-2.279219179	63.78983053	0.000514528
-2.277467333	175.9526732	0.000551286
-2.277467333	175.9526732	0.000551286
-2.277467333	175.9526732	0.000551286
-2.275965828	394.7698405	0.000613331
-2.275965828	394.7698405	0.000613331
-2.275965828	394.7698405	0.000613331
-2.273963639	612.6493743	0.000681633
-2.273963639	612.6493743	0.000681633
-2.272461957	971.0547588	0.000790082
-2.272461957	971.0547588	0.000790082
-2.272461957	971.0547588	0.000790082
-2.27071011	1329.811767	0.000896706
-2.27071011	1329.811767	0.000896706
-2.27071011	1329.811767	0.000896706
-2.268958263	1713.533031	0.001014279
-2.268958263	1713.533031	0.001014279
-2.268958263	1713.533031	0.001014279
-2.267206419	2123.273107	0.001141498
-2.267206419	2123.273107	0.001141498
-2.265454572	2517.50372	0.001267153
-2.265454572	2517.50372	0.001267153
-2.265454572	2517.50372	0.001267153
-2.263702549	2917.633368	0.001415228
-2.263702549	2917.633368	0.001415228
-2.263702549	2917.633368	0.001415228
-2.261950702	3255.8797	0.001642814
-2.261950702	3255.8797	0.001642814
-2.261950702	3255.8797	0.001642814
-2.260324024	3498.723444	0.002077392
-2.260324024	3498.723444	0.002077392
-2.25869735	3626.943136	0.002652745
-2.25869735	3626.943136	0.002652745
-2.25869735	3626.943136	0.002652745
-2.256945326	3708.750421	0.003300311
-2.256945326	3708.750421	0.003300311
-2.256945326	3708.750421	0.003300311
-2.255193479	3761.257334	0.003971599
-2.255193479	3761.257334	0.003971599
-2.253566802	3802.512555	0.004694506
-2.253566802	3802.512555	0.004694506

-2.253566802	3802.512555	0.004694506
-2.251814958	3840.486194	0.005432725
-2.251814958	3840.486194	0.005432725
-2.251814958	3840.486194	0.005432725
-2.249937942	3840.720692	0.006187697
-2.249937942	3840.720692	0.006187697
-2.249937942	3840.720692	0.006187697
-2.248436257	3890.180184	0.006968217
-2.248436257	3890.180184	0.006968217
-2.246559241	3909.86997	0.007732052
-2.246559241	3909.86997	0.007732052
-2.246559241	3909.86997	0.007732052
-2.244932566	3917.605603	0.008471382
-2.244932566	3917.605603	0.008471382
-2.244932566	3917.605603	0.008471382
-2.243305889	3941.280467	0.009214362
-2.243305889	3941.280467	0.009214362
-2.241428872	3964.252172	0.009913545
-2.241428872	3964.252172	0.009913545
-2.241428872	3964.252172	0.009913545
-2.239802018	3975.738025	0.010605204
-2.239802018	3975.738025	0.010605204
-2.239802018	3975.738025	0.010605204
-2.237925002	3971.518472	0.011302824
-2.237925002	3971.518472	0.011302824
-2.237925002	3971.518472	0.011302824
-2.236423497	4001.288155	0.012005656
-2.236423497	4001.288155	0.012005656
-2.23467165	4018.868513	0.012688676
-2.23467165	4018.868513	0.012688676
-2.23467165	4018.868513	0.012688676
-2.232919626	4024.72852	0.013356054
-2.232919626	4024.72852	0.013356054
-2.232919626	4024.72852	0.013356054
-2.231167779	4046.293933	0.014027604
-2.231167779	4046.293933	0.014027604
-2.231167779	4046.293933	0.014027604
-2.229666274	4058.248445	0.014674127
-2.229666274	4058.248445	0.014674127
-2.227914427	4060.826892	0.015333162
-2.227914427	4060.826892	0.015333162
-2.227914427	4060.826892	0.015333162
-2.226287573	4049.341017	0.015967172
-2.226287573	4049.341017	0.015967172
-2.226287573	4049.341017	0.015967172
-2.224410557	4084.267572	0.016626208
-2.224410557	4084.267572	0.016626208
-2.222783882	4099.269505	0.017257088
-2.222783882	4099.269505	0.017257088
-2.222783882	4099.269505	0.017257088
-2.221032035	4110.286384	0.017890056

-2.221032035	4110.286384	0.017890056
-2.221032035	4110.286384	0.017890056
-2.219405181	4120.365944	0.018508424
-2.219405181	4120.365944	0.018508424
-2.219405181	4120.365944	0.018508424
-2.217653334	4140.056067	0.019110107
-2.217653334	4140.056067	0.019110107
-2.21590149	4128.804375	0.019734731
-2.21590149	4128.804375	0.019734731
-2.21590149	4128.804375	0.019734731
-2.214149643	4155.057663	0.020362631
-2.214149643	4155.057663	0.020362631
-2.214149643	4155.057663	0.020362631
-2.212522969	4159.277216	0.020967442
-2.212522969	4159.277216	0.020967442
-2.212522969	4159.277216	0.020967442
-2.210770942	4179.435998	0.021574338
-2.210770942	4179.435998	0.021574338
-2.208893926	4186.936797	0.02216455
-2.208893926	4186.936797	0.02216455
-2.208893926	4186.936797	0.02216455
-2.207392421	4192.328144	0.022754765
-2.207392421	4192.328144	0.022754765
-2.207392421	4192.328144	0.022754765
-2.205765567	4208.970869	0.023347062
-2.205765567	4208.970869	0.023347062
-2.205765567	4208.970869	0.023347062
-2.20388873	4194.437932	0.023949789
-2.20388873	4194.437932	0.023949789
-2.201886542	4225.379432	0.024560857
-2.201886542	4225.379432	0.024560857
-2.201886542	4225.379432	0.024560857
-2.200635198	4234.052362	0.025148985
-2.200635198	4234.052362	0.025148985
-2.200635198	4234.052362	0.025148985
-2.198883352	4234.286838	0.02573294
-2.198883352	4234.286838	0.02573294
-2.197131328	4249.75743	0.026333579
-2.197131328	4249.75743	0.026333579
-2.197131328	4249.75743	0.026333579
-2.195379481	4257.258566	0.02692588
-2.195379481	4257.258566	0.02692588
-2.195379481	4257.258566	0.02692588
-2.193877976	4279.292615	0.027461866
-2.193877976	4279.292615	0.027461866
-2.193877976	4279.292615	0.027461866
-2.19187579	4266.869129	0.028114647
-2.19187579	4266.869129	0.028114647
-2.190374105	4288.200043	0.028702772
-2.190374105	4288.200043	0.028702772
-2.190374105	4288.200043	0.028702772

-2.188622261	4296.638497	0.029303414
-2.188622261	4296.638497	0.029303414
-2.188622261	4296.638497	0.029303414
-2.186870415	4298.513764	0.029891542
-2.186870415	4298.513764	0.029891542
-2.186870415	4298.513764	0.029891542
-2.185118568	4318.907045	0.030471325
-2.185118568	4318.907045	0.030471325
-2.183366721	4319.610203	0.031071967
-2.183366721	4319.610203	0.031071967
-2.183366721	4319.610203	0.031071967
-2.181739866	4317.500415	0.031643409
-2.181739866	4317.500415	0.031643409
-2.181739866	4317.500415	0.031643409
-2.179988023	4333.439982	0.032279503
-2.179988023	4333.439982	0.032279503
-2.177860845	4287.027912	0.032773781
-2.177860845	4287.027912	0.032773781
-2.177860845	4287.027912	0.032773781
-2.176609498	4344.457198	0.033466187
-2.176609498	4344.457198	0.033466187
-2.176609498	4344.457198	0.033466187
-2.174857655	4346.801124	0.034041798
-2.174857655	4346.801124	0.034041798
-2.174857655	4346.801124	0.034041798
-2.173355969	4369.538354	0.034629926
-2.173355969	4369.538354	0.034629926
-2.171604123	4377.508126	0.035230568
-2.171604123	4377.508126	0.035230568
-2.171604123	4377.508126	0.035230568
-2.169852279	4358.286977	0.035793668
-2.169852279	4358.286977	0.035793668
-2.169852279	4358.286977	0.035793668
-2.168100432	4384.071628	0.03644436
-2.168100432	4384.071628	0.03644436
-2.168100432	4384.071628	0.03644436
-2.166473578	4394.151188	0.03705543
-2.166473578	4394.151188	0.03705543
-2.164596561	4404.230411	0.037656069
-2.164596561	4404.230411	0.037656069
-2.164596561	4404.230411	0.037656069
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-1.932973808	4369.9112	0.00522052
-1.932973808	4369.9112	0.00522052
-1.931221961	4352.565318	0.005219477
-1.931221961	4352.565318	0.005219477
-1.931221961	4352.565318	0.005219477
-1.929595287	4322.092477	0.00522052
-1.929595287	4322.092477	0.00522052
-1.92784344	4308.965833	0.00522052
-1.92784344	4308.965833	0.00522052
-1.92784344	4308.965833	0.00522052
-1.926091416	4283.650201	0.005221563
-1.926091416	4283.650201	0.005221563
-1.926091416	4283.650201	0.005221563
-1.924464739	4265.835345	0.005219477
-1.924464739	4265.835345	0.005219477
-1.924464739	4265.835345	0.005219477
-1.922712895	4240.51969	0.005221041
-1.922712895	4240.51969	0.005221041
-1.921086218	4231.612285	0.005221563
-1.921086218	4231.612285	0.005221563
-1.921086218	4231.612285	0.005221563
-1.919209201	4201.608418	0.005221563
-1.919209201	4201.608418	0.005221563
-1.919209201	4201.608418	0.005221563
-1.917582347	4156.133644	0.005222606
-1.917582347	4156.133644	0.005222606
-1.9158305	4144.882289	0.005222606
-1.9158305	4144.882289	0.005222606
-1.9158305	4144.882289	0.005222606
-1.914078656	4113.940789	0.005221041
-1.914078656	4113.940789	0.005221041
-1.914078656	4113.940789	0.005221041
-1.912451979	4089.093794	0.005224691
-1.912451979	4089.093794	0.005224691
-1.912451979	4089.093794	0.005224691
-1.910699955	4059.558947	0.005222606
-1.910699955	4059.558947	0.005222606
-1.909073281	4030.023739	0.005221563
-1.909073281	4030.023739	0.005221563
-1.909073281	4030.023739	0.005221563
-1.907321434	4001.426525	0.005223127
-1.907321434	4001.426525	0.005223127
-1.907321434	4001.426525	0.005223127
-1.905569587	3934.855312	0.005223127
-1.905569587	3934.855312	0.005223127
-1.905569587	3934.855312	0.005223127
-1.903942732	3934.855312	0.005222606
-1.903942732	3934.855312	0.005222606
-1.902190886	3897.819329	0.005221041
-1.902190886	3897.819329	0.005221041
-1.902190886	3897.819329	0.005221041

-1.900564211	3857.501742	0.005221563
-1.900564211	3857.501742	0.005221563
-1.900564211	3857.501742	0.005221563
-1.898937534	3816.71518	0.005223648
-1.898937534	3816.71518	0.005223648
-1.897060518	3780.147834	0.005221563
-1.897060518	3780.147834	0.005221563
-1.897060518	3780.147834	0.005221563
-1.895308494	3742.643192	0.005221041
-1.895308494	3742.643192	0.005221041
-1.895308494	3742.643192	0.005221041
-1.893806989	3675.603342	0.005221041
-1.893806989	3675.603342	0.005221041
-1.893806989	3675.603342	0.005221041
-1.891929972	3645.130501	0.005223127
-1.891929972	3645.130501	0.005223127
-1.890303298	3577.621992	0.005222084
-1.890303298	3577.621992	0.005222084
-1.890303298	3577.621992	0.005222084
-1.888551271	3485.266173	0.005222606
-1.888551271	3485.266173	0.005222606
-1.888551271	3485.266173	0.005222606
-1.887550267	-0.437163629	0.005222606
-1.887550267	-0.437163629	0.005222606
-1.887550267	-0.437163629	0.005222606
-1.885422912	-1.84361385	0.005225213

Specimen No.	78B	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.16	Final Thick.	
Init. Gage	1	Final Gage	1.3
Init. Area	0.0495	Final Area	0.0201
Pct. Red.	59.39	Pct. Elong.	30
Modulus	34.51	Xhead Rate	0.05
Yield	74.7	Ultimate	97.3
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.216401991	0.266039	0.000653739
	-2.216401991	0.266039	0.000653739
	-2.216276822	0.617662795	0.00065426
	-2.216276822	0.617662795	0.00065426
	-2.214399805	1.906875109	0.000654782
	-2.214399805	1.906875109	0.000654782
	-2.214399805	1.906875109	0.000654782
	-2.212773128	1.20367248	0.000653999
	-2.212773128	1.20367248	0.000653999
	-2.212773128	1.20367248	0.000653999
	-2.210896112	2.258498905	0.000653999
	-2.210896112	2.258498905	0.000653999
	-2.209269437	3.5477337	0.000654782

-2.209269437	3.5477337	0.000654782
-2.209269437	3.5477337	0.000654782
-2.207642583	1.906875109	0.000655564
-2.207642583	1.906875109	0.000655564
-2.207642583	1.906875109	0.000655564
-2.205890736	3.07891696	0.000655042
-2.205890736	3.07891696	0.000655042
-2.205890736	3.07891696	0.000655042
-2.204264062	1.43808085	0.000656346
-2.204264062	1.43808085	0.000656346
-2.202512215	2.492907275	0.000653999
-2.202512215	2.492907275	0.000653999
-2.202512215	2.492907275	0.000653999
-2.20088536	4.250936329	0.000655824
-2.20088536	4.250936329	0.000655824
-2.20088536	4.250936329	0.000655824
-2.199133513	9.759454342	0.000660778
-2.199133513	9.759454342	0.000660778
-2.199133513	9.759454342	0.000660778
-2.197506839	78.2057542	0.000698318
-2.197506839	78.2057542	0.000698318
-2.195880162	231.2722842	0.000754106
-2.195880162	231.2722842	0.000754106
-2.195880162	231.2722842	0.000754106
-2.193877976	441.7680555	0.000815369
-2.193877976	441.7680555	0.000815369
-2.193877976	441.7680555	0.000815369
-2.192376291	745.4398612	0.000904266
-2.192376291	745.4398612	0.000904266
-2.192376291	745.4398612	0.000904266
-2.190624447	1085.092913	0.001007241
-2.190624447	1085.092913	0.001007241
-2.1888726	1443.498365	0.001112822
-2.1888726	1443.498365	0.001112822
-2.1888726	1443.498365	0.001112822
-2.187245926	1832.259061	0.001232742
-2.187245926	1832.259061	0.001232742
-2.187245926	1832.259061	0.001232742
-2.185493899	2221.254434	0.00135605
-2.185493899	2221.254434	0.00135605
-2.183742055	2616.422704	0.001500996
-2.183742055	2616.422704	0.001500996
-2.183742055	2616.422704	0.001500996
-2.181865039	2953.028582	0.001665234
-2.181865039	2953.028582	0.001665234
-2.181865039	2953.028582	0.001665234
-2.180363531	3226.34483	0.001862058
-2.180363531	3226.34483	0.001862058
-2.180363531	3226.34483	0.001862058
-2.178736676	3350.110808	0.002033335
-2.178736676	3350.110808	0.002033335

-2.176734671	3478.096002	0.002210868
-2.176734671	3478.096002	0.002210868
-2.176734671	3478.096002	0.002210868
-2.175358155	3554.04328	0.002345386
-2.175358155	3554.04328	0.002345386
-2.175358155	3554.04328	0.002345386
-2.173355969	3610.300434	0.002478862
-2.173355969	3610.300434	0.002478862
-2.173355969	3610.300434	0.002478862
-2.171854464	3647.101919	0.002610774
-2.171854464	3647.101919	0.002610774
-2.170102438	3683.903426	0.002746595
-2.170102438	3683.903426	0.002746595
-2.170102438	3683.903426	0.002746595
-2.168475763	3731.25349	0.002884764
-2.168475763	3731.25349	0.002884764
-2.168475763	3731.25349	0.002884764
-2.166723916	3771.102395	0.003025539
-2.166723916	3771.102395	0.003025539
-2.1648469	3799.465134	0.003173352
-2.1648469	3799.465134	0.003173352
-2.1648469	3799.465134	0.003173352
-2.163345218	3832.04774	0.003323513
-2.163345218	3832.04774	0.003323513
-2.163345218	3832.04774	0.003323513
-2.161593371	3867.911614	0.003471066
-2.161593371	3867.911614	0.003471066
-2.161593371	3867.911614	0.003471066
-2.159841524	3862.051607	0.003636346
-2.159841524	3862.051607	0.003636346
-2.15821485	3906.588388	0.003819354
-2.15821485	3906.588388	0.003819354
-2.15821485	3906.588388	0.003819354
-2.156337834	3927.919324	0.004002883
-2.156337834	3927.919324	0.004002883
-2.156337834	3927.919324	0.004002883
-2.154836149	3950.656532	0.004199968
-2.154836149	3950.656532	0.004199968
-2.154836149	3950.656532	0.004199968
-2.153084302	3977.378816	0.004405135
-2.153084302	3977.378816	0.004405135
-2.151332455	3990.974097	0.004622293
-2.151332455	3990.974097	0.004622293
-2.151332455	3990.974097	0.004622293
-2.149580611	4020.040645	0.004857961
-2.149580611	4020.040645	0.004857961
-2.149580611	4020.040645	0.004857961
-2.147828764	4011.133239	0.005101643
-2.147828764	4011.133239	0.005101643
-2.145826579	4006.210529	0.005341482
-2.145826579	4006.210529	0.005341482

-2.145826579	4006.210529	0.005341482
-2.144575236	4065.515082	0.005631375
-2.144575236	4065.515082	0.005631375
-2.144575236	4065.515082	0.005631375
-2.142823389	4071.609587	0.005909275
-2.142823389	4071.609587	0.005909275
-2.142823389	4071.609587	0.005909275
-2.141071365	4099.269505	0.006211159
-2.141071365	4099.269505	0.006211159
-2.139319518	4107.473461	0.006514608
-2.139319518	4107.473461	0.006514608
-2.139319518	4107.473461	0.006514608
-2.137692841	4133.727063	0.006820664
-2.137692841	4133.727063	0.006820664
-2.137692841	4133.727063	0.006820664
-2.135815824	4129.742009	0.007170516
-2.135815824	4129.742009	0.007170516
-2.13418915	4160.918007	0.007521933
-2.13418915	4160.918007	0.007521933
-2.13418915	4160.918007	0.007521933
-2.132562296	4168.184644	0.007873349
-2.132562296	4168.184644	0.007873349
-2.132562296	4168.184644	0.007873349
-2.130810449	4173.810153	0.008232065
-2.130810449	4173.810153	0.008232065
-2.130810449	4173.810153	0.008232065
-2.129183774	4195.375565	0.008605379
-2.129183774	4195.375565	0.008605379
-2.127431927	4200.766913	0.008987036
-2.127431927	4200.766913	0.008987036
-2.127431927	4200.766913	0.008987036
-2.125805073	4220.456721	0.009370779
-2.125805073	4220.456721	0.009370779
-2.125805073	4220.456721	0.009370779
-2.124053226	4222.800985	0.009785805
-2.124053226	4222.800985	0.009785805
-2.124053226	4222.800985	0.009785805
-2.122301382	4239.443709	0.010194349
-2.122301382	4239.443709	0.010194349
-2.120549535	4252.570353	0.010608333
-2.120549535	4252.570353	0.010608333
-2.120549535	4252.570353	0.010608333
-2.118797689	4259.133833	0.011028572
-2.118797689	4259.133833	0.011028572
-2.118797689	4259.133833	0.011028572
-2.117170834	4279.995773	0.011452983
-2.117170834	4279.995773	0.011452983
-2.11554416	4287.26241	0.011883651
-2.11554416	4287.26241	0.011883651
-2.11554416	4287.26241	0.011883651
-2.113792313	4312.578064	0.012235067

-2.113792313	4312.578064	0.012235067
-2.113792313	4312.578064	0.012235067
-2.111790127	4296.638497	0.012743944
-2.111790127	4296.638497	0.012743944
-2.111790127	4296.638497	0.012743944
-2.110288442	4305.076929	0.013176696
-2.110288442	4305.076929	0.013176696
-2.108536595	4323.829419	0.013623005
-2.108536595	4323.829419	0.013623005
-2.108536595	4323.829419	0.013623005
-2.106784752	4329.455265	0.014076614
-2.106784752	4329.455265	0.014076614
-2.106784752	4329.455265	0.014076614
-2.105283244	4349.614047	0.014515623
-2.105283244	4349.614047	0.014515623
-2.10353122	4351.254838	0.01497549
-2.10353122	4351.254838	0.01497549
-2.10353122	4351.254838	0.01497549
-2.101779373	4336.487403	0.015424927
-2.101779373	4336.487403	0.015424927
-2.101779373	4336.487403	0.015424927
-2.100152698	4369.069695	0.015908776
-2.100152698	4369.069695	0.015908776
-2.100152698	4369.069695	0.015908776
-2.098526021	4372.585753	0.01637177
-2.098526021	4372.585753	0.01637177
-2.096649005	4385.946895	0.016827464
-2.096649005	4385.946895	0.016827464
-2.096649005	4385.946895	0.016827464
-2.09502215	4393.447693	0.017300886
-2.09502215	4393.447693	0.017300886
-2.09502215	4393.447693	0.017300886
-2.093270307	4397.432748	0.017762837
-2.093270307	4397.432748	0.017762837
-2.093270307	4397.432748	0.017762837
-2.09151846	4409.621758	0.018238343
-2.09151846	4409.621758	0.018238343
-2.089766613	4377.273965	0.018690909
-2.089766613	4377.273965	0.018690909
-2.089766613	4377.273965	0.018690909
-2.088264928	4429.780541	0.019193529
-2.088264928	4429.780541	0.019193529
-2.088264928	4429.780541	0.019193529
-2.086513084	4431.187171	0.019670078
-2.086513084	4431.187171	0.019670078
-2.084761237	4426.733457	0.020131134
-2.084761237	4426.733457	0.020131134
-2.084761237	4426.733457	0.020131134
-2.083134563	4444.079316	0.020612897
-2.083134563	4444.079316	0.020612897
-2.083134563	4444.079316	0.020612897

-2.081382536	4468.926311	0.021050863
-2.081382536	4468.926311	0.021050863
-2.081382536	4468.926311	0.021050863
-2.079630692	4463.066305	0.021547227
-2.079630692	4463.066305	0.021547227
-2.078004015	4447.595397	0.022026904
-2.078004015	4447.595397	0.022026904
-2.078004015	4447.595397	0.022026904
-2.076126998	4474.083183	0.022519095
-2.076126998	4474.083183	0.022519095
-2.076126998	4474.083183	0.022519095
-2.074500324	4481.34982	0.023005031
-2.074500324	4481.34982	0.023005031
-2.074500324	4481.34982	0.023005031
-2.072748297	4481.34982	0.023474281
-2.072748297	4481.34982	0.023474281
-2.071121623	4492.132515	0.023964387
-2.071121623	4492.132515	0.023964387
-2.071121623	4492.132515	0.023964387
-2.069369776	4505.024683	0.024427381
-2.069369776	4505.024683	0.024427381
-2.069369776	4505.024683	0.024427381
-2.067743101	4501.039606	0.024919572
-2.067743101	4501.039606	0.024919572
-2.067743101	4501.039606	0.024919572
-2.065740916	4473.987032	0.025378394
-2.065740916	4473.987032	0.025378394
-2.064239231	4516.179887	0.025883099
-2.064239231	4516.179887	0.025883099
-2.064239231	4516.179887	0.025883099
-2.062612553	4525.556312	0.026371121
-2.062612553	4525.556312	0.026371121
-2.062612553	4525.556312	0.026371121
-2.06086071	4532.119454	0.026850799
-2.06086071	4532.119454	0.026850799
-2.059108863	4537.7453	0.027336735
-2.059108863	4537.7453	0.027336735
-2.059108863	4537.7453	0.027336735
-2.057482008	4553.684867	0.027805984
-2.057482008	4553.684867	0.027805984
-2.057482008	4553.684867	0.027805984
-2.055730161	4530.244187	0.028298175
-2.055730161	4530.244187	0.028298175
-2.055730161	4530.244187	0.028298175
-2.053978315	4549.93431	0.028792453
-2.053978315	4549.93431	0.028792453
-2.052226471	4554.622522	0.029282558
-2.052226471	4554.622522	0.029282558
-2.052226471	4554.622522	0.029282558
-2.049723781	4515.242254	0.029720524
-2.0487226	4291.150999	0.005131884

-2.0487226	4286.931783	0.005132927
-2.0487226	4286.931783	0.005132927
-2.047721596	4530.244187	0.005130841
-2.047721596	4530.244187	0.005130841
-2.047721596	4530.244187	0.005130841
-2.045969749	4582.751077	0.005132405
-2.045969749	4582.751077	0.005132405
-2.045969749	4582.751077	0.005132405
-2.044092733	4598.690667	0.00513032
-2.044092733	4598.690667	0.00513032
-2.044092733	4598.690667	0.00513032
-2.042340889	4597.753011	0.005131362
-2.042340889	4597.753011	0.005131362
-2.040589042	4599.6283	0.005132927
-2.040589042	4599.6283	0.005132927
-2.040589042	4599.6283	0.005132927
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-1.806838934	4547.121387	0.005139183
-1.806838934	4547.121387	0.005139183
-1.806838934	4547.121387	0.005139183
-1.805087087	4530.244187	0.005139183
-1.805087087	4530.244187	0.005139183
-1.80333524	4516.179887	0.005141269
-1.80333524	4516.179887	0.005141269
-1.80333524	4516.179887	0.005141269
-1.801458224	4467.42389	0.005141269
-1.801458224	4467.42389	0.005141269
-1.801458224	4467.42389	0.005141269
-1.799831369	4471.643106	0.005140226
-1.799831369	4471.643106	0.005140226
-1.799831369	4471.643106	0.005140226
-1.798204695	4454.296909	0.005140226
-1.798204695	4454.296909	0.005140226
-1.796452848	4421.480457	0.005139704
-1.796452848	4421.480457	0.005139704
-1.796452848	4421.480457	0.005139704
-1.794826174	4412.104054	0.005141269
-1.794826174	4412.104054	0.005141269

-1.794826174	4412.104054	0.005141269
-1.793324489	4450.077693	0.005142833
-1.793324489	4450.077693	0.005142833
-1.791447472	4354.909266	0.005140747
-1.791447472	4354.909266	0.005140747
-1.791447472	4354.909266	0.005140747
-1.789695626	4324.9054	0.00514179
-1.789695626	4324.9054	0.00514179
-1.789695626	4324.9054	0.00514179
-1.787943779	4305.215276	0.005140747
-1.787943779	4305.215276	0.005140747
-1.787943779	4305.215276	0.005140747
-1.786191935	4274.273776	0.00514179
-1.786191935	4274.273776	0.00514179
-1.784565081	4238.644423	0.005141269
-1.784565081	4238.644423	0.005141269
-1.784565081	4238.644423	0.005141269
-1.782938403	4192.70099	0.005142311
-1.782938403	4192.70099	0.005142311
-1.782938403	4192.70099	0.005142311
-1.781186556	4135.506202	0.005141269
-1.781186556	4135.506202	0.005141269
-1.781186556	4135.506202	0.005141269
-1.779434712	4041.275094	0.005141269
-1.779434712	4041.275094	0.005141269
-1.777933027	0.266039	0.005144918
-1.777933027	0.266039	0.005144918
-1.777933027	0.266039	0.005144918
-1.776181181	1.086457055	0.005143876
-1.776181181	1.086457055	0.005143876
-1.776181181	1.086457055	0.005143876
-1.774429334	0.383254425	0.005143354

Specimen No.	78T	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.15	Final Thick.	
Init. Gage	1	Final Gage	1.39
Init. Area	0.0495	Final Area	0.0177
Pct. Red.	64.24	Pct. Elong.	39
Modulus	38.29	Xhead Rate	0.05
Yield	72.2	Ultimate	91.8
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.303995719	3.07891696	0.000602643
	-2.303995719	2.141283479	0.00060525
	-2.303995719	2.141283479	0.00060525
	-2.303995719	2.141283479	0.00060525
	-2.302494034	3.31332533	0.000606553
	-2.302494034	3.31332533	0.000606553
	-2.302494034	3.31332533	0.000606553

-2.30086736	1.906875109	0.00060916
-2.30086736	1.906875109	0.00060916
-2.299115513	2.024090535	0.000613331
-2.299115513	2.024090535	0.000613331
-2.299115513	2.024090535	0.000613331
-2.297363669	1.320865425	0.000614374
-2.297363669	1.320865425	0.000614374
-2.297363669	1.320865425	0.000614374
-2.295736811	2.375691849	0.000617242
-2.295736811	2.375691849	0.000617242
-2.295736811	2.375691849	0.000617242
-2.293984968	2.844486109	0.000618545
-2.293984968	2.844486109	0.000618545
-2.29235829	2.141283479	0.000622195
-2.29235829	2.141283479	0.000622195
-2.29235829	2.141283479	0.000622195
-2.290606446	2.375691849	0.000623238
-2.290606446	2.375691849	0.000623238
-2.290606446	2.375691849	0.000623238
-2.288979592	2.727293164	0.00062428
-2.288979592	2.727293164	0.00062428
-2.287227745	5.188569809	0.000630016
-2.287227745	5.188569809	0.000630016
-2.287227745	5.188569809	0.000630016
-2.285475898	7.649801492	0.000630276
-2.285475898	7.649801492	0.000630276
-2.285475898	7.649801492	0.000630276
-2.283724051	24.87858064	0.000634969
-2.283724051	24.87858064	0.000634969
-2.283724051	24.87858064	0.000634969
-2.281972208	108.092383	0.000653217
-2.281972208	108.092383	0.000653217
-2.280470523	290.6939629	0.000700925
-2.280470523	290.6939629	0.000700925
-2.280470523	290.6939629	0.000700925
-2.278718676	547.6019845	0.000773137
-2.278718676	547.6019845	0.000773137
-2.278718676	547.6019845	0.000773137
-2.277092001	850.5705202	0.000854213
-2.277092001	850.5705202	0.000854213
-2.277092001	850.5705202	0.000854213
-2.275214985	1197.841676	0.000948584
-2.275214985	1197.841676	0.000948584
-2.273588131	1549.800886	0.001046084
-2.273588131	1549.800886	0.001046084
-2.273588131	1549.800886	0.001046084
-2.271961453	1926.138433	0.001152708
-2.271961453	1926.138433	0.001152708
-2.271961453	1926.138433	0.001152708
-2.270084437	2328.573182	0.001264546
-2.270084437	2328.573182	0.001264546

-2.268457763	2744.876714	0.001391244
-2.268457763	2744.876714	0.001391244
-2.268457763	2744.876714	0.001391244
-2.266705916	3118.049781	0.001542708
-2.266705916	3118.049781	0.001542708
-2.266705916	3118.049781	0.001542708
-2.265079061	3375.895122	0.001822172
-2.265079061	3375.895122	0.001822172
-2.265079061	3375.895122	0.001822172
-2.263202045	3533.88416	0.002330788
-2.263202045	3533.88416	0.002330788
-2.261575371	3622.958419	0.002961669
-2.261575371	3622.958419	0.002961669
-2.261575371	3622.958419	0.002961669
-2.259948693	3671.245779	0.003704127
-2.259948693	3671.245779	0.003704127
-2.259948693	3671.245779	0.003704127
-2.257946507	3674.058702	0.004511498
-2.257946507	3674.058702	0.004511498
-2.256444822	3735.238207	0.005396749
-2.256444822	3735.238207	0.005396749
-2.256444822	3735.238207	0.005396749
-2.254818148	3766.882842	0.006270598
-2.254818148	3766.882842	0.006270598
-2.254818148	3766.882842	0.006270598
-2.252941132	3787.74512	0.007145489
-2.252941132	3787.74512	0.007145489
-2.252941132	3787.74512	0.007145489
-2.251314454	3816.108173	0.008013602
-2.251314454	3816.108173	0.008013602
-2.2496876	3844.470911	0.008877023
-2.2496876	3844.470911	0.008877023
-2.2496876	3844.470911	0.008877023
-2.247935756	3840.720692	0.009744094
-2.247935756	3840.720692	0.009744094
-2.247935756	3840.720692	0.009744094
-2.246309079	3869.083745	0.010633359
-2.246309079	3869.083745	0.010633359
-2.246309079	3869.083745	0.010633359
-2.244557232	3884.788814	0.011480096
-2.244557232	3884.788814	0.011480096
-2.242930377	3910.104468	0.012312233
-2.242930377	3910.104468	0.012312233
-2.242930377	3910.104468	0.012312233
-2.240928192	3909.401311	0.013126643
-2.240928192	3909.401311	0.013126643
-2.240928192	3909.401311	0.013126643
-2.239426687	3934.248305	0.013901427
-2.239426687	3934.248305	0.013901427
-2.237424501	3956.282378	0.014684555
-2.237424501	3956.282378	0.014684555

-2.237424501	3956.282378	0.014684555
-2.235922996	3947.140474	0.015485409
-2.235922996	3947.140474	0.015485409
-2.235922996	3947.140474	0.015485409
-2.234296142	3969.877681	0.016289391
-2.234296142	3969.877681	0.016289391
-2.234296142	3969.877681	0.016289391
-2.232669464	3986.286244	0.01704749
-2.232669464	3986.286244	0.01704749
-2.230917617	3998.70973	0.017810805
-2.230917617	3998.70973	0.017810805
-2.230917617	3998.70973	0.017810805
-2.229165594	4012.539532	0.018576205
-2.229165594	4012.539532	0.018576205
-2.229165594	4012.539532	0.018576205
-2.227413747	4017.227722	0.01932179
-2.227413747	4017.227722	0.01932179
-2.225787072	4050.981808	0.02000481
-2.225787072	4050.981808	0.02000481
-2.225787072	4050.981808	0.02000481
-2.223910056	4031.995157	0.020785998
-2.223910056	4031.995157	0.020785998
-2.223910056	4031.995157	0.020785998
-2.222283379	4059.420577	0.021524285
-2.222283379	4059.420577	0.021524285
-2.222283379	4059.420577	0.021524285
-2.220531355	4067.390371	0.022241716
-2.220531355	4067.390371	0.022241716
-2.21890468	4076.297799	0.02296332
-2.21890468	4076.297799	0.02296332
-2.21890468	4076.297799	0.02296332
-2.217152833	4090.362077	0.023664066
-2.217152833	4090.362077	0.023664066
-2.217152833	4090.362077	0.023664066
-2.215400987	4098.800508	0.024373156
-2.215400987	4098.800508	0.024373156
-2.215400987	4098.800508	0.024373156
-2.213774132	4109.114567	0.02506139
-2.213774132	4109.114567	0.02506139
-2.211897296	4109.114567	0.025793421
-2.211897296	4109.114567	0.025793421
-2.211897296	4109.114567	0.025793421
-2.210395611	4102.551087	0.026467055
-2.210395611	4102.551087	0.026467055
-2.210395611	4102.551087	0.026467055
-2.208643764	4130.211005	0.027159461
-2.208643764	4130.211005	0.027159461
-2.20689192	4137.243144	0.027847695
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-2.20689192	4137.243144	0.027847695
-2.205139893	4156.698791	0.028542185

-2.205139893	4156.698791	0.028542185
-2.205139893	4156.698791	0.028542185
-2.203638388	4163.965091	0.029232505
-2.203638388	4163.965091	0.029232505
-2.203638388	4163.965091	0.029232505
-2.201886542	4154.354505	0.029879028
-2.201886542	4154.354505	0.029879028
-2.200009525	4179.670497	0.030627742
-2.200009525	4179.670497	0.030627742
-2.200009525	4179.670497	0.030627742
-2.198382671	4183.420716	0.031305549
-2.198382671	4183.420716	0.031305549
-2.198382671	4183.420716	0.031305549
-2.196630827	4197.485016	0.031991696
-2.196630827	4197.485016	0.031991696
-2.196630827	4197.485016	0.031991696
-2.19500415	4200.063778	0.032694531
-2.19500415	4200.063778	0.032694531
-2.193252306	4221.863351	0.033357736
-2.193252306	4221.863351	0.033357736
-2.193252306	4221.863351	0.033357736
-2.19137529	4220.69122	0.034041798
-2.19137529	4220.69122	0.034041798
-2.19137529	4220.69122	0.034041798
-2.189873605	4209.205367	0.034709176
-2.189873605	4209.205367	0.034709176
-2.189873605	4209.205367	0.034709176
-2.188121758	4233.817864	0.035428694
-2.188121758	4233.817864	0.035428694
-2.186369911	4241.318999	0.036114845
-2.186369911	4241.318999	0.036114845
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-2.184743236	4253.273489	0.036786392
-2.184743236	4253.273489	0.036786392
-2.184743236	4253.273489	0.036786392
-2.183116382	4258.196199	0.037474626
-2.183116382	4258.196199	0.037474626
-2.181364535	4266.634631	0.038146177
-2.181364535	4266.634631	0.038146177
-2.181364535	4266.634631	0.038146177
-2.179737861	4271.791502	0.038823983
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-2.179737861	4271.791502	0.038823983
-2.177860845	4257.024067	0.039309916
-2.177860845	4257.024067	0.039309916
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-2.176108998	4278.823641	0.040181679
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-2.174607313	4291.950285	0.040840715
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-2.174607313	4291.950285	0.040840715

-2.172855469	4291.950285	0.041514352
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-2.172855469	4291.950285	0.041514352
-2.171103622	4301.326687	0.042194241
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-2.169351775	4313.984357	0.042859536
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-2.167724921	4313.984357	0.04354777
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-2.165847904	4303.436138	0.044244346
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-2.162594553	4099.269505	0.005210613
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-2.16184371	4182.483082	0.005212178
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-2.160342028	4361.334398	0.00521322
-2.160342028	4361.334398	0.00521322
-2.158465012	4362.272054	0.005214263
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-2.156838334	4355.239893	0.00521322
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-2.155086488	4363.443849	0.005213742
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-2.155086488	4363.443849	0.005213742
-2.153459633	4372.351277	0.005211656
-2.153459633	4372.351277	0.005211656
-2.151582617	4373.992068	0.005214263
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-2.150081112	4360.396765	0.005214263
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-2.150081112	4360.396765	0.005214263
-2.148204096	4388.525342	0.005214263
-2.148204096	4388.525342	0.005214263
-2.146577421	4388.056345	0.005216349
-2.146577421	4388.056345	0.005216349
-2.146577421	4388.056345	0.005216349
-2.144825394	4384.774763	0.005214263
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-2.144825394	4384.774763	0.005214263
-2.14319872	4397.432748	0.005214785
-2.14319872	4397.432748	0.005214785
-2.14319872	4397.432748	0.005214785
-2.141446873	4400.011195	0.005213742

-2.141446873	4400.011195	0.005213742
-2.139820199	4403.058594	0.005215306
-2.139820199	4403.058594	0.005215306
-2.139820199	4403.058594	0.005215306
-2.138068175	4387.822184	0.005215827
-2.138068175	4387.822184	0.005215827
-2.138068175	4387.822184	0.005215827
-2.136316328	4411.262549	0.005216349
-2.136316328	4411.262549	0.005216349
-2.136316328	4411.262549	0.005216349
-2.134564481	4413.840974	0.005214785
-2.134564481	4413.840974	0.005214785
-2.132812634	4411.731546	0.005215827
-2.132812634	4411.731546	0.005215827
-2.132812634	4411.731546	0.005215827
-2.13118596	4426.967618	0.005216349
-2.13118596	4426.967618	0.005216349
-2.13118596	4426.967618	0.005216349
-2.129559106	4446.657764	0.005214785
-2.129559106	4446.657764	0.005214785
-2.127807259	4421.810769	0.005215827
-2.127807259	4421.810769	0.005215827
-2.127807259	4421.810769	0.005215827
-2.125805073	4430.718197	0.005216349
-2.125805073	4430.718197	0.005216349
-2.125805073	4430.718197	0.005216349
-2.124303568	4433.999757	0.005214785
-2.124303568	4433.999757	0.005214785
-2.124303568	4433.999757	0.005214785
-2.122676714	4445.720108	0.005217392
-2.122676714	4445.720108	0.005217392
-2.120924867	4445.251471	0.005215306
-2.120924867	4445.251471	0.005215306
-2.120924867	4445.251471	0.005215306
-2.119298192	4449.939323	0.005217913
-2.119298192	4449.939323	0.005217913
-2.119298192	4449.939323	0.005217913
-2.117546345	4453.221243	0.005217392
-2.117546345	4453.221243	0.005217392
-2.117546345	4453.221243	0.005217392
-2.115794499	4440.094599	0.005217392
-2.115794499	4440.094599	0.005217392
-2.113792313	4404.933546	0.00521687
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-1.883546075	3461.825808	0.005226777
-1.883546075	3461.825808	0.005226777
-1.883546075	3461.825808	0.005226777
-1.88204439	3399.474171	0.005228862
-1.88204439	3399.474171	0.005228862
-1.88204439	3399.474171	0.005228862
-1.880542705	1.43808085	0.005241375
-1.880542705	1.43808085	0.005241375
-1.878790859	1.43808085	0.005242418

Specimen No.	143T	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.16	Final Thick.	
Init. Gage	1	Final Gage	1.24
Init. Area	0.0495	Final Area	0.0201
Pct. Red.	59.39	Pct. Elong.	24
Modulus	33.27	Xhead Rate	0.05
Yield	74.8	Ultimate	100.7
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.240427691	37.88807657	0.001802099
	-2.240427691	38.47406378	0.001803402
	-2.240427691	38.47406378	0.001803402
	-2.240427691	38.47406378	0.001803402
	-2.239426687	101.9978778	0.00182895
	-2.239426687	101.9978778	0.00182895
	-2.23767484	254.3611826	0.001875354
	-2.23767484	254.3611826	0.001875354
	-2.23767484	254.3611826	0.001875354
	-2.235922996	462.0441434	0.001941049
	-2.235922996	462.0441434	0.001941049
	-2.235922996	462.0441434	0.001941049
	-2.233920807	725.1638407	0.002022125
	-2.233920807	725.1638407	0.002022125
	-2.233920807	725.1638407	0.002022125
	-2.232419125	1022.975505	0.002111804
	-2.232419125	1022.975505	0.002111804
	-2.230792448	1375.051976	0.002220514
	-2.230792448	1375.051976	0.002220514
	-2.230792448	1375.051976	0.002220514
	-2.228915432	1729.003624	0.002335219
	-2.228915432	1729.003624	0.002335219
	-2.228915432	1729.003624	0.002335219
	-2.227413747	2112.724887	0.002460613
	-2.227413747	2112.724887	0.002460613
	-2.227413747	2112.724887	0.002460613
	-2.225661903	2489.375143	0.002586008
	-2.225661903	2489.375143	0.002586008

-2.223910056	2884.113443	0.002730693
-2.223910056	2884.113443	0.002730693
-2.223910056	2884.113443	0.002730693
-2.222158209	3256.583195	0.002952805
-2.222158209	3256.583195	0.002952805
-2.222158209	3256.583195	0.002952805
-2.220406365	3511.381451	0.003312564
-2.220406365	3511.381451	0.003312564
-2.218779508	3678.981075	0.003812576
-2.218779508	3678.981075	0.003812576
-2.218779508	3678.981075	0.003812576
-2.217027664	3778.603194	0.004365249
-2.217027664	3778.603194	0.004365249
-2.217027664	3778.603194	0.004365249
-2.215400987	3858.769687	0.00492861
-2.215400987	3858.769687	0.00492861
-2.215400987	3858.769687	0.00492861
-2.213649143	3915.730314	0.00549842
-2.213649143	3915.730314	0.00549842
-2.211897296	3937.529888	0.006077684
-2.211897296	3937.529888	0.006077684
-2.211897296	3937.529888	0.006077684
-2.20989511	3946.202818	0.006634527
-2.20989511	3946.202818	0.006634527
-2.20989511	3946.202818	0.006634527
-2.208393425	4015.586931	0.00724351
-2.208393425	4015.586931	0.00724351
-2.206766748	4046.293933	0.007799833
-2.206766748	4046.293933	0.007799833
-2.206766748	4046.293933	0.007799833
-2.205265066	4070.906452	0.008367626
-2.205265066	4070.906452	0.008367626
-2.205265066	4070.906452	0.008367626
-2.20338805	4096.925241	0.008922384
-2.20338805	4096.925241	0.008922384
-2.20338805	4096.925241	0.008922384
-2.201761372	4121.772236	0.009440645
-2.201761372	4121.772236	0.009440645
-2.199884356	4120.365944	0.010000617
-2.199884356	4120.365944	0.010000617
-2.199884356	4120.365944	0.010000617
-2.198257682	4154.354505	0.010544723
-2.198257682	4154.354505	0.010544723
-2.198257682	4154.354505	0.010544723
-2.196505835	4169.122278	0.011061941
-2.196505835	4169.122278	0.011061941
-2.196505835	4169.122278	0.011061941
-2.19487898	4182.248921	0.011585416
-2.19487898	4182.248921	0.011585416
-2.193127133	4206.861418	0.012094292
-2.193127133	4206.861418	0.012094292

-2.193127133	4206.861418	0.012094292
-2.19137529	4216.70648	0.012601082
-2.19137529	4216.70648	0.012601082
-2.19137529	4216.70648	0.012601082
-2.189623443	4235.927629	0.013097446
-2.189623443	4235.927629	0.013097446
-2.187871596	4239.443709	0.013621964
-2.187871596	4239.443709	0.013621964
-2.187871596	4239.443709	0.013621964
-2.186369911	4263.821708	0.014129797
-2.186369911	4263.821708	0.014129797
-2.186369911	4263.821708	0.014129797
-2.184618067	4278.823641	0.014619902
-2.184618067	4278.823641	0.014619902
-2.184618067	4278.823641	0.014619902
-2.18286622	4288.434205	0.015120436
-2.18286622	4288.434205	0.015120436
-2.181239366	4310.702775	0.015618885
-2.181239366	4310.702775	0.015618885
-2.181239366	4310.702775	0.015618885
-2.17936235	4319.141544	0.016104819
-2.17936235	4319.141544	0.016104819
-2.17936235	4319.141544	0.016104819
-2.177610503	4378.211621	0.016569898
-2.177610503	4378.211621	0.016569898
-2.176108998	4325.704708	0.017087117
-2.176108998	4325.704708	0.017087117
-2.176108998	4325.704708	0.017087117
-2.174356974	4354.067761	0.017562623
-2.174356974	4354.067761	0.017562623
-2.174356974	4354.067761	0.017562623
-2.172605127	4369.304193	0.018041259
-2.172605127	4369.304193	0.018041259
-2.172605127	4369.304193	0.018041259
-2.170978453	4375.398698	0.01852928
-2.170978453	4375.398698	0.01852928
-2.169351775	4396.260616	0.019008957
-2.169351775	4396.260616	0.019008957
-2.169351775	4396.260616	0.019008957
-2.167599751	4408.215465	0.019503234
-2.167599751	4408.215465	0.019503234
-2.167599751	4408.215465	0.019503234
-2.165847904	4396.963774	0.019963099
-2.165847904	4396.963774	0.019963099
-2.165847904	4396.963774	0.019963099
-2.164096058	4425.092328	0.020479421
-2.164096058	4425.092328	0.020479421
-2.162344214	4440.094599	0.020963269
-2.162344214	4440.094599	0.020963269
-2.162344214	4440.094599	0.020963269
-2.160842529	4453.924401	0.021436691

-2.160842529	4453.924401	0.021436691
-2.160842529	4453.924401	0.021436691
-2.159090682	4458.846752	0.021928883
-2.159090682	4458.846752	0.021928883
-2.157338838	4474.786318	0.022408561
-2.157338838	4474.786318	0.022408561
-2.157338838	4474.786318	0.022408561
-2.155586991	4484.162743	0.022896582
-2.155586991	4484.162743	0.022896582
-2.155586991	4484.162743	0.022896582
-2.153835144	4470.098443	0.023351233
-2.153835144	4470.098443	0.023351233
-2.153835144	4470.098443	0.023351233
-2.15220829	4505.962317	0.023874708
-2.15220829	4505.962317	0.023874708
-2.150581616	4513.367301	0.024358557
-2.150581616	4513.367301	0.024358557
-2.150581616	4513.367301	0.024358557
-2.148704599	4530.713161	0.024840321
-2.148704599	4530.713161	0.024840321
-2.148704599	4530.713161	0.024840321
-2.147077922	4540.089249	0.025332513
-2.147077922	4540.089249	0.025332513
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-2.145326075	4556.966449	0.025774652
-2.145326075	4556.966449	0.025774652
-2.143699221	4556.497789	0.026273099
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-2.141822204	4545.246098	0.026752776
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-2.141822204	4545.246098	0.026752776
-2.140320699	4577.594228	0.027259567
-2.140320699	4577.594228	0.027259567
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-2.138568856	4585.564023	0.027743417
-2.138568856	4585.564023	0.027743417
-2.136816829	4591.189531	0.028218925
-2.136816829	4591.189531	0.028218925
-2.136816829	4591.189531	0.028218925
-2.135064985	4605.722805	0.02870903
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-2.133438307	4615.09887	0.029188707
-2.133438307	4615.09887	0.029188707
-2.131686461	4625.412591	0.029682985
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-2.129809444	4593.064798	0.030137637
-2.129809444	4593.064798	0.030137637
-2.129809444	4593.064798	0.030137637

-2.128307762	4636.195309	0.03065694
-2.128307762	4636.195309	0.03065694
-2.128307762	4636.195309	0.03065694
-2.126555915	4651.197242	0.031147045
-2.126555915	4651.197242	0.031147045
-2.124804069	4648.853293	0.031639236
-2.124804069	4648.853293	0.031639236
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-2.123177394	4670.418706	0.032127258
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-2.121300378	4681.201086	0.032602766
-2.121300378	4681.201086	0.032602766
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-2.119798693	4675.575578	0.033094957
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-2.118046846	4677.919504	0.033597577
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-2.116295002	4699.953576	0.034108537
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-2.113792313	4697.140653	0.034586129
-2.113792313	4697.140653	0.034586129
-2.112791132	4706.048081	0.035049123
-2.112791132	4706.048081	0.035049123
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-2.111289624	4724.331575	0.035539231
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-2.109412607	4737.458556	0.036029336
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-2.107785933	4722.456645	0.036519441
-2.107785933	4722.456645	0.036519441
-2.106033909	4729.95742	0.037028319
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-2.106033909	4729.95742	0.037028319
-2.104407232	4749.647566	0.037522593
-2.104407232	4749.647566	0.037522593
-2.104407232	4749.647566	0.037522593
-2.102530215	4761.836577	0.038021043
-2.102530215	4761.836577	0.038021043
-2.102530215	4761.836577	0.038021043
-2.100903541	4764.180503	0.038521576
-2.100903541	4764.180503	0.038521576
-2.099276687	4771.212642	0.039013767
-2.099276687	4771.212642	0.039013767
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-2.09752484	4792.778054	0.039476761
-2.09752484	4792.778054	0.039476761

-2.09752484	4792.778054	0.039476761
-2.095898165	4770.275008	0.040004408
-2.095898165	4770.275008	0.040004408
-2.094271311	4794.184347	0.040527883
-2.094271311	4794.184347	0.040527883
-2.094271311	4794.184347	0.040527883
-2.092394295	4798.87256	0.041032589
-2.092394295	4798.87256	0.041032589
-2.092394295	4798.87256	0.041032589
-2.090767617	4804.029431	0.041533121
-2.090767617	4804.029431	0.041533121
-2.090767617	4804.029431	0.041533121
-2.087514088	4550.871944	0.005224691
-2.087514088	4550.871944	0.005224691
-2.087514088	4550.871944	0.005224691
-2.086513084	4822.781921	0.005225734
-2.086513084	4822.781921	0.005225734
-2.086513084	4822.781921	0.005225734
-2.084636068	4852.785765	0.005227298
-2.084636068	4852.785765	0.005227298
-2.082759052	4842.472044	0.005226255
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-2.082759052	4842.472044	0.005226255
-2.081007205	4858.88027	0.005223648
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-2.081007205	4858.88027	0.005223648
-2.07938053	4852.785765	0.005225213
-2.07938053	4852.785765	0.005225213
-2.07938053	4852.785765	0.005225213
-2.077628503	4860.286563	0.005223648
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-2.076126998	4858.411274	0.005224691
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-2.076126998	4858.411274	0.005224691
-2.074124813	4867.787699	0.005224691
-2.074124813	4867.787699	0.005224691
-2.074124813	4867.787699	0.005224691
-2.072498138	4870.600622	0.005223127
-2.072498138	4870.600622	0.005223127
-2.072498138	4870.600622	0.005223127
-2.070871281	4872.944548	0.005222606
-2.070871281	4872.944548	0.005222606
-2.069119437	4888.884115	0.00522417
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-2.069119437	4888.884115	0.00522417
-2.06749276	4890.290408	0.005224691
-2.06749276	4890.290408	0.005224691
-2.06749276	4890.290408	0.005224691
-2.065740916	4865.912409	0.005222084
-2.065740916	4865.912409	0.005222084
-2.063989069	4895.447279	0.005223648

-2.063989069	4895.447279	0.005223648
-2.063989069	4895.447279	0.005223648
-2.062237045	4893.10333	0.005222606
-2.062237045	4893.10333	0.005222606
-2.062237045	4893.10333	0.005222606
-2.060610368	4908.57426	0.005221563
-2.060610368	4908.57426	0.005221563
-2.060610368	4908.57426	0.005221563
-2.058858521	4907.16763	0.005221041
-2.058858521	4907.16763	0.005221041
-2.057231846	4913.262136	0.005221041
-2.057231846	4913.262136	0.005221041
-2.057231846	4913.262136	0.005221041
-2.055479823	4916.544033	0.005222606
-2.055479823	4916.544033	0.005222606
-2.055479823	4916.544033	0.005222606
-2.053727976	4894.040986	0.005221563
-2.053727976	4894.040986	0.005221563
-2.053727976	4894.040986	0.005221563
-2.052101301	4924.513827	0.005221563
-2.052101301	4924.513827	0.005221563
-2.049723781	4854.661055	0.005222606
-2.049723781	4854.661055	0.005222606
-2.049723781	4854.661055	0.005222606
-2.048597608	4923.576171	0.005221041
-2.048597608	4923.576171	0.005221041
-2.048597608	4923.576171	0.005221041
-2.046970753	4931.545966	0.00522052
-2.046970753	4931.545966	0.00522052
-2.045218906	4931.545966	0.005221563
-2.045218906	4931.545966	0.005221563
-2.045218906	4931.545966	0.005221563
-2.043467063	4939.515761	0.005219477
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-2.043467063	4939.515761	0.005219477
-2.041715216	4909.04292	0.005218434
-2.041715216	4909.04292	0.005218434
-2.041715216	4909.04292	0.005218434
-2.040088361	4948.891826	0.00522052
-2.040088361	4948.891826	0.00522052
-2.038336514	4948.422852	0.005219477
-2.038336514	4948.422852	0.005219477
-2.038336514	4948.422852	0.005219477
-2.03670984	4945.610243	0.00522052
-2.03670984	4945.610243	0.00522052
-2.03670984	4945.610243	0.00522052
-2.035083163	4952.642405	0.005217392
-2.035083163	4952.642405	0.005217392
-2.033206146	4963.4251	0.005219477
-2.033206146	4963.4251	0.005219477
-2.033206146	4963.4251	0.005219477

-2.031579292	4960.14318	0.005217392
-2.031579292	4960.14318	0.005217392
-2.031579292	4960.14318	0.005217392
-2.029702276	4944.67261	0.005218434
-2.029702276	4944.67261	0.005218434
-2.029702276	4944.67261	0.005218434
-2.028200771	4960.14318	0.005217913
-2.028200771	4960.14318	0.005217913
-2.026448924	4960.612177	0.005218956
-2.026448924	4960.612177	0.005218956
-2.026448924	4960.612177	0.005218956
-2.024822069	4957.799254	0.005217913
-2.024822069	4957.799254	0.005217913
-2.024822069	4957.799254	0.005217913
-2.023070226	4970.925898	0.005218434
-2.023070226	4970.925898	0.005218434
-2.023070226	4970.925898	0.005218434
-2.021443548	4974.676454	0.005219477
-2.021443548	4974.676454	0.005219477
-2.019566532	4965.300052	0.005218434
-2.019566532	4965.300052	0.005218434
-2.019566532	4965.300052	0.005218434
-2.018190019	4922.169564	0.005218434
-2.018190019	4922.169564	0.005218434
-2.018190019	4922.169564	0.005218434
-2.016313003	4965.769048	0.005218434
-2.016313003	4965.769048	0.005218434
-2.014435987	4975.61411	0.005219477
-2.014435987	4975.61411	0.005219477
-2.014435987	4975.61411	0.005219477
-2.01268414	4971.863531	0.005218434
-2.01268414	4971.863531	0.005218434
-2.01268414	4971.863531	0.005218434
-2.010932293	4982.177252	0.005218434
-2.010932293	4982.177252	0.005218434
-2.010932293	4982.177252	0.005218434
-2.009180449	4983.114908	0.005216349
-2.009180449	4983.114908	0.005216349
-2.007678764	4965.769048	0.005218434
-2.007678764	4965.769048	0.005218434
-2.007678764	4965.769048	0.005218434
-2.005926917	4972.801187	0.005217392
-2.005926917	4972.801187	0.005217392
-2.005926917	4972.801187	0.005217392
-2.004175071	4975.61411	0.005218434
-2.004175071	4975.61411	0.005218434
-2.002548216	4977.958036	0.005218956
-2.002548216	4977.958036	0.005218956
-2.002548216	4977.958036	0.005218956
-2.000921542	4980.301985	0.00521687
-2.000921542	4980.301985	0.00521687

-2.000921542	4980.301985	0.00521687
-1.999169695	4973.269824	0.005217913
-1.999169695	4973.269824	0.005217913
-1.999169695	4973.269824	0.005217913
-1.997417848	4981.239619	0.00521687
-1.997417848	4981.239619	0.00521687
-1.995666004	4957.799254	0.005214263
-1.995666004	4957.799254	0.005214263
-1.995666004	4957.799254	0.005214263
-1.994164319	4972.801187	0.00521687
-1.994164319	4972.801187	0.00521687
-1.994164319	4972.801187	0.00521687
-1.992412472	4972.801187	0.005214263
-1.992412472	4972.801187	0.005214263
-1.992412472	4972.801187	0.005214263
-1.990660629	4971.394557	0.005216349
-1.990660629	4971.394557	0.005216349
-1.988908602	4969.050608	0.00521687
-1.988908602	4969.050608	0.00521687
-1.988908602	4969.050608	0.00521687
-1.987156758	4960.612177	0.005217913
-1.987156758	4960.612177	0.005217913
-1.987156758	4960.612177	0.005217913
-1.98565525	4972.801187	0.005215306
-1.98565525	4972.801187	0.005215306
-1.983653064	4948.422852	0.005215827
-1.983653064	4948.422852	0.005215827
-1.983653064	4948.422852	0.005215827
-1.98202639	4959.674543	0.005216349
-1.98202639	4959.674543	0.005216349
-1.98202639	4959.674543	0.005216349
-1.980149373	4952.642405	0.005214785
-1.980149373	4952.642405	0.005214785
-1.980149373	4952.642405	0.005214785
-1.978647688	4939.046764	0.005214263
-1.978647688	4939.046764	0.005214263
-1.976895842	4943.26598	0.005217392
-1.976895842	4943.26598	0.005217392
-1.976895842	4943.26598	0.005217392
-1.975143998	4932.483599	0.005214263
-1.975143998	4932.483599	0.005214263
-1.975143998	4932.483599	0.005214263
-1.97351714	4927.79541	0.005215827
-1.97351714	4927.79541	0.005215827
-1.97351714	4927.79541	0.005215827
-1.971890466	4914.668766	0.005216349
-1.971890466	4914.668766	0.005216349
-1.970138619	4903.417389	0.005214263
-1.970138619	4903.417389	0.005214263
-1.970138619	4903.417389	0.005214263
-1.968386775	4897.791543	0.005214785

-1.968386775	4897.791543	0.005214785
-1.968386775	4897.791543	0.005214785
-1.966634928	4882.789632	0.005214785
-1.966634928	4882.789632	0.005214785
-1.965008074	4887.477822	0.005214263
-1.965008074	4887.477822	0.005214263
-1.965008074	4887.477822	0.005214263
-1.963381397	4875.288497	0.005214263
-1.963381397	4875.288497	0.005214263
-1.963381397	4875.288497	0.005214263
-1.961629553	4845.28463	0.005213742
-1.961629553	4845.28463	0.005213742
-1.961629553	4845.28463	0.005213742
-1.959627364	4849.035209	0.005214263
-1.959627364	4849.035209	0.005214263
-1.958125682	4835.439568	0.005212699
-1.958125682	4835.439568	0.005212699
-1.958125682	4835.439568	0.005212699
-1.956499005	4826.532477	0.00521322
-1.956499005	4826.532477	0.00521322
-1.956499005	4826.532477	0.00521322
-1.954621988	4811.06157	0.005213742
-1.954621988	4811.06157	0.005213742
-1.952995314	4807.779988	0.005215306
-1.952995314	4807.779988	0.005215306
-1.952995314	4807.779988	0.005215306
-1.95136846	4786.683549	0.005212699
-1.95136846	4786.683549	0.005212699
-1.95136846	4786.683549	0.005212699
-1.949616613	4755.742071	0.00521322
-1.949616613	4755.742071	0.00521322
-1.949616613	4755.742071	0.00521322
-1.947864766	4751.053859	0.005213742
-1.947864766	4751.053859	0.005213742
-1.946112922	4737.458556	0.005214785
-1.946112922	4737.458556	0.005214785
-1.946112922	4737.458556	0.005214785
-1.944486245	4729.019787	0.005212178
-1.944486245	4729.019787	0.005212178
-1.944486245	4729.019787	0.005212178
-1.94285939	4706.517056	0.005213742
-1.94285939	4706.517056	0.005213742
-1.94285939	4706.517056	0.005213742
-1.941107543	4688.233225	0.005212699
-1.941107543	4688.233225	0.005212699
-1.939230527	4669.012076	0.005214785
-1.939230527	4669.012076	0.005214785
-1.939230527	4669.012076	0.005214785
-1.937603853	4618.849449	0.005212178
-1.937603853	4618.849449	0.005212178
-1.937603853	4618.849449	0.005212178

-1.935852006	4637.132942	0.005213742
-1.935852006	4637.132942	0.005213742
-1.934350321	4612.754944	0.005213742
-1.934350321	4612.754944	0.005213742
-1.934350321	4612.754944	0.005213742
-1.932473308	4594.002454	0.00521322
-1.932473308	4594.002454	0.00521322
-1.932473308	4594.002454	0.00521322
-1.93084663	4575.249964	0.005214785
-1.93084663	4575.249964	0.005214785
-1.93084663	4575.249964	0.005214785
-1.929219776	4557.435445	0.00521322
-1.929219776	4557.435445	0.00521322
-1.927342759	4534.932377	0.005212178
-1.927342759	4534.932377	0.005212178
-1.927342759	4534.932377	0.005212178
-1.925590913	4493.677178	0.005212178
-1.925590913	4493.677178	0.005212178
-1.925590913	4493.677178	0.005212178
-1.923964238	4492.739522	0.00521322
-1.923964238	4492.739522	0.00521322
-1.922337561	4436.48239	0.005213742
-1.922337561	4436.48239	0.005213742
-1.922337561	4436.48239	0.005213742
-1.920585537	4429.450251	0.00521322
-1.920585537	4429.450251	0.00521322
-1.920585537	4429.450251	0.00521322
-1.91883369	4421.480457	0.005210613
-1.91883369	4421.480457	0.005210613
-1.91883369	4421.480457	0.005210613
-1.917081846	4398.039755	0.005212178
-1.917081846	4398.039755	0.005212178
-1.915580341	4372.724123	0.005212178
-1.915580341	4372.724123	0.005212178
-1.915580341	4372.724123	0.005212178
-1.913578153	4322.092477	0.005211135
-1.913578153	4322.092477	0.005211135
-1.913578153	4322.092477	0.005211135
-1.912076471	4320.21721	0.005211135
-1.912076471	4320.21721	0.005211135
-1.912076471	4320.21721	0.005211135
-1.910324624	4295.370215	0.005212178
-1.910324624	4295.370215	0.005212178
-1.908572777	4261.147132	0.005211135
-1.908572777	4261.147132	0.005211135
-1.908572777	4261.147132	0.005211135
-1.906946102	4241.925983	0.005212699
-1.906946102	4241.925983	0.005212699
-1.906946102	4241.925983	0.005212699
-1.905319248	4220.360908	0.005212699
-1.905319248	4220.360908	0.005212699

-1.903567401	4173.010867	0.005212178
-1.903567401	4173.010867	0.005212178
-1.903567401	4173.010867	0.005212178
-1.901815554	4143.007	0.005211135
-1.901815554	4143.007	0.005211135
-1.901815554	4143.007	0.005211135
-1.9001887	4110.659229	0.005210613
-1.9001887	4110.659229	0.005210613
-1.9001887	4110.659229	0.005210613
-1.898311864	4083.468286	0.005210613
-1.898311864	4083.468286	0.005210613
-1.896685009	4049.244888	0.005208528
-1.896685009	4049.244888	0.005208528
-1.896685009	4049.244888	0.005208528
-1.894933162	4020.647652	0.005210613
-1.894933162	4020.647652	0.005210613
-1.894933162	4020.647652	0.005210613
-1.893306488	3986.893251	0.005212178
-1.893306488	3986.893251	0.005212178
-1.893306488	3986.893251	0.005212178
-1.891554641	3932.511386	0.005210092
-1.891554641	3932.511386	0.005210092
-1.889552455	3865.00254	0.005210613
-1.889552455	3865.00254	0.005210613
-1.889552455	3865.00254	0.005210613
-1.888301109	3862.658613	0.005210092
-1.888301109	3862.658613	0.005210092
-1.888301109	3862.658613	0.005210092
-1.886549265	3817.652836	0.005211135
-1.886549265	3817.652836	0.005211135
-1.886549265	3817.652836	0.005211135
-1.884797239	3770.771769	0.005210613
-1.884797239	3770.771769	0.005210613
-1.883045395	3722.953068	0.005210092
-1.883045395	3722.953068	0.005210092
-1.883045395	3722.953068	0.005210092
-1.881293548	3682.635481	0.005211135
-1.881293548	3682.635481	0.005211135
-1.881293548	3682.635481	0.005211135
-1.879541701	3553.243994	0.005209049
-1.879541701	3553.243994	0.005209049
-1.874911837	8.353004122	0.005211656
-1.874911837	8.353004122	0.005211656
-1.874911837	8.353004122	0.005211656
-1.876538511	-2.781224849	0.005208528

Specimen No.	143B	Temperature	
Init. Width		0.251 Init. Thick.	
Final Width		0.11 Final Thick.	
Init. Gage		1 Final Gage	1.17

Init. Area	0.0495	Final Area	0.0095
Pct. Red.	80.81	Pct. Elong.	17
Modulus	33.72	Xhead Rate	0.05
Yield	81.3	Ultimate	98.3
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.233920807	202.0888355	0.001066418
	-2.233920807	202.0888355	0.001066418
	-2.233920807	202.0888355	0.001066418
	-2.233169965	324.6827045	0.001095095
	-2.233169965	324.6827045	0.001095095
	-2.233169965	324.6827045	0.001095095
	-2.231418121	588.8572732	0.001160529
	-2.231418121	588.8572732	0.001160529
	-2.229916436	902.0224493	0.001240302
	-2.229916436	902.0224493	0.001240302
	-2.229916436	902.0224493	0.001240302
	-2.228164589	1268.983683	0.001335195
	-2.228164589	1268.983683	0.001335195
	-2.228164589	1268.983683	0.001335195
	-2.226287573	1658.447693	0.001436866
	-2.226287573	1658.447693	0.001436866
	-2.226287573	1658.447693	0.001436866
	-2.224535729	2066.781454	0.001544532
	-2.224535729	2066.781454	0.001544532
	-2.222783882	2475.076367	0.001658195
	-2.222783882	2475.076367	0.001658195
	-2.222783882	2475.076367	0.001658195
	-2.221032035	2848.952727	0.00177238
	-2.221032035	2848.952727	0.00177238
	-2.221032035	2848.952727	0.00177238
	-2.219405181	3133.989348	0.001887606
	-2.219405181	3133.989348	0.001887606
	-2.217653334	3310.261902	0.001981196
	-2.217653334	3310.261902	0.001981196
	-2.217653334	3310.261902	0.001981196
	-2.21590149	3392.303663	0.002049759
	-2.21590149	3392.303663	0.002049759
	-2.21590149	3392.303663	0.002049759
	-2.214274813	3478.096002	0.00211415
	-2.214274813	3478.096002	0.00211415
	-2.214274813	3478.096002	0.00211415
	-2.212647958	3533.181025	0.002169157
	-2.212647958	3533.181025	0.002169157
	-2.210896112	3583.57815	0.002225206
	-2.210896112	3583.57815	0.002225206
	-2.210896112	3583.57815	0.002225206
	-2.209144268	3624.364712	0.00227917
	-2.209144268	3624.364712	0.00227917
	-2.209144268	3624.364712	0.00227917
	-2.207392421	3665.854431	0.002333916

-2.207392421	3665.854431	0.002333916
-2.207392421	3665.854431	0.002333916
-2.205765567	3709.688077	0.002391269
-2.205765567	3709.688077	0.002391269
-2.20388873	3738.754288	0.002449664
-2.20388873	3738.754288	0.002449664
-2.20388873	3738.754288	0.002449664
-2.202387045	3777.196901	0.00250806
-2.202387045	3777.196901	0.00250806
-2.202387045	3777.196901	0.00250806
-2.200635198	3803.450188	0.002566977
-2.200635198	3803.450188	0.002566977
-2.198883352	3827.828187	0.002625633
-2.198883352	3827.828187	0.002625633
-2.198883352	3827.828187	0.002625633
-2.197131328	3863.457899	0.002691328
-2.197131328	3863.457899	0.002691328
-2.197131328	3863.457899	0.002691328
-2.195504653	3881.272756	0.002753634
-2.195504653	3881.272756	0.002753634
-2.195504653	3881.272756	0.002753634
-2.193877976	3921.590321	0.002820372
-2.193877976	3921.590321	0.002820372
-2.192126132	3929.091456	0.002892584
-2.192126132	3929.091456	0.002892584
-2.192126132	3929.091456	0.002892584
-2.190374105	3954.407111	0.002965057
-2.190374105	3954.407111	0.002965057
-2.190374105	3954.407111	0.002965057
-2.188622261	3975.738025	0.003039877
-2.188622261	3975.738025	0.003039877
-2.186995584	3995.193672	0.003118867
-2.186995584	3995.193672	0.003118867
-2.186995584	3995.193672	0.003118867
-2.185243737	4026.838308	0.003200725
-2.185243737	4026.838308	0.003200725
-2.185243737	4026.838308	0.003200725
-2.183616883	4042.543376	0.00328858
-2.183616883	4042.543376	0.00328858
-2.183616883	4042.543376	0.00328858
-2.181865039	4043.949669	0.003370438
-2.181865039	4043.949669	0.003370438
-2.180113192	4075.828803	0.003470023
-2.180113192	4075.828803	0.003470023
-2.180113192	4075.828803	0.003470023
-2.177860845	4032.463816	0.003539368
-2.177860845	4032.463816	0.003539368
-2.177860845	4032.463816	0.003539368
-2.176609498	4103.723219	0.003674147
-2.176609498	4103.723219	0.003674147
-2.176609498	4103.723219	0.003674147

-2.174857655	4123.178866	0.003773993
-2.174857655	4123.178866	0.003773993
-2.173355969	4146.619231	0.003882442
-2.173355969	4146.619231	0.003882442
-2.173355969	4146.619231	0.003882442
-2.171604123	4156.464293	0.003996105
-2.171604123	4156.464293	0.003996105
-2.171604123	4156.464293	0.003996105
-2.169852279	4139.118433	0.004099862
-2.169852279	4139.118433	0.004099862
-2.168100432	4186.936797	0.004241418
-2.168100432	4186.936797	0.004241418
-2.168100432	4186.936797	0.004241418
-2.166473578	4197.719514	0.004370984
-2.166473578	4197.719514	0.004370984
-2.166473578	4197.719514	0.004370984
-2.1648469	4220.69122	0.004506284
-2.1648469	4220.69122	0.004506284
-2.1648469	4220.69122	0.004506284
-2.163095056	4228.192355	0.00464367
-2.163095056	4228.192355	0.00464367
-2.161343209	4248.819774	0.004784445
-2.161343209	4248.819774	0.004784445
-2.161343209	4248.819774	0.004784445
-2.159591186	4260.30565	0.004940862
-2.159591186	4260.30565	0.004940862
-2.159591186	4260.30565	0.004940862
-2.157839339	4245.069218	0.005087566
-2.157839339	4245.069218	0.005087566
-2.157839339	4245.069218	0.005087566
-2.156337834	4283.511854	0.005260146
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-1.921586721	4750.5852	0.005287779
-1.921586721	4750.5852	0.005287779
-1.921586721	4750.5852	0.005287779
-1.919584533	4755.742071	0.005288301

-1.919584533	4755.742071	0.005288301
-1.917957858	4753.866782	0.005288301
-1.917957858	4753.866782	0.005288301
-1.917957858	4753.866782	0.005288301
-1.916331004	4747.772277	0.005285172
-1.916331004	4747.772277	0.005285172
-1.916331004	4747.772277	0.005285172
-1.914579157	4731.363736	0.005289343
-1.914579157	4731.363736	0.005289343
-1.914579157	4731.363736	0.005289343
-1.913077652	4735.583289	0.005289343
-1.913077652	4735.583289	0.005289343
-1.911200636	4725.738205	0.005287779
-1.911200636	4725.738205	0.005287779
-1.911200636	4725.738205	0.005287779
-1.909448612	4709.329664	0.005287779
-1.909448612	4709.329664	0.005287779
-1.909448612	4709.329664	0.005287779
-1.907821934	4703.235159	0.005287779
-1.907821934	4703.235159	0.005287779
-1.90619526	4687.764566	0.005287779
-1.90619526	4687.764566	0.005287779
-1.90619526	4687.764566	0.005287779
-1.904318244	4685.889299	0.005287258
-1.904318244	4685.889299	0.005287258
-1.904318244	4685.889299	0.005287258
-1.902566397	4669.481073	0.005289343
-1.902566397	4669.481073	0.005289343
-1.902566397	4669.481073	0.005289343
-1.901064712	4669.949732	0.005286736
-1.901064712	4669.949732	0.005286736
-1.899312868	4654.479139	0.005287779
-1.899312868	4654.479139	0.005287779
-1.899312868	4654.479139	0.005287779
-1.897561021	4612.754944	0.005288822
-1.897561021	4612.754944	0.005288822
-1.897561021	4612.754944	0.005288822
-1.895809174	4624.943954	0.005287258
-1.895809174	4624.943954	0.005287258
-1.895809174	4624.943954	0.005287258
-1.89418232	4609.004365	0.005287779
-1.89418232	4609.004365	0.005287779
-1.892430473	4599.6283	0.005288301
-1.892430473	4599.6283	0.005288301
-1.892430473	4599.6283	0.005288301
-1.890803799	4582.751077	0.005290386
-1.890803799	4582.751077	0.005290386
-1.890803799	4582.751077	0.005290386
-1.889051952	4578.062887	0.005287258
-1.889051952	4578.062887	0.005287258
-1.887299928	4552.747233	0.005289343

-1.887299928	4552.747233	0.005289343
-1.887299928	4552.747233	0.005289343
-1.885548081	4510.554378	0.005288822
-1.885548081	4510.554378	0.005288822
-1.885548081	4510.554378	0.005288822
-1.883921407	4512.429668	0.005289343
-1.883921407	4512.429668	0.005289343
-1.883921407	4512.429668	0.005289343
-1.88216956	4500.24032	0.005290386
-1.88216956	4500.24032	0.005290386
-1.880417713	4475.393325	0.005287779
-1.880417713	4475.393325	0.005287779
-1.880417713	4475.393325	0.005287779
-1.878790859	4454.296909	0.005287779
-1.878790859	4454.296909	0.005287779
-1.878790859	4454.296909	0.005287779
-1.877039015	4434.607101	0.005289343
-1.877039015	4434.607101	0.005289343
-1.877039015	4434.607101	0.005289343
-1.875412337	4415.385614	0.005288822
-1.875412337	4415.385614	0.005288822
-1.873535321	4353.971633	0.005287258
-1.873535321	4353.971633	0.005287258
-1.873535321	4353.971633	0.005287258
-1.872033636	4363.348035	0.005289865
-1.872033636	4363.348035	0.005289865
-1.872033636	4363.348035	0.005289865
-1.87015662	4337.563407	0.005291429
-1.87015662	4337.563407	0.005291429
-1.87015662	4337.563407	0.005291429
-1.868529945	4308.028199	0.005287779
-1.868529945	4308.028199	0.005287779
-1.866778099	4291.150999	0.005289343
-1.866778099	4291.150999	0.005289343
-1.866778099	4291.150999	0.005289343
-1.865151244	4263.491418	0.005289343
-1.865151244	4263.491418	0.005289343
-1.865151244	4263.491418	0.005289343
-1.8633994	4232.080922	0.005289343
-1.8633994	4232.080922	0.005289343
-1.861522384	4184.262221	0.005289343
-1.861522384	4184.262221	0.005289343
-1.861522384	4184.262221	0.005289343
-1.860020876	4168.322654	0.005289865
-1.860020876	4168.322654	0.005289865
-1.860020876	4168.322654	0.005289865
-1.858269032	4118.629002	0.005288301
-1.858269032	4118.629002	0.005288301
-1.858269032	4118.629002	0.005288301
-1.856517005	4097.532585	0.005290386
-1.856517005	4097.532585	0.005290386

-1.8550155	4072.216594	0.005287779
-1.8550155	4072.216594	0.005287779
-1.8550155	4072.216594	0.005287779
-1.853263654	4038.931167	0.005289343
-1.853263654	4038.931167	0.005289343
-1.853263654	4038.931167	0.005289343
-1.85151181	3992.519097	0.005289343
-1.85151181	3992.519097	0.005289343
-1.85151181	3992.519097	0.005289343
-1.849759783	3939.543525	0.005289865
-1.849759783	3939.543525	0.005289865
-1.848007939	3910.477314	0.005289343
-1.848007939	3910.477314	0.005289343
-1.848007939	3910.477314	0.005289343
-1.846381262	3874.847601	0.005290386
-1.846381262	3874.847601	0.005290386
-1.846381262	3874.847601	0.005290386
-1.844629418	3827.028901	0.005288822
-1.844629418	3827.028901	0.005288822
-1.842877571	3785.773702	0.005290908
-1.842877571	3785.773702	0.005290908
-1.842877571	3785.773702	0.005290908
-1.841250716	3758.582758	0.005289865
-1.841250716	3758.582758	0.005289865
-1.841250716	3758.582758	0.005289865
-1.83949887	3674.665708	0.005289865
-1.83949887	3674.665708	0.005289865
-1.83949887	3674.665708	0.005289865
-1.837496684	3638.567359	0.005291429
-1.837496684	3638.567359	0.005291429
-1.835995179	3579.497282	0.005289343
-1.835995179	3579.497282	0.005289343
-1.835995179	3579.497282	0.005289343
-1.834368325	3534.491504	0.005290386
-1.834368325	3534.491504	0.005290386
-1.834368325	3534.491504	0.005290386
-1.832616478	3475.421449	0.005291429
-1.832616478	3475.421449	0.005291429
-1.832616478	3475.421449	0.005291429
-1.8309898	3420.101613	0.005291429
-1.8309898	3420.101613	0.005291429
-1.829237956	3368.532671	0.005290386
-1.829237956	3368.532671	0.005290386
-1.829237956	3368.532671	0.005290386
-1.82748611	3282.271672	0.005291429
-1.82748611	3282.271672	0.005291429
-1.82748611	3282.271672	0.005291429
-1.825483924	3201.636205	0.005291429
-1.825483924	3201.636205	0.005291429
-1.824232581	3166.475489	0.005291429
-1.824232581	3166.475489	0.005291429

-1.824232581	3166.475489	0.005291429
-1.822355564	3097.56035	0.005289865
-1.822355564	3097.56035	0.005289865
-1.822355564	3097.56035	0.005289865
-1.82072871	3024.894654	0.005291429
-1.82072871	3024.894654	0.005291429
-1.82072871	3024.894654	0.005291429
-1.818976863	2946.134453	0.005288822
-1.818976863	2946.134453	0.005288822
-1.817350186	2888.471028	0.005291429
-1.817350186	2888.471028	0.005291429
-1.817350186	2888.471028	0.005291429
-1.81547317	2766.44197	0.005291429
-1.81547317	2766.44197	0.005291429
-1.81547317	2766.44197	0.005291429
-1.814472168	-1.140366259	0.005288301
-1.814472168	-1.140366259	0.005288301
-1.81246998	-2.546816479	0.005290386
-1.81246998	-2.546816479	0.005290386
-1.81246998	-2.546816479	0.005290386
-1.810467794	-2.781224849	0.005291429
-1.810467794	-2.781224849	0.005291429

Specimen No.	225B	Temperature	
Init. Width	0.252	Init. Thick.	
Final Width	0.15	Final Thick.	
Init. Gage	1	Final Gage	1.27
Init. Area	0.0499	Final Area	0.0177
Pct. Red.	64.53	Pct. Elong.	27
Modulus	29.27	Xhead Rate	0.05
Yield	71.8	Ultimate	91
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.321013855	4.250936329	0.00028642
	-2.321013855	3.5477337	0.000288506
	-2.321013855	3.5477337	0.000288506
	-2.320012853	3.782119589	0.000287463
	-2.320012853	3.782119589	0.000287463
	-2.320012853	3.782119589	0.000287463
	-2.318261007	5.774557013	0.000287723
	-2.318261007	5.774557013	0.000287723
	-2.318261007	5.774557013	0.000287723
	-2.31650916	3.664904163	0.000289548
	-2.31650916	3.664904163	0.000289548
	-2.31650916	3.664904163	0.000289548
	-2.314506974	3.07891696	0.000289548
	-2.314506974	3.07891696	0.000289548
	-2.313005289	4.133743384	0.000289548
	-2.313005289	4.133743384	0.000289548
	-2.313005289	4.133743384	0.000289548

-2.311378615	3.782119589	0.000288766
-2.311378615	3.782119589	0.000288766
-2.311378615	3.782119589	0.000288766
-2.309501598	4.719730588	0.000291634
-2.309501598	4.719730588	0.000291634
-2.308000093	4.719730588	0.000288766
-2.308000093	4.719730588	0.000288766
-2.308000093	4.719730588	0.000288766
-2.306998909	4.133743384	0.000291113
-2.306998909	4.133743384	0.000291113
-2.306998909	4.133743384	0.000291113
-2.304496223	12.68952525	0.000292416
-2.304496223	12.68952525	0.000292416
-2.304496223	12.68952525	0.000292416
-2.302869545	40.93534042	0.000309361
-2.302869545	40.93534042	0.000309361
-2.301117698	112.66329	0.000335431
-2.301117698	112.66329	0.000335431
-2.301117698	112.66329	0.000335431
-2.299616016	235.4915674	0.000377142
-2.299616016	235.4915674	0.000377142
-2.299616016	235.4915674	0.000377142
-2.29786417	436.9627176	0.000438926
-2.29786417	436.9627176	0.000438926
-2.29786417	436.9627176	0.000438926
-2.296237492	687.5418031	0.00051896
-2.296237492	687.5418031	0.00051896
-2.294485468	984.6503094	0.000614635
-2.294485468	984.6503094	0.000614635
-2.294485468	984.6503094	0.000614635
-2.292733621	1318.325914	0.000729862
-2.292733621	1318.325914	0.000729862
-2.292733621	1318.325914	0.000729862
-2.290981778	1662.667089	0.00086047
-2.290981778	1662.667089	0.00086047
-2.289104761	2015.095116	0.001009587
-2.289104761	2015.095116	0.001009587
-2.289104761	2015.095116	0.001009587
-2.287478084	2361.389949	0.001186077
-2.287478084	2361.389949	0.001186077
-2.287478084	2361.389949	0.001186077
-2.28572624	2705.731124	0.001388116
-2.28572624	2705.731124	0.001388116
-2.28572624	2705.731124	0.001388116
-2.284099386	2989.595591	0.001618048
-2.284099386	2989.595591	0.001618048
-2.282347539	3244.393847	0.00188135
-2.282347539	3244.393847	0.00188135
-2.282347539	3244.393847	0.00188135
-2.280595692	3417.150658	0.002132138
-2.280595692	3417.150658	0.002132138

-2.280595692	3417.150658	0.002132138
-2.278969018	3533.88416	0.002376148
-2.278969018	3533.88416	0.002376148
-2.278969018	3533.88416	0.002376148
-2.277216991	3610.534933	0.002620941
-2.277216991	3610.534933	0.002620941
-2.275465147	3667.729698	0.002867297
-2.275465147	3667.729698	0.002867297
-2.275465147	3667.729698	0.002867297
-2.2737133	3735.472705	0.00308993
-2.2737133	3735.472705	0.00308993
-2.2737133	3735.472705	0.00308993
-2.271961453	3733.128757	0.003360792
-2.271961453	3733.128757	0.003360792
-2.271961453	3733.128757	0.003360792
-2.270334779	3783.760065	0.0036413
-2.270334779	3783.760065	0.0036413
-2.268707924	3810.01369	0.003927542
-2.268707924	3810.01369	0.003927542
-2.268707924	3810.01369	0.003927542
-2.266956077	3830.172473	0.004231512
-2.266956077	3830.172473	0.004231512
-2.266956077	3830.172473	0.004231512
-2.265204231	3865.333189	0.004556599
-2.265204231	3865.333189	0.004556599
-2.263452387	3878.694309	0.004897065
-2.263452387	3878.694309	0.004897065
-2.263452387	3878.694309	0.004897065
-2.261950702	3909.635809	0.005262231
-2.261950702	3909.635809	0.005262231
-2.261950702	3909.635809	0.005262231
-2.260198855	3914.089523	0.005656401
-2.260198855	3914.089523	0.005656401
-2.260198855	3914.089523	0.005656401
-2.258447008	3934.248305	0.006058914
-2.258447008	3934.248305	0.006058914
-2.256695164	3954.407111	0.006480196
-2.256695164	3954.407111	0.006480196
-2.256695164	3954.407111	0.006480196
-2.254943317	3967.76823	0.006922334
-2.254943317	3967.76823	0.006922334
-2.254943317	3967.76823	0.006922334
-2.253316463	3995.896808	0.007382721
-2.253316463	3995.896808	0.007382721
-2.253316463	3995.896808	0.007382721
-2.251564616	4004.335239	0.007856664
-2.251564616	4004.335239	0.007856664
-2.249937942	4005.038397	0.008318615
-2.249937942	4005.038397	0.008318615
-2.249937942	4005.038397	0.008318615
-2.248060926	4029.885392	0.00886451

-2.248060926	4029.885392	0.00886451
-2.248060926	4029.885392	0.00886451
-2.246434071	4037.621003	0.009384335
-2.246434071	4037.621003	0.009384335
-2.244807394	4054.732387	0.00992293
-2.244807394	4054.732387	0.00992293
-2.244807394	4054.732387	0.00992293
-2.242930377	4062.702159	0.010470686
-2.242930377	4062.702159	0.010470686
-2.242930377	4062.702159	0.010470686
-2.241303703	4083.798597	0.011007717
-2.241303703	4083.798597	0.011007717
-2.241303703	4083.798597	0.011007717
-2.239676849	4087.080495	0.011543705
-2.239676849	4087.080495	0.011543705
-2.237925002	4079.579382	0.012097421
-2.237925002	4079.579382	0.012097421
-2.237925002	4079.579382	0.012097421
-2.236298327	4110.052223	0.01270119
-2.236298327	4110.052223	0.01270119
-2.236298327	4110.052223	0.01270119
-2.23454648	4116.146705	0.013287231
-2.23454648	4116.146705	0.013287231
-2.23454648	4116.146705	0.013287231
-2.232669464	4136.30551	0.013869101
-2.232669464	4136.30551	0.013869101
-2.23104261	4140.056067	0.014471827
-2.23104261	4140.056067	0.014471827
-2.23104261	4140.056067	0.014471827
-2.229415935	4150.135289	0.01506204
-2.229415935	4150.135289	0.01506204
-2.229415935	4150.135289	0.01506204
-2.227789258	4160.44901	0.015675195
-2.227789258	4160.44901	0.015675195
-2.225912242	4123.178866	0.016232038
-2.225912242	4123.178866	0.016232038
-2.225912242	4123.178866	0.016232038
-2.224285387	4179.670497	0.016907758
-2.224285387	4179.670497	0.016907758
-2.224285387	4179.670497	0.016907758
-2.222408371	4184.827346	0.017525083
-2.222408371	4184.827346	0.017525083
-2.222408371	4184.827346	0.017525083
-2.220906866	4189.515221	0.018138237
-2.220906866	4189.515221	0.018138237
-2.219155019	4200.532437	0.018769118
-2.219155019	4200.532437	0.018769118
-2.219155019	4200.532437	0.018769118
-2.217528165	4208.502209	0.019387485
-2.217528165	4208.502209	0.019387485
-2.217528165	4208.502209	0.019387485

-2.215776318	4218.81593	0.020020452
-2.215776318	4218.81593	0.020020452
-2.214149643	4204.282993	0.020650436
-2.214149643	4204.282993	0.020650436
-2.214149643	4204.282993	0.020650436
-2.212397797	4232.411571	0.021303216
-2.212397797	4232.411571	0.021303216
-2.212397797	4232.411571	0.021303216
-2.210645953	4240.615841	0.021947654
-2.210645953	4240.615841	0.021947654
-2.210645953	4240.615841	0.021947654
-2.208893926	4237.099761	0.022554551
-2.208893926	4237.099761	0.022554551
-2.207142082	4251.398222	0.023205245
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-2.20388873	4263.353048	0.02449829
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-2.195254491	4302.73298	0.02781224
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-2.19187579	4299.685896	0.029136568
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-1.970388961	2912.849027	0.00507036

Specimen No.	225T	Temperature	
Init. Width	0.25	Init. Thick.	
Final Width	0.14	Final Thick.	
Init. Gage	1	Final Gage	1.33
Init. Area	0.0491	Final Area	0.0154
Pct. Red.	68.64	Pct. Elong.	33
Modulus	30.62	Xhead Rate	0.05
Yield	77.9	Ultimate	92.7
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.2737133	6.712190493	0.000180578
	-2.2737133	6.712190493	0.000180578
	-2.272962458	20.19048068	0.00018892
	-2.272962458	20.19048068	0.00018892

-2.272962458	20.19048068	0.00018892
-2.271460953	86.52712769	0.000221246
-2.271460953	86.52712769	0.000221246
-2.269583936	202.0888355	0.000266868
-2.269583936	202.0888355	0.000266868
-2.269583936	202.0888355	0.000266868
-2.267957259	378.4786948	0.000323178
-2.267957259	378.4786948	0.000323178
-2.267957259	378.4786948	0.000323178
-2.265955073	637.4963018	0.000415725
-2.265955073	637.4963018	0.000415725
-2.26470373	931.5575667	0.000517917
-2.26470373	931.5575667	0.000517917
-2.26470373	931.5575667	0.000517917
-2.262951883	1253.278525	0.000634447
-2.262951883	1253.278525	0.000634447
-2.262951883	1253.278525	0.000634447
-2.260949697	1624.341871	0.000764273
-2.260949697	1624.341871	0.000764273
-2.259448012	2009.938245	0.000903224
-2.259448012	2009.938245	0.000903224
-2.259448012	2009.938245	0.000903224
-2.257696169	2398.425954	0.00104452
-2.257696169	2398.425954	0.00104452
-2.257696169	2398.425954	0.00104452
-2.255944322	2785.663276	0.00119833
-2.255944322	2785.663276	0.00119833
-2.255944322	2785.663276	0.00119833
-2.254192475	3188.136715	0.001392808
-2.254192475	3188.136715	0.001392808
-2.252565621	3526.383362	0.001658195
-2.252565621	3526.383362	0.001658195
-2.252565621	3526.383362	0.001658195
-2.250813774	3747.661693	0.002059665
-2.250813774	3747.661693	0.002059665
-2.250813774	3747.661693	0.002059665
-2.248936757	3852.675182	0.002608949
-2.248936757	3852.675182	0.002608949
-2.247310083	3913.151889	0.003280759
-2.247310083	3913.151889	0.003280759
-2.247310083	3913.151889	0.003280759
-2.245433067	3945.968319	0.00397942
-2.245433067	3945.968319	0.00397942
-2.245433067	3945.968319	0.00397942
-2.243931562	3949.953397	0.004711451
-2.243931562	3949.953397	0.004711451
-2.243931562	3949.953397	0.004711451
-2.241929376	3931.435383	0.005340439
-2.241929376	3931.435383	0.005340439
-2.240427691	3999.647364	0.006131387
-2.240427691	3999.647364	0.006131387

-2.240427691	3999.647364	0.006131387
-2.238801014	4024.259883	0.006823271
-2.238801014	4024.259883	0.006823271
-2.238801014	4024.259883	0.006823271
-2.237174159	4036.683369	0.007515676
-2.237174159	4036.683369	0.007515676
-2.237174159	4036.683369	0.007515676
-2.235422315	4044.653164	0.008194525
-2.235422315	4044.653164	0.008194525
-2.233795638	4073.016217	0.00884574
-2.233795638	4073.016217	0.00884574
-2.233795638	4073.016217	0.00884574
-2.231918622	4060.592731	0.009544402
-2.231918622	4060.592731	0.009544402
-2.231918622	4060.592731	0.009544402
-2.230416937	4088.721286	0.010221462
-2.230416937	4088.721286	0.010221462
-2.228665093	4096.925241	0.010886755
-2.228665093	4096.925241	0.010886755
-2.228665093	4096.925241	0.010886755
-2.226913246	4103.020061	0.01154162
-2.226913246	4103.020061	0.01154162
-2.226913246	4103.020061	0.01154162
-2.225161399	4119.662786	0.012183971
-2.225161399	4119.662786	0.012183971
-2.225161399	4119.662786	0.012183971
-2.223409555	4124.1165	0.012831536
-2.223409555	4124.1165	0.012831536
-2.221782698	4141.46236	0.013466589
-2.221782698	4141.46236	0.013466589
-2.221782698	4141.46236	0.013466589
-2.219905862	4138.180777	0.014140224
-2.219905862	4138.180777	0.014140224
-2.219905862	4138.180777	0.014140224
-2.218404177	4154.589004	0.014786747
-2.218404177	4154.589004	0.014786747
-2.216652333	4165.137223	0.015414499
-2.216652333	4165.137223	0.015414499
-2.216652333	4165.137223	0.015414499
-2.214900486	4166.778014	0.016054766
-2.214900486	4166.778014	0.016054766
-2.214900486	4166.778014	0.016054766
-2.213273632	4185.530504	0.016688775
-2.213273632	4185.530504	0.016688775
-2.213273632	4185.530504	0.016688775
-2.211521785	4189.984218	0.017322785
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-2.20639124	4212.252788	0.019194572
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-2.204639393	4228.426494	0.019820239
-2.204639393	4228.426494	0.019820239
-2.202887546	4228.89549	0.020443967
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-2.202887546	4228.89549	0.020443967
-2.201260872	4248.116639	0.02105712
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-2.199509025	4250.929562	0.021678616
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-2.187496085	128.9544582	0.005096429
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-2.187621257	127.3136221	0.005096429
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-2.188747431	123.7975415	0.005095908
-2.188747431	123.7975415	0.005095908
-2.188747431	123.7975415	0.005095908
-2.188747431	123.4459402	0.005095387
-2.188747431	123.4459402	0.005095387
-2.188747431	125.2039692	0.005096951
-2.188747431	125.2039692	0.005096951
-2.188747431	125.2039692	0.005096951
-2.1888726	123.7975415	0.005096429
-2.1888726	123.7975415	0.005096429
-2.1888726	123.7975415	0.005096429
-2.188747431	124.2663582	0.005096951
-2.188747431	124.2663582	0.005096951
-2.188747431	124.2663582	0.005096951
-2.188747431	125.0867763	0.005095908
-2.188747431	125.0867763	0.005095908
-2.188747431	124.9695608	0.005096951
-2.188747431	124.9695608	0.005096951
-2.188747431	124.9695608	0.005096951
-2.1888726	124.0319498	0.005095908
-2.1888726	124.0319498	0.005095908
-2.1888726	124.0319498	0.005095908

-2.1888726	124.3835512	0.005097993
-2.1888726	124.3835512	0.005097993
-2.1888726	124.5007666	0.005097993
-2.1888726	124.5007666	0.005097993
-2.1888726	124.5007666	0.005097993
-2.188747431	123.4459402	0.005097472
-2.188747431	123.4459402	0.005097472
-2.188747431	123.4459402	0.005097472
-2.1888726	123.3287247	0.005096429
-2.1888726	123.3287247	0.005096429
-2.1888726	123.3287247	0.005096429
-2.1888726	124.1491428	0.005097472
-2.1888726	124.1491428	0.005097472
-2.188747431	125.3211846	0.005095387
-2.188747431	125.3211846	0.005095387
-2.188747431	125.3211846	0.005095387
-2.188747431	124.0319498	0.005096429
-2.188747431	124.0319498	0.005096429
-2.188747431	124.0319498	0.005096429
-2.1888726	125.3211846	0.005096429
-2.1888726	125.3211846	0.005096429
-2.1888726	123.5631331	0.005096951
-2.1888726	123.5631331	0.005096951
-2.1888726	123.5631331	0.005096951
-2.1888726	125.7899789	0.005096429
-2.1888726	125.7899789	0.005096429
-2.1888726	125.7899789	0.005096429
-2.1888726	124.5007666	0.005096951
-2.1888726	124.5007666	0.005096951
-2.1888726	124.5007666	0.005096951
-2.1888726	125.0867763	0.005096951
-2.1888726	125.0867763	0.005096951
-2.1888726	125.2039692	0.005096429
-2.1888726	125.2039692	0.005096429
-2.1888726	125.2039692	0.005096429
-2.1888726	124.7351525	0.005096951
-2.1888726	124.7351525	0.005096951
-2.1888726	124.7351525	0.005096951
-2.1888726	125.2039692	0.005096951
-2.1888726	125.2039692	0.005096951
-2.1888726	125.2039692	0.005096951
-2.1888726	125.2039692	0.005096429
-2.1888726	125.2039692	0.005096429
-2.1888726	125.6727635	0.005096951
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-2.1888726	125.6727635	0.005096951
-2.1888726	126.1416027	0.005097472
-2.1888726	126.1416027	0.005097472
-2.1888726	126.1416027	0.005097472
-2.1888726	124.2663582	0.005096951
-2.1888726	124.2663582	0.005096951

-2.1888726	124.9695608	0.005096951
-2.1888726	124.9695608	0.005096951
-2.1888726	124.9695608	0.005096951
-2.1888726	125.2039692	0.005096429
-2.1888726	125.2039692	0.005096429
-2.1888726	125.2039692	0.005096429
-2.1888726	125.9071718	0.005096951
-2.1888726	125.9071718	0.005096951
-2.1888726	125.9071718	0.005096951
-2.1888726	125.7899789	0.005096951
-2.1888726	125.7899789	0.005096951
-2.1888726	124.3835512	0.005096951
-2.1888726	124.3835512	0.005096951
-2.1888726	124.3835512	0.005096951
-2.1888726	124.9695608	0.005097472
-2.1888726	124.9695608	0.005097472
-2.1888726	124.9695608	0.005097472
-2.1888726	126.1416027	0.005097993
-2.1888726	126.1416027	0.005097993
-2.1888726	126.1416027	0.005097993
-2.1888726	125.3211846	0.005096429
-2.1888726	125.3211846	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	124.5007666	0.005096429
-2.1888726	124.5007666	0.005096429
-2.1888726	124.5007666	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	124.7351525	0.005096429
-2.1888726	126.7275899	0.005096951
-2.1888726	126.7275899	0.005096951
-2.1888726	125.3211846	0.005097993
-2.1888726	125.3211846	0.005097993
-2.1888726	125.3211846	0.005097993
-2.1888726	124.0319498	0.005097472
-2.1888726	124.0319498	0.005097472
-2.1888726	124.0319498	0.005097472
-2.1888726	125.7899789	0.005096951
-2.1888726	125.7899789	0.005096951
-2.1888726	122.859908	0.005097993
-2.1888726	122.859908	0.005097993
-2.1888726	122.859908	0.005097993
-2.1888726	124.3835512	0.005097472
-2.1888726	124.3835512	0.005097472
-2.1888726	124.3835512	0.005097472
-2.1888726	126.1416027	0.005097472
-2.1888726	126.1416027	0.005097472
-2.1888726	126.1416027	0.005097472
-2.1888726	123.5631331	0.005098515

-2.1888726	123.5631331	0.005098515
-2.1888726	124.9695608	0.005095387
-2.1888726	124.9695608	0.005095387
-2.1888726	124.9695608	0.005095387
-2.18899777	124.2663582	0.005096429
-2.18899777	124.2663582	0.005096429
-2.18899777	124.2663582	0.005096429
-2.1888726	126.2587956	0.005097472
-2.1888726	126.2587956	0.005097472
-2.1888726	126.2587956	0.005097472
-2.1888726	124.3835512	0.005095908
-2.1888726	124.3835512	0.005095908
-2.18899777	126.1416027	0.005097472
-2.18899777	126.1416027	0.005097472
-2.18899777	126.1416027	0.005097472
-2.1888726	126.2587956	0.005095908
-2.1888726	126.2587956	0.005095908
-2.1888726	126.2587956	0.005095908
-2.1888726	125.6727635	0.005095387
-2.1888726	125.6727635	0.005095387
-2.1888726	123.3287247	0.005096951
-2.1888726	123.3287247	0.005096951
-2.1888726	123.3287247	0.005096951
-2.18899777	124.2663582	0.005096951
-2.18899777	124.2663582	0.005096951
-2.18899777	124.2663582	0.005096951
-2.1888726	127.0792137	0.005097472
-2.1888726	127.0792137	0.005097472
-2.1888726	127.0792137	0.005097472
-2.1888726	125.6727635	0.005096951
-2.1888726	125.6727635	0.005096951
-2.1888726	124.9695608	0.005097472
-2.1888726	124.9695608	0.005097472
-2.1888726	124.9695608	0.005097472
-2.18899777	125.2039692	0.005096429
-2.18899777	125.2039692	0.005096429
-2.18899777	125.2039692	0.005096429
-2.189122762	125.9071718	0.005095908
-2.189122762	125.9071718	0.005095908
-2.189122762	125.9071718	0.005095908
-2.1888726	125.6727635	0.005098515
-2.1888726	125.6727635	0.005098515
-2.189122762	125.9071718	0.005095387
-2.189122762	125.9071718	0.005095387
-2.189122762	125.9071718	0.005095387
-2.189122762	125.6727635	0.005098515
-2.189122762	125.6727635	0.005098515
-2.189122762	125.6727635	0.005098515
-2.18899777	125.9071718	0.005096429
-2.18899777	125.9071718	0.005096429
-2.18899777	125.9071718	0.005096429

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-2.1888726	124.9695608	0.005096951
-2.189122762	125.9071718	0.005096429
-2.189122762	125.9071718	0.005096429
-2.189122762	125.9071718	0.005096429
-2.18899777	126.9619983	0.005096429
-2.18899777	126.9619983	0.005096429
-2.18899777	126.9619983	0.005096429
-2.189122762	126.3760111	0.005097472
-2.189122762	126.3760111	0.005097472
-2.18899777	125.3211846	0.005098515
-2.18899777	125.3211846	0.005098515
-2.18899777	125.3211846	0.005098515
-2.189122762	125.7899789	0.005098515
-2.189122762	125.7899789	0.005098515
-2.189122762	125.7899789	0.005098515
-2.189122762	126.1416027	0.005096951
-2.189122762	126.1416027	0.005096951
-2.189122762	126.1416027	0.005096951
-2.189122762	124.5007666	0.005095908
-2.189122762	124.5007666	0.005095908
-2.189122762	124.5007666	0.005096429
-2.189122762	124.5007666	0.005096429
-2.189122762	124.5007666	0.005096429
-2.1888726	121.922297	0.005095387
-2.1888726	121.922297	0.005095387
-2.1888726	121.922297	0.005095387
-2.189122762	124.2663582	0.005095908
-2.189122762	124.2663582	0.005095908
-2.189122762	124.2663582	0.005095908
-2.189122762	124.617937	0.005095908
-2.189122762	124.617937	0.005095908
-2.18899777	121.922297	0.005095908
-2.18899777	121.922297	0.005095908
-2.18899777	121.922297	0.005095908
-2.189122762	123.680326	0.005097993
-2.189122762	123.680326	0.005097993
-2.189122762	123.680326	0.005097993
-2.18899777	123.5631331	0.005096429
-2.18899777	123.5631331	0.005096429
-2.189122762	124.1491428	0.005097472
-2.189122762	124.1491428	0.005097472
-2.189122762	124.1491428	0.005097472
-2.189122762	123.5631331	0.005095908
-2.189122762	123.5631331	0.005095908
-2.189122762	123.5631331	0.005095908
-2.189122762	124.8523454	0.005095387
-2.189122762	124.8523454	0.005095387
-2.189122762	124.8523454	0.005095387
-2.18899777	124.7351525	0.005095387
-2.18899777	124.7351525	0.005095387

-2.189122762	123.5631331	0.005096429
-2.189122762	123.5631331	0.005096429
-2.189122762	123.5631331	0.005096429
-2.189122762	125.6727635	0.005097993
-2.189122762	125.6727635	0.005097993
-2.189122762	125.6727635	0.005097993
-2.189122762	123.9147344	0.005095908
-2.189122762	123.9147344	0.005095908
-2.189122762	123.9147344	0.005095908
-2.189122762	124.9695608	0.005096951
-2.189122762	124.9695608	0.005096951
-2.189122762	123.9147344	0.005097472
-2.189122762	123.9147344	0.005097472
-2.189122762	123.9147344	0.005097472
-2.189122762	124.5007666	0.005096951
-2.189122762	124.5007666	0.005096951
-2.189122762	124.5007666	0.005096951
-2.189122762	124.5007666	0.005096951
-2.189122762	124.5007666	0.005096951
-2.189122762	124.5007666	0.005097993
-2.189122762	124.5007666	0.005097993
-2.189122762	124.5007666	0.005097993
-2.189122762	124.5007666	0.005097993
-2.189122762	124.5007666	0.005097993
-2.189122762	124.3835512	0.005096951
-2.189122762	124.3835512	0.005096951
-2.189122762	124.3835512	0.005096951
-2.189122762	125.6727635	0.005096429
-2.189122762	125.6727635	0.005096429
-2.189122762	125.6727635	0.005096429
-2.189122762	124.7351525	0.005096951
-2.189122762	124.7351525	0.005096951
-2.189122762	124.5007666	0.005097472
-2.189122762	124.5007666	0.005097472
-2.189122762	124.5007666	0.005097472
-2.189122762	121.4534803	0.005096951
-2.189122762	121.4534803	0.005096951
-2.189122762	121.4534803	0.005096951
-2.189122762	125.2039692	0.005095908
-2.189122762	125.2039692	0.005095908
-2.189247931	125.3211846	0.005095908
-2.189247931	125.3211846	0.005095908
-2.189247931	125.3211846	0.005095908
-2.189247931	124.9695608	0.005095908
-2.189247931	124.9695608	0.005095908
-2.189247931	124.9695608	0.005095908
-2.189247931	124.3835512	0.005095908
-2.189247931	124.3835512	0.005095908
-2.189247931	124.3835512	0.005095908
-2.189122762	124.8523454	0.005095387
-2.189122762	124.8523454	0.005095387
-2.189122762	124.3835512	0.005096429
-2.189122762	124.3835512	0.005096429

Specimen No.	225T (continued)	Temperature	
Init. Width	0.25	Init. Thick.	
Final Width	0.14	Final Thick.	
Init. Gage	1	Final Gage	1.33
Init. Area	0.0491	Final Area	0.0154
Pct. Red.	68.64	Pct. Elong.	33
Modulus		Xhead Rate	0.05
Yield		Ultimate	92.7
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.214399805	-3.414804123	0.005095387
	-2.214399805	-3.414804123	0.005095387
	-2.213774132	-3.414804123	0.005095387
	-2.213774132	-3.414804123	0.005095387
	-2.213774132	-3.414804123	0.005095387
	-2.211897296	-4.117422249	0.005095387
	-2.211897296	-4.117422249	0.005095387
	-2.211897296	-4.117422249	0.005095387
	-2.20989511	-2.243728952	0.005095387
	-2.20989511	-2.243728952	0.005095387
	-2.208643764	-1.541110826	0.005093301
	-2.208643764	-1.541110826	0.005093301
	-2.208643764	-1.541110826	0.005093301
	-2.20689192	-1.072676261	0.005095387
	-2.20689192	-1.072676261	0.005095387
	-2.20689192	-1.072676261	0.005095387
	-2.205139893	-2.243728952	0.005095387
	-2.205139893	-2.243728952	0.005095387
	-2.20338805	-2.243728952	0.005093301
	-2.20338805	-2.243728952	0.005093301
	-2.20338805	-2.243728952	0.005093301
	-2.201886542	-1.775316868	0.005095387
	-2.201886542	-1.775316868	0.005095387
	-2.201886542	-1.775316868	0.005095387
	-2.200134698	-3.414804123	0.005095387
	-2.200134698	-3.414804123	0.005095387
	-2.200134698	-3.414804123	0.005095387
	-2.198382671	-1.072676261	0.005095387
	-2.198382671	-1.072676261	0.005095387
	-2.196630827	-0.604264177	0.005095387
	-2.196630827	-0.604264177	0.005095387
	-2.196630827	-0.604264177	0.005095387
	-2.19487898	3.143122417	0.005095387
	-2.19487898	3.143122417	0.005095387
	-2.19487898	3.143122417	0.005095387
	-2.193127133	10.16946104	0.005095387
	-2.193127133	10.16946104	0.005095387
	-2.19137529	42.37353368	0.005095387
	-2.19137529	42.37353368	0.005095387
	-2.19137529	42.37353368	0.005095387
	-2.189873605	132.076516	0.005095387

-2.189873605	132.076516	0.005095387
-2.189873605	132.076516	0.005095387
-2.187871596	299.0692681	0.005095387
-2.187871596	299.0692681	0.005095387
-2.187871596	299.0692681	0.005095387
-2.186369911	546.7478676	0.005096429
-2.186369911	546.7478676	0.005096429
-2.184743236	833.1884663	0.005095387
-2.184743236	833.1884663	0.005095387
-2.184743236	833.1884663	0.005095387
-2.18286622	1154.175198	0.005095387
-2.18286622	1154.175198	0.005095387
-2.18286622	1154.175198	0.005095387
-2.181239366	1496.475264	0.00509278
-2.181239366	1496.475264	0.00509278
-2.181239366	1496.475264	0.00509278
-2.179612688	1853.413455	0.005095387
-2.179612688	1853.413455	0.005095387
-2.177860845	2091.138028	0.005093301
-2.177860845	2091.138028	0.005093301
-2.177860845	2091.138028	0.005093301
-2.17623399	2536.994708	0.005095387
-2.17623399	2536.994708	0.005095387
-2.17623399	2536.994708	0.005095387
-2.174607313	2927.893494	0.005095387
-2.174607313	2927.893494	0.005095387
-2.172730296	3343.150361	0.005095387
-2.172730296	3343.150361	0.005095387
-2.172730296	3343.150361	0.005095387
-2.170978453	3718.825642	0.005095908
-2.170978453	3718.825642	0.005095908
-2.170978453	3718.825642	0.005095908
-2.169351775	4083.258584	0.005095387
-2.169351775	4083.258584	0.005095387
-2.169351775	4083.258584	0.005095387
-2.167474759	4383.28338	0.005095387
-2.167474759	4383.28338	0.005095387
-2.165847904	4417.244155	0.005095387
-2.165847904	4417.244155	0.005095387
-2.165847904	4417.244155	0.005095387
-2.164096058	4424.270269	0.005095387
-2.164096058	4424.270269	0.005095387
-2.164096058	4424.270269	0.005095387
-2.162344214	4414.433571	0.005093822
-2.162344214	4414.433571	0.005093822
-2.162344214	4414.433571	0.005093822
-2.160717536	4415.604713	0.005095387
-2.160717536	4415.604713	0.005095387
-2.159090682	4411.154686	0.005095387
-2.159090682	4411.154686	0.005095387
-2.159090682	4411.154686	0.005095387

-2.157338838	4406.93882	0.00509278
-2.157338838	4406.93882	0.00509278
-2.157338838	4406.93882	0.00509278
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-1.921586721	3591.47324	0.00509278
-1.921586721	3591.47324	0.00509278
-1.920085036	3595.688769	0.005091737
-1.920085036	3595.688769	0.005091737
-1.920085036	3595.688769	0.005091737
-1.918333189	3564.304755	0.005095387
-1.918333189	3564.304755	0.005095387
-1.916581343	3520.272783	0.005095387
-1.916581343	3520.272783	0.005095387
-1.916581343	3520.272783	0.005095387
-1.914829499	3490.293735	0.005092258
-1.914829499	3490.293735	0.005092258
-1.914829499	3490.293735	0.005092258
-1.913077652	3454.225195	0.005095387
-1.913077652	3454.225195	0.005095387
-1.913077652	3454.225195	0.005095387
-1.911450797	3411.598841	0.005093301
-1.911450797	3411.598841	0.005093301
-1.909573781	3353.982649	0.005095387
-1.909573781	3353.982649	0.005095387
-1.909573781	3353.982649	0.005095387
-1.908072276	3320.724694	0.005092258
-1.908072276	3320.724694	0.005092258
-1.908072276	3320.724694	0.005092258
-1.906320429	3274.819118	0.005091215
-1.906320429	3274.819118	0.005091215
-1.906320429	3274.819118	0.005091215
-1.904568406	3220.482147	0.005093301
-1.904568406	3220.482147	0.005093301
-1.902941728	3183.008326	0.005092258
-1.902941728	3183.008326	0.005092258

-1.902941728	3183.008326	0.005092258
-1.901189884	3130.544959	0.005090694
-1.901189884	3130.544959	0.005090694
-1.901189884	3130.544959	0.005090694
-1.899563207	3015.312889	0.00509278
-1.899563207	3015.312889	0.00509278
-1.897561021	2697.195372	0.005092258
-1.897561021	2697.195372	0.005092258
-1.897561021	2697.195372	0.005092258
-1.896059336	2280.767363	0.005095387
-1.896059336	2280.767363	0.005095387
-1.896059336	2280.767363	0.005095387

Specimen No.	236B	Temperature	
Init. Width	0.25	Init. Thick.	
Final Width	0.11	Final Thick.	
Init. Gage	1	Final Gage	1.23
Init. Area	0.0491	Final Area	0.0095
Pct. Red.	80.65	Pct. Elong.	23
Modulus	39.1	Xhead Rate	0.05
Yield	74.7	Ultimate	97.5
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.307749751	1.555273795	0.000546593
	-2.307749751	0.96926411	0.000546072
	-2.307749751	0.96926411	0.000546072
	-2.307749751	0.96926411	0.000546072
	-2.305997905	3.5477337	0.000546593
	-2.305997905	3.5477337	0.000546593
	-2.305997905	3.5477337	0.000546593
	-2.304746561	1.906875109	0.000547636
	-2.304746561	1.906875109	0.000547636
	-2.302994715	3.430518274	0.000547375
	-2.302994715	3.430518274	0.000547375
	-2.302994715	3.430518274	0.000547375
	-2.301242691	3.782119589	0.00054555
	-2.301242691	3.782119589	0.00054555
	-2.301242691	3.782119589	0.00054555
	-2.299741186	3.196109904	0.000546593
	-2.299741186	3.196109904	0.000546593
	-2.299741186	3.196109904	0.000546593
	-2.297989339	4.133743384	0.000547375
	-2.297989339	4.133743384	0.000547375
	-2.296237492	3.899312533	0.000547115
	-2.296237492	3.899312533	0.000547115
	-2.296237492	3.899312533	0.000547115
	-2.294485468	3.899312533	0.000547115
	-2.294485468	3.899312533	0.000547115
	-2.294485468	3.899312533	0.000547115
	-2.292733621	4.602537644	0.000546854

-2.292733621	4.602537644	0.000546854
-2.291106947	6.594975068	0.000550764
-2.291106947	6.594975068	0.000550764
-2.291106947	6.594975068	0.000550764
-2.2893551	12.10349308	0.000554936
-2.2893551	12.10349308	0.000554936
-2.2893551	12.10349308	0.000554936
-2.287728246	62.96941247	0.000591954
-2.287728246	62.96941247	0.000591954
-2.287728246	62.96941247	0.000591954
-2.285976402	216.1531579	0.00064305
-2.285976402	216.1531579	0.00064305
-2.284349724	488.5318621	0.000720737
-2.284349724	488.5318621	0.000720737
-2.284349724	488.5318621	0.000720737
-2.28272305	782.9446834	0.000803117
-2.28272305	782.9446834	0.000803117
-2.28272305	782.9446834	0.000803117
-2.280971023	1116.854809	0.000897228
-2.280971023	1116.854809	0.000897228
-2.280971023	1116.854809	0.000897228
-2.279219179	1530.345419	0.001014279
-2.279219179	1530.345419	0.001014279
-2.277467333	1921.684741	0.001127421
-2.277467333	1921.684741	0.001127421
-2.277467333	1921.684741	0.001127421
-2.275715486	2322.713175	0.00124734
-2.275715486	2322.713175	0.00124734
-2.275715486	2322.713175	0.00124734
-2.273963639	2655.333976	0.00136361
-2.273963639	2655.333976	0.00136361
-2.273963639	2655.333976	0.00136361
-2.272211795	3012.332798	0.001528109
-2.272211795	3012.332798	0.001528109
-2.27071011	3206.186047	0.001678269
-2.27071011	3206.186047	0.001678269
-2.27071011	3206.186047	0.001678269
-2.268958263	3326.201469	0.001807313
-2.268958263	3326.201469	0.001807313
-2.268958263	3326.201469	0.001807313
-2.267206419	3405.195831	0.001920975
-2.267206419	3405.195831	0.001920975
-2.265454572	3457.936882	0.002021082
-2.265454572	3457.936882	0.002021082
-2.265454572	3457.936882	0.002021082
-2.263827718	3513.022242	0.002122232
-2.263827718	3513.022242	0.002122232
-2.263827718	3513.022242	0.002122232
-2.261950702	3531.071574	0.002217907
-2.261950702	3531.071574	0.002217907
-2.261950702	3531.071574	0.002217907

-2.260324024	3593.65771	0.002325834
-2.260324024	3593.65771	0.002325834
-2.25869735	3629.287085	0.002429852
-2.25869735	3629.287085	0.002429852
-2.25869735	3629.287085	0.002429852
-2.256945326	3648.977208	0.002528394
-2.256945326	3648.977208	0.002528394
-2.256945326	3648.977208	0.002528394
-2.255318649	3692.576693	0.002633975
-2.255318649	3692.576693	0.002633975
-2.255318649	3692.576693	0.002633975
-2.253441632	3717.892347	0.002739557
-2.253441632	3717.892347	0.002739557
-2.251814958	3742.973841	0.002848006
-2.251814958	3742.973841	0.002848006
-2.251814958	3742.973841	0.002848006
-2.249937942	3738.754288	0.002948112
-2.249937942	3738.754288	0.002948112
-2.249937942	3738.754288	0.002948112
-2.248436257	3790.089046	0.003072203
-2.248436257	3790.089046	0.003072203
-2.24668441	3815.873697	0.003192905
-2.24668441	3815.873697	0.003192905
-2.24668441	3815.873697	0.003192905
-2.245057736	3828.765843	0.003311521
-2.245057736	3828.765843	0.003311521
-2.245057736	3828.765843	0.003311521
-2.243180719	3861.113973	0.003440304
-2.243180719	3861.113973	0.003440304
-2.243180719	3861.113973	0.003440304
-2.241553865	3892.055451	0.003571694
-2.241553865	3892.055451	0.003571694
-2.239927187	3893.227268	0.003696828
-2.239927187	3893.227268	0.003696828
-2.239927187	3893.227268	0.003696828
-2.238175344	3906.822886	0.003834735
-2.238175344	3906.822886	0.003834735
-2.238175344	3906.822886	0.003834735
-2.236423497	3926.747193	0.003977856
-2.236423497	3926.747193	0.003977856
-2.236423497	3926.747193	0.003977856
-2.234796642	3951.359689	0.004134012
-2.234796642	3951.359689	0.004134012
-2.232919626	3970.112179	0.004289126
-2.232919626	3970.112179	0.004289126
-2.232919626	3970.112179	0.004289126
-2.231292949	3988.161511	0.004452842
-2.231292949	3988.161511	0.004452842
-2.231292949	3988.161511	0.004452842
-2.229666274	4005.507371	0.004622033
-2.229666274	4005.507371	0.004622033

-2.229666274	4005.507371	0.004622033
-2.227914427	3999.17839	0.004799045
-2.227914427	3999.17839	0.004799045
-2.225912242	4005.97603	0.004983616
-2.225912242	4005.97603	0.004983616
-2.225912242	4005.97603	0.004983616
-2.224410557	4043.012373	0.005185065
-2.224410557	4043.012373	0.005185065
-2.224410557	4043.012373	0.005185065
-2.222783882	4064.34295	0.005385279
-2.222783882	4064.34295	0.005385279
-2.221032035	4077.704092	0.005596963
-2.221032035	4077.704092	0.005596963
-2.221032035	4077.704092	0.005596963
-2.219405181	4087.080495	0.005812818
-2.219405181	4087.080495	0.005812818
-2.219405181	4087.080495	0.005812818
-2.217778507	4113.802442	0.006027109
-2.217778507	4113.802442	0.006027109
-2.217778507	4113.802442	0.006027109
-2.21590149	4096.456582	0.006265384
-2.21590149	4096.456582	0.006265384
-2.214274813	4131.851796	0.006513044
-2.214274813	4131.851796	0.006513044
-2.214274813	4131.851796	0.006513044
-2.212522969	4139.58707	0.006764875
-2.212522969	4139.58707	0.006764875
-2.212522969	4139.58707	0.006764875
-2.210896112	4142.399993	0.00701462
-2.210896112	4142.399993	0.00701462
-2.210896112	4142.399993	0.00701462
-2.209144268	4166.543853	0.007268537
-2.209144268	4166.543853	0.007268537
-2.207392421	4170.52857	0.007536531
-2.207392421	4170.52857	0.007536531
-2.207392421	4170.52857	0.007536531
-2.205765567	4190.218716	0.007807653
-2.205765567	4190.218716	0.007807653
-2.205765567	4190.218716	0.007807653
-2.20401372	4186.233639	0.008098589
-2.20401372	4186.233639	0.008098589
-2.202387045	4203.813997	0.00838796
-2.202387045	4203.813997	0.00838796
-2.202387045	4203.813997	0.00838796
-2.200635198	4219.284927	0.008684631
-2.200635198	4219.284927	0.008684631
-2.200635198	4219.284927	0.008684631
-2.198883352	4218.81593	0.008977651
-2.198883352	4218.81593	0.008977651
-2.198883352	4218.81593	0.008977651
-2.197256497	4240.381343	0.009285271

-2.197256497	4240.381343	0.009285271
-2.195504653	4242.256632	0.009594976
-2.195504653	4242.256632	0.009594976
-2.195504653	4242.256632	0.009594976
-2.193877976	4242.725292	0.009872877
-2.193877976	4242.725292	0.009872877
-2.193877976	4242.725292	0.009872877
-2.192126132	4260.774624	0.010238146
-2.192126132	4260.774624	0.010238146
-2.192126132	4260.774624	0.010238146
-2.190374105	4274.604425	0.010564536
-2.190374105	4274.604425	0.010564536
-2.188622261	4284.683985	0.010886755
-2.188622261	4284.683985	0.010886755
-2.188622261	4284.683985	0.010886755
-2.186870415	4283.98049	0.011221486
-2.186870415	4283.98049	0.011221486
-2.186870415	4283.98049	0.011221486
-2.185243737	4310.702775	0.011552048
-2.185243737	4310.702775	0.011552048
-2.185243737	4310.702775	0.011552048
-2.183491893	4310.702775	0.011895122
-2.183491893	4310.702775	0.011895122
-2.181865039	4301.326687	0.012222554
-2.181865039	4301.326687	0.012222554
-2.181865039	4301.326687	0.012222554
-2.180113192	4325.939184	0.012589613
-2.180113192	4325.939184	0.012589613
-2.180113192	4325.939184	0.012589613
-2.177860845	4283.043194	0.012882634
-2.177860845	4283.043194	0.012882634
-2.176609498	4338.831352	0.013293488
-2.176609498	4338.831352	0.013293488
-2.176609498	4338.831352	0.013293488
-2.174857655	4340.706619	0.013625091
-2.174857655	4340.706619	0.013625091
-2.174857655	4340.706619	0.013625091
-2.1732308	4357.81834	0.013973379
-2.1732308	4357.81834	0.013973379
-2.1732308	4357.81834	0.013973379
-2.171604123	4366.49127	0.014327924
-2.171604123	4366.49127	0.014327924
-2.169852279	4341.409777	0.014662656
-2.169852279	4341.409777	0.014662656
-2.169852279	4341.409777	0.014662656
-2.168225421	4379.149255	0.015050569
-2.168225421	4379.149255	0.015050569
-2.168225421	4379.149255	0.015050569
-2.166473578	4385.24376	0.015412414
-2.166473578	4385.24376	0.015412414
-2.166473578	4385.24376	0.015412414

-2.1648469	4394.385349	0.015768001
-2.1648469	4394.385349	0.015768001
-2.162969884	4399.542198	0.016131932
-2.162969884	4399.542198	0.016131932
-2.162969884	4399.542198	0.016131932
-2.161343209	4415.247604	0.016480219
-2.161343209	4415.247604	0.016480219
-2.161343209	4415.247604	0.016480219
-2.159591186	4418.294688	0.016854577
-2.159591186	4418.294688	0.016854577
-2.157839339	4396.260616	0.017214336
-2.157839339	4396.260616	0.017214336
-2.157839339	4396.260616	0.017214336
-2.156337834	4433.06246	0.017595992
-2.156337834	4433.06246	0.017595992
-2.156337834	4433.06246	0.017595992
-2.154335645	4438.922467	0.017960964
-2.154335645	4438.922467	0.017960964
-2.154335645	4438.922467	0.017960964
-2.152833963	4435.875046	0.01831968
-2.152833963	4435.875046	0.01831968
-2.151082116	4447.829895	0.018699253
-2.151082116	4447.829895	0.018699253
-2.151082116	4447.829895	0.018699253
-2.149330269	4456.971485	0.01905901
-2.149330269	4456.971485	0.01905901
-2.149330269	4456.971485	0.01905901
-2.147703595	4464.941257	0.019429196
-2.147703595	4464.941257	0.019429196
-2.147703595	4464.941257	0.019429196
-2.145826579	4408.215465	0.019744116
-2.145826579	4408.215465	0.019744116
-2.144199724	4475.255315	0.020149903
-2.144199724	4475.255315	0.020149903
-2.144199724	4475.255315	0.020149903
-2.142573047	4480.412164	0.020521133
-2.142573047	4480.412164	0.020521133
-2.142573047	4480.412164	0.020521133
-2.140821203	4480.646662	0.020884019
-2.140821203	4480.646662	0.020884019
-2.139069356	4488.850618	0.021255249
-2.139069356	4488.850618	0.021255249
-2.139069356	4488.850618	0.021255249
-2.137442502	4502.680735	0.021605621
-2.137442502	4502.680735	0.021605621
-2.137442502	4502.680735	0.021605621
-2.135815824	4496.586229	0.021974765
-2.135815824	4496.586229	0.021974765
-2.135815824	4496.586229	0.021974765
-2.134063981	4497.896394	0.022354338
-2.134063981	4497.896394	0.022354338

-2.132312134	4514.30462	0.022725566
-2.132312134	4514.30462	0.022725566
-2.132312134	4514.30462	0.022725566
-2.130560287	4517.117543	0.023088454
-2.130560287	4517.117543	0.023088454
-2.130560287	4517.117543	0.023088454
-2.128808263	4526.962605	0.023442997
-2.128808263	4526.962605	0.023442997
-2.127181589	4535.401036	0.023810056
-2.127181589	4535.401036	0.023810056
-2.127181589	4535.401036	0.023810056
-2.125429742	4543.371146	0.024168772
-2.125429742	4543.371146	0.024168772
-2.125429742	4543.371146	0.024168772
-2.123803064	4526.962605	0.024525403
-2.123803064	4526.962605	0.024525403
-2.123803064	4526.962605	0.024525403
-2.12217621	4529.306531	0.024898717
-2.12217621	4529.306531	0.024898717
-2.120299194	4546.183754	0.025259519
-2.120299194	4546.183754	0.025259519
-2.120299194	4546.183754	0.025259519
-2.118672519	4555.560156	0.02562449
-2.118672519	4555.560156	0.02562449
-2.118672519	4555.560156	0.02562449
-2.117045665	4561.185665	0.025985292
-2.117045665	4561.185665	0.025985292
-2.117045665	4561.185665	0.025985292
-2.115293818	4565.40488	0.026341921
-2.115293818	4565.40488	0.026341921
-2.113667144	4605.253809	0.026625559
-2.113667144	4605.253809	0.026625559
-2.113667144	4605.253809	0.026625559
-2.111790127	4550.871944	0.027030155
-2.111790127	4550.871944	0.027030155
-2.111790127	4550.871944	0.027030155
-2.11003828	4579.938154	0.027401385
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-1.870907462	4624.006298	0.005533354
-1.869155618	4611.348314	0.005533354
-1.869155618	4611.348314	0.005533354
-1.869155618	4611.348314	0.005533354
-1.867528941	4592.596161	0.005534918
-1.867528941	4592.596161	0.005534918
-1.867528941	4592.596161	0.005534918
-1.865526755	4564.467584	0.005533354
-1.865526755	4564.467584	0.005533354
-1.865526755	4564.467584	0.005533354
-1.86402507	4570.562089	0.005533354
-1.86402507	4570.562089	0.005533354
-1.862273224	4562.123321	0.005534396
-1.862273224	4562.123321	0.005534396
-1.862273224	4562.123321	0.005534396
-1.86052138	4544.308464	0.005534918
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-1.86052138	4544.308464	0.005534918
-1.858894702	4535.870033	0.005534396
-1.858894702	4535.870033	0.005534396
-1.858894702	4535.870033	0.005534396
-1.857267848	4562.123321	0.005535439
-1.857267848	4562.123321	0.005535439
-1.855516004	4492.739522	0.005534396
-1.855516004	4492.739522	0.005534396
-1.855516004	4492.739522	0.005534396
-1.853764157	4484.300753	0.005534396
-1.853764157	4484.300753	0.005534396
-1.853764157	4484.300753	0.005534396
-1.85201231	4471.643106	0.005535439
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-1.85201231	4471.643106	0.005535439
-1.850385456	4452.421957	0.005535439
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-1.84850844	4433.200471	0.005533354
-1.84850844	4433.200471	0.005533354
-1.84850844	4433.200471	0.005533354
-1.847006935	4413.041688	0.005533875
-1.847006935	4413.041688	0.005533875
-1.847006935	4413.041688	0.005533875
-1.84538008	4401.321337	0.005535439

-1.84538008	4401.321337	0.005535439
-1.843628233	4355.8469	0.005534918
-1.843628233	4355.8469	0.005534918
-1.843628233	4355.8469	0.005534918
-1.842001559	4335.219121	0.005535439
-1.842001559	4335.219121	0.005535439
-1.842001559	4335.219121	0.005535439
-1.83999937	4323.967766	0.005534918
-1.83999937	4323.967766	0.005534918
-1.83999937	4323.967766	0.005534918
-1.838497865	4302.402691	0.005534396
-1.838497865	4302.402691	0.005534396
-1.836745841	4279.430985	0.005534396
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-1.836745841	4279.430985	0.005534396
-1.834993995	4246.145222	0.005535439
-1.834993995	4246.145222	0.005535439
-1.834993995	4246.145222	0.005535439
-1.833242151	4232.080922	0.005536482
-1.833242151	4232.080922	0.005536482
-1.833242151	4232.080922	0.005536482
-1.831490304	4178.167716	0.005534396
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-1.829863627	4162.697146	0.005534396
-1.829863627	4162.697146	0.005534396
-1.829863627	4162.697146	0.005534396
-1.828236772	4130.349353	0.005536482
-1.828236772	4130.349353	0.005536482
-1.828236772	4130.349353	0.005536482
-1.826484928	4093.313347	0.005536482
-1.826484928	4093.313347	0.005536482
-1.824733081	4062.371869	0.005537003
-1.824733081	4062.371869	0.005537003
-1.824733081	4062.371869	0.005537003
-1.822981235	4030.492736	0.005534396
-1.822981235	4030.492736	0.005534396
-1.822981235	4030.492736	0.005534396
-1.82147955	3995.800657	0.005536482
-1.82147955	3995.800657	0.005536482
-1.82147955	3995.800657	0.005536482
-1.819727706	3942.356448	0.005535439
-1.819727706	3942.356448	0.005535439
-1.817975859	3911.883607	0.005534396
-1.817975859	3911.883607	0.005534396
-1.817975859	3911.883607	0.005534396
-1.816224012	3869.221756	0.00553596
-1.816224012	3869.221756	0.00553596
-1.816224012	3869.221756	0.00553596
-1.814472168	3821.403392	0.005534918
-1.814472168	3821.403392	0.005534918
-1.814472168	3821.403392	0.005534918

-1.812845314	3786.711336	0.005536482
-1.812845314	3786.711336	0.005536482
-1.811093467	3736.079712	0.005535439
-1.811093467	3736.079712	0.005535439
-1.811093467	3736.079712	0.005535439
-1.80946679	3678.884924	0.005536482
-1.80946679	3678.884924	0.005536482
-1.80946679	3678.884924	0.005536482
-1.807714946	3634.81678	0.005535439
-1.807714946	3634.81678	0.005535439
-1.805962919	3580.434937	0.005535439
-1.805962919	3580.434937	0.005535439
-1.805962919	3580.434937	0.005535439
-1.804211075	3532.616214	0.005534918
-1.804211075	3532.616214	0.005534918
-1.804211075	3532.616214	0.005534918
-1.802584398	3469.795581	0.005536482
-1.802584398	3469.795581	0.005536482
-1.802584398	3469.795581	0.005536482
-1.800957723	3423.85217	0.005537524
-1.800957723	3423.85217	0.005537524
-1.799205696	3362.906825	0.005536482
-1.799205696	3362.906825	0.005536482
-1.799205696	3362.906825	0.005536482
-1.797453852	3285.084258	0.005537524
-1.797453852	3285.084258	0.005537524
-1.797453852	3285.084258	0.005537524
-1.795702006	3227.420833	0.00553596
-1.795702006	3227.420833	0.00553596
-1.794450662	3129.439483	0.005536482
-1.794450662	3129.439483	0.005536482
-1.794450662	3129.439483	0.005536482
-1.792448477	3090.059214	0.005537524
-1.792448477	3090.059214	0.005537524
-1.792448477	3090.059214	0.005537524
-1.79069663	3024.425995	0.00553596
-1.79069663	3024.425995	0.00553596
-1.79069663	3024.425995	0.00553596
-1.788944783	2945.665794	0.005536482
-1.788944783	2945.665794	0.005536482
-1.786942597	2866.436956	0.005536482
-1.786942597	2866.436956	0.005536482
-1.786942597	2866.436956	0.005536482
-1.785566262	2758.003358	0.005537003
-1.785566262	2758.003358	0.005537003
-1.785566262	2758.003358	0.005537003

Specimen No.	236T	Temperature
Init. Width		0.251 Init. Thick.
Final Width		0.14 Final Thick.

Init. Gage	1 Final Gage	1.36	
Init. Area	0.0495 Final Area	0.0154	
Pct. Red.	68.89 Pct. Elong.	36	
Modulus	29.39 Xhead Rate	0.05	
Yield	80.5 Ultimate	100.5	
Full Scale	3.00001 22480.90247	0.05	
Time	Stroke	Load	Strain
	-2.293859795	5.422978179	5.49231E-05
	-2.293859795	5.422978179	5.49231E-05
	-2.293859795	4.836946014	5.44018E-05
	-2.293859795	4.836946014	5.44018E-05
	-2.293859795	4.836946014	5.44018E-05
	-2.292608632	13.86154462	5.80515E-05
	-2.292608632	13.86154462	5.80515E-05
	-2.290981778	76.09610135	7.96892E-05
	-2.290981778	76.09610135	7.96892E-05
	-2.290981778	76.09610135	7.96892E-05
	-2.289229931	208.6521799	0.000125832
	-2.289229931	208.6521799	0.000125832
	-2.289229931	208.6521799	0.000125832
	-2.287478084	406.4901016	0.000200391
	-2.287478084	406.4901016	0.000200391
	-2.285976402	644.8800868	0.000285377
	-2.285976402	644.8800868	0.000285377
	-2.285976402	644.8800868	0.000285377
	-2.284224555	957.3420378	0.000391219
	-2.284224555	957.3420378	0.000391219
	-2.284224555	957.3420378	0.000391219
	-2.282472708	1287.618913	0.0005041
	-2.282472708	1287.618913	0.0005041
	-2.282472708	1287.618913	0.0005041
	-2.280720861	1643.797519	0.000626887
	-2.280720861	1643.797519	0.000626887
	-2.278969018	2005.836109	0.000746546
	-2.278969018	2005.836109	0.000746546
	-2.278969018	2005.836109	0.000746546
	-2.277216991	2406.630225	0.000881847
	-2.277216991	2406.630225	0.000881847
	-2.277216991	2406.630225	0.000881847
	-2.275590316	2808.634824	0.001024186
	-2.275590316	2808.634824	0.001024186
	-2.275590316	2808.634824	0.001024186
	-2.273838469	3188.605689	0.001184252
	-2.273838469	3188.605689	0.001184252
	-2.272211795	3514.663011	0.001392808
	-2.272211795	3514.663011	0.001392808
	-2.272211795	3514.663011	0.001392808
	-2.270459768	3757.506777	0.001688436
	-2.270459768	3757.506777	0.001688436
	-2.270459768	3757.506777	0.001688436
	-2.268457763	3905.182095	0.002049237

-2.268457763	3905.182095	0.002049237
-2.266956077	3990.036801	0.002446014
-2.266956077	3990.036801	0.002446014
-2.266956077	3990.036801	0.002446014
-2.265454572	4066.921375	0.002865733
-2.265454572	4066.921375	0.002865733
-2.265454572	4066.921375	0.002865733
-2.263702549	4115.677731	0.003295097
-2.263702549	4115.677731	0.003295097
-2.263702549	4115.677731	0.003295097
-2.261950702	4152.713714	0.003711687
-2.261950702	4152.713714	0.003711687
-2.260198855	4181.779925	0.004162949
-2.260198855	4181.779925	0.004162949
-2.260198855	4181.779925	0.004162949
-2.258447008	4202.642202	0.004589446
-2.258447008	4202.642202	0.004589446
-2.258447008	4202.642202	0.004589446
-2.256695164	4231.473915	0.005008904
-2.256695164	4231.473915	0.005008904
-2.254943317	4248.819774	0.005429076
-2.254943317	4248.819774	0.005429076
-2.254943317	4248.819774	0.005429076
-2.253316463	4272.025978	0.005851922
-2.253316463	4272.025978	0.005851922
-2.253316463	4272.025978	0.005851922
-2.251689789	4285.621619	0.006271119
-2.251689789	4285.621619	0.006271119
-2.251689789	4285.621619	0.006271119
-2.249937942	4271.791502	0.00665799
-2.249937942	4271.791502	0.00665799
-2.248186095	4311.171771	0.007120463
-2.248186095	4311.171771	0.007120463
-2.248186095	4311.171771	0.007120463
-2.24668441	4321.250994	0.007536531
-2.24668441	4321.250994	0.007536531
-2.24668441	4321.250994	0.007536531
-2.244807394	4343.050905	0.007957814
-2.244807394	4343.050905	0.007957814
-2.244807394	4343.050905	0.007957814
-2.24305555	4354.770919	0.008385353
-2.24305555	4354.770919	0.008385353
-2.241178534	4359.927768	0.008805592
-2.241178534	4359.927768	0.008805592
-2.241178534	4359.927768	0.008805592
-2.239676849	4376.336332	0.009197678
-2.239676849	4376.336332	0.009197678
-2.239676849	4376.336332	0.009197678
-2.237925002	4365.08464	0.009592891
-2.237925002	4365.08464	0.009592891
-2.236423497	4394.385349	0.010036071

-2.236423497	4394.385349	0.010036071
-2.236423497	4394.385349	0.010036071
-2.234421311	4404.464909	0.010450873
-2.234421311	4404.464909	0.010450873
-2.234421311	4404.464909	0.010450873
-2.232794634	4414.075472	0.0108586
-2.232794634	4414.075472	0.0108586
-2.232794634	4414.075472	0.0108586
-2.231167779	4429.077406	0.011287182
-2.231167779	4429.077406	0.011287182
-2.229415935	4438.21931	0.011699079
-2.229415935	4438.21931	0.011699079
-2.229415935	4438.21931	0.011699079
-2.227664089	4452.986745	0.012118276
-2.227664089	4452.986745	0.012118276
-2.227664089	4452.986745	0.012118276
-2.225912242	4418.763685	0.012503061
-2.225912242	4418.763685	0.012503061
-2.225912242	4418.763685	0.012503061
-2.224285387	4470.098443	0.012958756
-2.224285387	4470.098443	0.012958756
-2.222533354	4480.646662	0.013382123
-2.222533354	4480.646662	0.013382123
-2.222533354	4480.646662	0.013382123
-2.220906866	4481.583981	0.013798192
-2.220906866	4481.583981	0.013798192
-2.220906866	4481.583981	0.013798192
-2.21902985	4492.132515	0.014216347
-2.21902985	4492.132515	0.014216347
-2.21902985	4492.132515	0.014216347
-2.217403175	4507.741455	0.014626159
-2.217403175	4507.741455	0.014626159
-2.21590149	4515.242254	0.015040141
-2.21590149	4515.242254	0.015040141
-2.21590149	4515.242254	0.015040141
-2.214149643	4503.990899	0.015460381
-2.214149643	4503.990899	0.015460381
-2.214149643	4503.990899	0.015460381
-2.212397797	4532.119454	0.015887921
-2.212397797	4532.119454	0.015887921
-2.210645953	4542.433512	0.016307119
-2.210645953	4542.433512	0.016307119
-2.210645953	4542.433512	0.016307119
-2.208893926	4538.682956	0.016701289
-2.208893926	4538.682956	0.016701289
-2.208893926	4538.682956	0.016701289
-2.207267252	4557.435445	0.017119442
-2.207267252	4557.435445	0.017119442
-2.207267252	4557.435445	0.017119442
-2.205390235	4570.562089	0.01753134
-2.205390235	4570.562089	0.01753134

-2.20388873	4570.562089	0.017941152
-2.20388873	4570.562089	0.017941152
-2.20388873	4570.562089	0.017941152
-2.201886542	4562.123321	0.018355136
-2.201886542	4562.123321	0.018355136
-2.201886542	4562.123321	0.018355136
-2.20038486	4588.376608	0.018775375
-2.20038486	4588.376608	0.018775375
-2.20038486	4588.376608	0.018775375
-2.198758182	4601.50359	0.019191444
-2.198758182	4601.50359	0.019191444
-2.196881166	4604.316175	0.019604383
-2.196881166	4604.316175	0.019604383
-2.196881166	4604.316175	0.019604383
-2.195379481	4617.443156	0.020017324
-2.195379481	4617.443156	0.020017324
-2.195379481	4617.443156	0.020017324
-2.193627637	4639.945865	0.020398085
-2.193627637	4639.945865	0.020398085
-2.19187579	4616.5055	0.020817281
-2.19187579	4616.5055	0.020817281
-2.19187579	4616.5055	0.020817281
-2.190123943	4637.132942	0.021242735
-2.190123943	4637.132942	0.021242735
-2.190123943	4637.132942	0.021242735
-2.1883721	4640.883521	0.021651503
-2.1883721	4640.883521	0.021651503
-2.1883721	4640.883521	0.021651503
-2.186870415	4647.91566	0.022056103
-2.186870415	4647.91566	0.022056103
-2.184993398	4660.573644	0.022460701
-2.184993398	4660.573644	0.022460701
-2.184993398	4660.573644	0.022460701
-2.183366721	4667.605783	0.022861128
-2.183366721	4667.605783	0.022861128
-2.183366721	4667.605783	0.022861128
-2.181614877	4675.106581	0.023263639
-2.181614877	4675.106581	0.023263639
-2.181614877	4675.106581	0.023263639
-2.17986303	4663.855227	0.023664066
-2.17986303	4663.855227	0.023664066
-2.177860845	4620.255742	0.0239769
-2.177860845	4620.255742	0.0239769
-2.177860845	4620.255742	0.0239769
-2.176484329	4683.54535	0.024485776
-2.176484329	4683.54535	0.024485776
-2.176484329	4683.54535	0.024485776
-2.174857655	4698.078287	0.024865347
-2.174857655	4698.078287	0.024865347
-2.173105628	4702.766499	0.025261605
-2.173105628	4702.766499	0.025261605

-2.173105628	4702.766499	0.025261605
-2.171353784	4706.517056	0.025653687
-2.171353784	4706.517056	0.025653687
-2.171353784	4706.517056	0.025653687
-2.169727106	4727.144498	0.026035345
-2.169727106	4727.144498	0.026035345
-2.169727106	4727.144498	0.026035345
-2.167975263	4707.454712	0.026444113
-2.167975263	4707.454712	0.026444113
-2.166348408	4730.426417	0.026842457
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-2.166348408	4730.426417	0.026842457
-2.164471569	4734.645633	0.027236626
-2.164471569	4734.645633	0.027236626
-2.164471569	4734.645633	0.027236626
-2.162844714	4729.95742	0.027622455
-2.162844714	4729.95742	0.027622455
-2.161092868	4750.5852	0.028014538
-2.161092868	4750.5852	0.028014538
-2.161092868	4750.5852	0.028014538
-2.159341024	4751.522856	0.028400368
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-2.15583733	4756.210708	0.029184538
-2.15583733	4756.210708	0.029184538
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-1.923463738	4864.03712	0.005268488
-1.921586721	4781.5267	0.005267445
-1.921586721	4781.5267	0.005267445
-1.919959864	4845.753627	0.00526953
-1.919959864	4845.753627	0.00526953
-1.919959864	4845.753627	0.00526953
-1.918333189	4837.783832	0.00526953
-1.918333189	4837.783832	0.00526953
-1.918333189	4837.783832	0.00526953

-1.916581343	4822.781921	0.00526953
-1.916581343	4822.781921	0.00526953
-1.916581343	4822.781921	0.00526953
-1.914829499	4814.343152	0.005270573
-1.914829499	4814.343152	0.005270573
-1.913202644	4809.655277	0.005270052
-1.913202644	4809.655277	0.005270052
-1.913202644	4809.655277	0.005270052
-1.911325628	4796.528633	0.005270573
-1.911325628	4796.528633	0.005270573
-1.911325628	4796.528633	0.005270573
-1.909573781	4771.212642	0.005270573
-1.909573781	4771.212642	0.005270573
-1.909573781	4771.212642	0.005270573
-1.908072276	4771.681638	0.005269009
-1.908072276	4771.681638	0.005269009
-1.906320429	4762.77421	0.00526953
-1.906320429	4762.77421	0.00526953
-1.906320429	4762.77421	0.00526953
-1.904568406	4739.333508	0.005269009
-1.904568406	4739.333508	0.005269009
-1.904568406	4739.333508	0.005269009
-1.902816559	4733.707999	0.005270573
-1.902816559	4733.707999	0.005270573
-1.902816559	4733.707999	0.005270573
-1.901064712	4721.518989	0.005267966
-1.901064712	4721.518989	0.005267966
-1.899563207	4696.671994	0.005268488
-1.899563207	4696.671994	0.005268488
-1.899563207	4696.671994	0.005268488
-1.897561021	4663.855227	0.005270573
-1.897561021	4663.855227	0.005270573
-1.897561021	4663.855227	0.005270573
-1.896059336	4664.323886	0.005270573
-1.896059336	4664.323886	0.005270573
-1.894432662	4652.603872	0.005270573
-1.894432662	4652.603872	0.005270573
-1.894432662	4652.603872	0.005270573
-1.892555645	4630.5698	0.00526953
-1.892555645	4630.5698	0.00526953
-1.892555645	4630.5698	0.00526953
-1.89105396	4615.09887	0.005270052
-1.89105396	4615.09887	0.005270052
-1.89105396	4615.09887	0.005270052
-1.889302114	4629.16317	0.005268488
-1.889302114	4629.16317	0.005268488
-1.887550267	4563.529951	0.005271616
-1.887550267	4563.529951	0.005271616
-1.887550267	4563.529951	0.005271616
-1.885548081	4552.747233	0.005270052
-1.885548081	4552.747233	0.005270052

-1.885548081	4552.747233	0.005270052
-1.884046576	4527.431579	0.005271095
-1.884046576	4527.431579	0.005271095
-1.884046576	4527.431579	0.005271095
-1.882419722	4505.397192	0.005270573
-1.882419722	4505.397192	0.005270573
-1.880542705	4484.76975	0.005270573
-1.880542705	4484.76975	0.005270573
-1.880542705	4484.76975	0.005270573
-1.8790412	4452.890616	0.005270052
-1.8790412	4452.890616	0.005270052
-1.8790412	4452.890616	0.005270052
-1.877289354	4435.07576	0.005272137
-1.877289354	4435.07576	0.005272137
-1.875537507	4385.850767	0.005271616
-1.875537507	4385.850767	0.005271616
-1.875537507	4385.850767	0.005271616
-1.874035825	4355.8469	0.005270052
-1.874035825	4355.8469	0.005270052
-1.874035825	4355.8469	0.005270052
-1.872158809	4344.595545	0.005271616
-1.872158809	4344.595545	0.005271616
-1.872158809	4344.595545	0.005271616
-1.870532131	4318.34192	0.005271616
-1.870532131	4318.34192	0.005271616
-1.868655115	4285.056494	0.005270573
-1.868655115	4285.056494	0.005270573
-1.868655115	4285.056494	0.005270573
-1.86702826	4252.708701	0.005271095
-1.86702826	4252.708701	0.005271095
-1.86702826	4252.708701	0.005271095
-1.865276414	4234.893845	0.005271095
-1.865276414	4234.893845	0.005271095
-1.865276414	4234.893845	0.005271095
-1.863649739	4172.542207	0.005271616
-1.863649739	4172.542207	0.005271616
-1.862022885	4152.852084	0.00526953
-1.862022885	4152.852084	0.00526953
-1.862022885	4152.852084	0.00526953
-1.860020876	4113.940789	0.005272137
-1.860020876	4113.940789	0.005272137
-1.860020876	4113.940789	0.005272137
-1.858394022	4068.935012	0.005270052
-1.858394022	4068.935012	0.005270052
-1.856767347	4042.681724	0.005273702
-1.856767347	4042.681724	0.005273702
-1.856767347	4042.681724	0.005273702
-1.8550155	3997.675946	0.005272659
-1.8550155	3997.675946	0.005272659
-1.8550155	3997.675946	0.005272659
-1.853388646	3964.859179	0.005272137

-1.853388646	3964.859179	0.005272137
-1.853388646	3964.859179	0.005272137
-1.85151181	3905.789102	0.005271616
-1.85151181	3905.789102	0.005271616
-1.849884955	3867.346826	0.005273702
-1.849884955	3867.346826	0.005273702
-1.849884955	3867.346826	0.005273702
-1.848258278	3816.71518	0.00527318
-1.848258278	3816.71518	0.00527318
-1.848258278	3816.71518	0.00527318
-1.846506434	3763.270971	0.005272659
-1.846506434	3763.270971	0.005272659
-1.844879577	3725.296995	0.005272659
-1.844879577	3725.296995	0.005272659
-1.844879577	3725.296995	0.005272659
-1.843002563	3674.665708	0.005272137
-1.843002563	3674.665708	0.005272137
-1.843002563	3674.665708	0.005272137
-1.841501055	3609.969785	0.005272137
-1.841501055	3609.969785	0.005272137
-1.841501055	3609.969785	0.005272137
-1.839749211	3556.525576	0.00527318
-1.839749211	3556.525576	0.00527318
-1.837997185	3492.298649	0.005272659
-1.837997185	3492.298649	0.005272659
-1.837997185	3492.298649	0.005272659
-1.83637051	3419.163957	0.005271616
-1.83637051	3419.163957	0.005271616
-1.83637051	3419.163957	0.005271616
-1.835744837	1.906875109	0.005272659

Specimen No.	271B	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.14	Final Thick.	
Init. Gage	1	Final Gage	1.36
Init. Area	0.0495	Final Area	0.0154
Pct. Red.	68.89	Pct. Elong.	36
Modulus	29.76	Xhead Rate	0.05
Yield	67.2	Ultimate	90.6
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.241929376	4.719730588	0.000350551
	-2.241929376	4.016527959	0.00035003
	-2.241929376	4.016527959	0.00035003
	-2.24067803	28.6290696	0.000363325
	-2.24067803	28.6290696	0.000363325
	-2.24067803	28.6290696	0.000363325
	-2.238926186	167.8656856	0.000414682
	-2.238926186	167.8656856	0.000414682
	-2.238926186	167.8656856	0.000414682

-2.237424501	405.2008443	0.000486112
-2.237424501	405.2008443	0.000486112
-2.237424501	405.2008443	0.000486112
-2.235672654	697.0352185	0.000576834
-2.235672654	697.0352185	0.000576834
-2.233920807	1015.59172	0.000684501
-2.233920807	1015.59172	0.000684501
-2.233920807	1015.59172	0.000684501
-2.232168964	1401.65691	0.000830229
-2.232168964	1401.65691	0.000830229
-2.232168964	1401.65691	0.000830229
-2.230416937	1785.143675	0.000993945
-2.230416937	1785.143675	0.000993945
-2.228665093	2170.857309	0.001181124
-2.228665093	2170.857309	0.001181124
-2.228665093	2170.857309	0.001181124
-2.226913246	2529.224071	0.001395415
-2.226913246	2529.224071	0.001395415
-2.226913246	2529.224071	0.001395415
-2.225286569	2852.234309	0.001652981
-2.225286569	2852.234309	0.001652981
-2.225286569	2852.234309	0.001652981
-2.223659714	3112.658411	0.0019679
-2.223659714	3112.658411	0.0019679
-2.22190787	3284.477251	0.002328962
-2.22190787	3284.477251	0.002328962
-2.22190787	3284.477251	0.002328962
-2.220156023	3387.146813	0.002713227
-2.220156023	3387.146813	0.002713227
-2.220156023	3387.146813	0.002713227
-2.218404177	3453.717666	0.003076374
-2.218404177	3453.717666	0.003076374
-2.216777502	3502.708521	0.003427009
-2.216777502	3502.708521	0.003427009
-2.216777502	3502.708521	0.003427009
-2.214900486	3536.228446	0.003767476
-2.214900486	3536.228446	0.003767476
-2.214900486	3536.228446	0.003767476
-2.213398801	3566.935448	0.004107682
-2.213398801	3566.935448	0.004107682
-2.213398801	3566.935448	0.004107682
-2.211646954	3593.891871	0.004455449
-2.211646954	3593.891871	0.004455449
-2.20989511	3595.298501	0.004743777
-2.20989511	3595.298501	0.004743777
-2.20989511	3595.298501	0.004743777
-2.208143263	3629.990557	0.00513814
-2.208143263	3629.990557	0.00513814
-2.208143263	3629.990557	0.00513814
-2.206516409	3642.882703	0.005478086
-2.206516409	3642.882703	0.005478086

-2.206516409	3642.882703	0.005478086
-2.204764562	3658.119135	0.005827417
-2.204764562	3658.119135	0.005827417
-2.203012718	3674.527361	0.006186654
-2.203012718	3674.527361	0.006186654
-2.203012718	3674.527361	0.006186654
-2.201386041	3686.950847	0.006531814
-2.201386041	3686.950847	0.006531814
-2.201386041	3686.950847	0.006531814
-2.199634017	3698.202202	0.00690565
-2.199634017	3698.202202	0.00690565
-2.19788217	3690.23243	0.007262281
-2.19788217	3690.23243	0.007262281
-2.19788217	3690.23243	0.007262281
-2.196255496	3725.158984	0.007657494
-2.196255496	3725.158984	0.007657494
-2.196255496	3725.158984	0.007657494
-2.19437848	3732.191123	0.00803498
-2.19437848	3732.191123	0.00803498
-2.19437848	3732.191123	0.00803498
-2.192751802	3746.2554	0.008409337
-2.192751802	3746.2554	0.008409337
-2.191124948	3750.943276	0.008796729
-2.191124948	3750.943276	0.008796729
-2.191124948	3750.943276	0.008796729
-2.189373101	3757.038118	0.009182557
-2.189373101	3757.038118	0.009182557
-2.189373101	3757.038118	0.009182557
-2.187746426	3776.493765	0.00958142
-2.187746426	3776.493765	0.00958142
-2.187746426	3776.493765	0.00958142
-2.18586941	3752.115407	0.009965163
-2.18586941	3752.115407	0.009965163
-2.184242556	3793.605127	0.010389349
-2.184242556	3793.605127	0.010389349
-2.184242556	3793.605127	0.010389349
-2.182615878	3802.043896	0.010797076
-2.182615878	3802.043896	0.010797076
-2.182615878	3802.043896	0.010797076
-2.180864035	3807.200767	0.011197503
-2.180864035	3807.200767	0.011197503
-2.180864035	3807.200767	0.011197503
-2.179237357	3821.96818	0.011614614
-2.179237357	3821.96818	0.011614614
-2.177360341	3828.765843	0.01202964
-2.177360341	3828.765843	0.01202964
-2.177360341	3828.765843	0.01202964
-2.175733486	3828.765843	0.012411297
-2.175733486	3828.765843	0.012411297
-2.175733486	3828.765843	0.012411297
-2.17385647	3825.015264	0.01282111

-2.17385647	3825.015264	0.01282111
-2.172354965	3846.580699	0.01323822
-2.172354965	3846.580699	0.01323822
-2.172354965	3846.580699	0.01323822
-2.170603118	3858.769687	0.013656375
-2.170603118	3858.769687	0.013656375
-2.170603118	3858.769687	0.013656375
-2.168851094	3861.113973	0.014070357
-2.168851094	3861.113973	0.014070357
-2.168851094	3861.113973	0.014070357
-2.167099248	3875.64691	0.014488512
-2.167099248	3875.64691	0.014488512
-2.165597743	3883.148023	0.014903538
-2.165597743	3883.148023	0.014903538
-2.165597743	3883.148023	0.014903538
-2.163845899	3878.225335	0.015323778
-2.163845899	3878.225335	0.015323778
-2.163845899	3878.225335	0.015323778
-2.16184371	3865.333189	0.015735675
-2.16184371	3865.333189	0.015735675
-2.16184371	3865.333189	0.015735675
-2.160467198	3896.743326	0.016171557
-2.158590181	3701.249623	0.005197579
-2.158590181	3701.249623	0.005197579
-2.158590181	3701.249623	0.005197579
-2.157464008	3927.684826	0.005199143
-2.157464008	3927.684826	0.005199143
-2.157464008	3927.684826	0.005199143
-2.15583733	3933.779331	0.005200186
-2.15583733	3933.779331	0.005200186
-2.153835144	3908.463677	0.005199664
-2.153835144	3908.463677	0.005199664
-2.153835144	3908.463677	0.005199664
-2.152333459	3940.577309	0.005201228
-2.152333459	3940.577309	0.005201228
-2.152333459	3940.577309	0.005201228
-2.150581616	3948.078107	0.005201228
-2.150581616	3948.078107	0.005201228
-2.150581616	3948.078107	0.005201228
-2.148829769	3941.983602	0.005202793
-2.148829769	3941.983602	0.005202793
-2.147077922	3965.658465	0.00520175
-2.147077922	3965.658465	0.00520175
-2.147077922	3965.658465	0.00520175
-2.145326075	3987.223878	0.005202793
-2.145326075	3987.223878	0.005202793
-2.145326075	3987.223878	0.005202793
-2.143699221	3969.409021	0.005202793
-2.143699221	3969.409021	0.005202793
-2.142072546	3968.471388	0.005203314
-2.142072546	3968.471388	0.005203314

-2.142072546	3968.471388	0.005203314
-2.140320699	3983.707797	0.005201228
-2.140320699	3983.707797	0.005201228
-2.140320699	3983.707797	0.005201228
-2.138693845	3996.365467	0.005201228
-2.138693845	3996.365467	0.005201228
-2.138693845	3996.365467	0.005201228
-2.136816829	3997.068939	0.005203835
-2.136816829	3997.068939	0.005203835
-2.135190154	4007.148162	0.005202793
-2.135190154	4007.148162	0.005202793
-2.135190154	4007.148162	0.005202793
-2.133563477	4017.461883	0.00520175
-2.133563477	4017.461883	0.00520175
-2.133563477	4017.461883	0.00520175
-2.131811633	4010.195583	0.00520175
-2.131811633	4010.195583	0.00520175
-2.131811633	4010.195583	0.00520175
-2.129809444	3992.380727	0.005202793
-2.129809444	3992.380727	0.005202793
-2.128432932	4021.681436	0.005200707
-2.128432932	4021.681436	0.005200707
-2.128432932	4021.681436	0.005200707
-2.126681085	4035.276739	0.005202793
-2.126681085	4035.276739	0.005202793
-2.126681085	4035.276739	0.005202793
-2.124804069	4041.840219	0.005203314
-2.124804069	4041.840219	0.005203314
-2.123302384	4049.575515	0.005202793
-2.123302384	4049.575515	0.005202793
-2.123302384	4049.575515	0.005202793
-2.12155054	4057.779808	0.00520175
-2.12155054	4057.779808	0.00520175
-2.12155054	4057.779808	0.00520175
-2.119798693	4041.605743	0.005202793
-2.119798693	4041.605743	0.005202793
-2.119798693	4041.605743	0.005202793
-2.118046846	4062.702159	0.005202271
-2.118046846	4062.702159	0.005202271
-2.116420172	4066.921375	0.005203835
-2.116420172	4066.921375	0.005203835
-2.116420172	4066.921375	0.005203835
-2.114793317	4075.125668	0.005202793
-2.114793317	4075.125668	0.005202793
-2.114793317	4075.125668	0.005202793
-2.11304147	4084.501733	0.00520175
-2.11304147	4084.501733	0.00520175
-2.11304147	4084.501733	0.00520175
-2.111289624	4080.517015	0.005202793
-2.111289624	4080.517015	0.005202793
-2.10953778	4094.815791	0.00520175

-2.10953778	4094.815791	0.00520175
-2.10953778	4094.815791	0.00520175
-2.107785933	4080.048356	0.00520175
-2.107785933	4080.048356	0.00520175
-2.107785933	4080.048356	0.00520175
-2.106159079	4099.738164	0.00520175
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-1.872283978	4465.644752	0.005228862
-1.870532131	4464.003623	0.005226255
-1.870532131	4464.003623	0.005226255
-1.870532131	4464.003623	0.005226255
-1.868905277	4469.394971	0.005229383
-1.868905277	4469.394971	0.005229383
-1.868905277	4469.394971	0.005229383
-1.86715343	4466.816546	0.005228862
-1.86715343	4466.816546	0.005228862
-1.865526755	4453.689902	0.005228862
-1.865526755	4453.689902	0.005228862
-1.865526755	4453.689902	0.005228862
-1.863774909	4467.051044	0.005229383
-1.863774909	4467.051044	0.005229383
-1.863774909	4467.051044	0.005229383
-1.862022885	4468.457337	0.005228862
-1.862022885	4468.457337	0.005228862
-1.862022885	4468.457337	0.005228862
-1.86039621	4470.801601	0.005228862
-1.86039621	4470.801601	0.005228862
-1.858519194	4470.332604	0.005228862
-1.858519194	4470.332604	0.005228862
-1.858519194	4470.332604	0.005228862
-1.857017686	4484.162743	0.005229905
-1.857017686	4484.162743	0.005229905
-1.857017686	4484.162743	0.005229905
-1.8550155	4472.207894	0.005228862
-1.8550155	4472.207894	0.005228862

-1.8550155	4472.207894	0.005228862
-1.853513815	4452.986745	0.005229383
-1.853513815	4452.986745	0.005229383
-1.851761972	4471.035762	0.005228862
-1.851761972	4471.035762	0.005228862
-1.851761972	4471.035762	0.005228862
-1.850010125	4465.175755	0.005229383
-1.850010125	4465.175755	0.005229383
-1.850010125	4465.175755	0.005229383
-1.848258278	4470.567103	0.005229383
-1.848258278	4470.567103	0.005229383
-1.848258278	4470.567103	0.005229383
-1.846756593	4469.629469	0.005229905
-1.846756593	4469.629469	0.005229905
-1.845004749	4467.75418	0.005229905
-1.845004749	4467.75418	0.005229905
-1.845004749	4467.75418	0.005229905
-1.843378072	4466.347887	0.00523199
-1.843378072	4466.347887	0.00523199
-1.843378072	4466.347887	0.00523199
-1.841501055	4428.842907	0.005230948
-1.841501055	4428.842907	0.005230948
-1.839749211	4468.223176	0.005230948
-1.839749211	4468.223176	0.005230948
-1.839749211	4468.223176	0.005230948
-1.838247526	4463.534964	0.005230426
-1.838247526	4463.534964	0.005230426
-1.838247526	4463.534964	0.005230426
-1.83649568	4460.722041	0.005229905
-1.83649568	4460.722041	0.005229905
-1.83649568	4460.722041	0.005229905
-1.834743833	4462.128671	0.005230426
-1.834743833	4462.128671	0.005230426
-1.832991989	4458.846752	0.005229905
-1.832991989	4458.846752	0.005229905
-1.832991989	4458.846752	0.005229905
-1.831239962	4456.971485	0.00523199
-1.831239962	4456.971485	0.00523199
-1.831239962	4456.971485	0.00523199
-1.829488118	4436.344043	0.00523199
-1.829488118	4436.344043	0.00523199
-1.829488118	4436.344043	0.00523199
-1.827861441	4453.455404	0.005229905
-1.827861441	4453.455404	0.005229905
-1.826234766	4450.876979	0.005230426
-1.826234766	4450.876979	0.005230426
-1.826234766	4450.876979	0.005230426
-1.82448274	4439.391127	0.00523199
-1.82448274	4439.391127	0.00523199
-1.82448274	4439.391127	0.00523199
-1.822730896	4440.797757	0.005232512

-1.822730896	4440.797757	0.005232512
-1.820979049	4436.812679	0.005230948
-1.820979049	4436.812679	0.005230948
-1.820979049	4436.812679	0.005230948
-1.819477544	4430.718197	0.005230426
-1.819477544	4430.718197	0.005230426
-1.819477544	4430.718197	0.005230426
-1.817475358	4400.245671	0.005231469
-1.817475358	4400.245671	0.005231469
-1.817475358	4400.245671	0.005231469
-1.815973673	4412.434681	0.005230948
-1.815973673	4412.434681	0.005230948
-1.814221826	4404.464909	0.005230426
-1.814221826	4404.464909	0.005230426
-1.814221826	4404.464909	0.005230426
-1.81246998	4394.151188	0.005231469
-1.81246998	4394.151188	0.005231469
-1.81246998	4394.151188	0.005231469
-1.810843305	4390.635107	0.005231469
-1.810843305	4390.635107	0.005231469
-1.810843305	4390.635107	0.005231469
-1.809216451	4396.963774	0.005230948
-1.809216451	4396.963774	0.005230948
-1.807464604	4359.459109	0.005232512
-1.807464604	4359.459109	0.005232512
-1.807464604	4359.459109	0.005232512
-1.805712757	4350.083044	0.00523199
-1.805712757	4350.083044	0.00523199
-1.805712757	4350.083044	0.00523199
-1.803960913	4336.487403	0.00523199
-1.803960913	4336.487403	0.00523199
-1.802209066	4331.564715	0.005234076
-1.802209066	4331.564715	0.005234076
-1.802209066	4331.564715	0.005234076
-1.800457043	4316.328621	0.005232512
-1.800457043	4316.328621	0.005232512
-1.800457043	4316.328621	0.005232512
-1.798955537	4304.13961	0.005233033
-1.798955537	4304.13961	0.005233033
-1.798955537	4304.13961	0.005233033
-1.797203691	4292.653757	0.005229905
-1.797203691	4292.653757	0.005229905
-1.795451844	4256.32091	0.005230948
-1.795451844	4256.32091	0.005230948
-1.795451844	4256.32091	0.005230948
-1.793449658	4191.15635	0.005233033
-1.793449658	4191.15635	0.005233033
-1.793449658	4191.15635	0.005233033
-1.791947973	4234.755497	0.005230948
-1.791947973	4234.755497	0.005230948
-1.790446468	4216.940641	0.00523199

-1.790446468	4216.940641	0.00523199
-1.790446468	4216.940641	0.00523199
-1.788569452	4197.95399	0.00523199
-1.788569452	4197.95399	0.00523199
-1.788569452	4197.95399	0.00523199
-1.786942597	4173.810153	0.005233555
-1.786942597	4173.810153	0.005233555
-1.786942597	4173.810153	0.005233555
-1.78531592	4165.137223	0.005233033
-1.78531592	4165.137223	0.005233033
-1.783438907	4121.303577	0.005233555
-1.783438907	4121.303577	0.005233555
-1.783438907	4121.303577	0.005233555
-1.781812229	4113.802442	0.00523199
-1.781812229	4113.802442	0.00523199
-1.781812229	4113.802442	0.00523199
-1.780060383	4089.424443	0.005231469
-1.780060383	4089.424443	0.005231469
-1.780060383	4089.424443	0.005231469
-1.778308359	4063.405317	0.005235119
-1.778308359	4063.405317	0.005235119
-1.776681684	4034.104945	0.00523199
-1.776681684	4034.104945	0.00523199
-1.776681684	4034.104945	0.00523199
-1.774929837	4010.898741	0.005232512
-1.774929837	4010.898741	0.005232512
-1.774929837	4010.898741	0.005232512
-1.773428152	3994.021518	0.005232512
-1.773428152	3994.021518	0.005232512
-1.771676306	3946.671814	0.005233033
-1.771676306	3946.671814	0.005233033
-1.771676306	3946.671814	0.005233033
-1.769924462	3928.62246	0.00523199
-1.769924462	3928.62246	0.00523199
-1.769924462	3928.62246	0.00523199
-1.768172615	3896.274667	0.005234076
-1.768172615	3896.274667	0.005234076
-1.768172615	3896.274667	0.005234076
-1.766420768	3860.644977	0.005234076
-1.766420768	3860.644977	0.005234076
-1.764668744	3837.204612	0.005234597
-1.764668744	3837.204612	0.005234597
-1.764668744	3837.204612	0.005234597
-1.762916897	3796.652548	0.005233033
-1.762916897	3796.652548	0.005233033
-1.762916897	3796.652548	0.005233033
-1.761415392	3759.616543	0.00523199
-1.761415392	3759.616543	0.00523199
-1.759663546	3721.877065	0.005234076
-1.759663546	3721.877065	0.005234076
-1.759663546	3721.877065	0.005234076

-1.757911522	3681.5595	0.005233555
-1.757911522	3681.5595	0.005233555
-1.757911522	3681.5595	0.005233555
-1.756159675	3644.523494	0.005234076
-1.756159675	3644.523494	0.005234076
-1.756159675	3644.523494	0.005234076
-1.754407831	3594.829504	0.005233555
-1.754407831	3594.829504	0.005233555
-1.752655984	3560.606444	0.005235119
-1.752655984	3560.606444	0.005235119
-1.752655984	3560.606444	0.005235119
-1.750904137	3508.803004	0.005234597
-1.750904137	3508.803004	0.005234597
-1.750904137	3508.803004	0.005234597
-1.749402452	3441.060019	0.00523564
-1.749402452	3441.060019	0.00523564
-1.749402452	3441.060019	0.00523564
-1.748401451	2.141283479	0.005241375
-1.748401451	2.141283479	0.005241375
-1.746274093	2.727293164	0.005240333
-1.746274093	2.727293164	0.005240333

Specimen No.	271T	Temperature	
Init. Width	0.248	Init. Thick.	
Final Width	0.15	Final Thick.	
Init. Gage	1	Final Gage	1.29
Init. Area	0.0483	Final Area	0.0177
Pct. Red.	63.35	Pct. Elong.	29
Modulus	30.05	Xhead Rate	0.05
Yield	68.9	Ultimate	85
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.272461957	5.657364068	0.000665991
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	3.5477337	0.000664949
	-2.272461957	2.727293164	0.00066912
	-2.272461957	3.196109904	0.000668077
	-2.272461957	3.196109904	0.000668077
	-2.272461957	3.196109904	0.000668077
	-2.272461957	4.016527959	0.000667556
	-2.272461957	4.016527959	0.000667556
	-2.272461957	4.016527959	0.000667556
	-2.272461957	3.31332533	0.000666513

-2.272461957	4.016527959	0.00066938
-2.272461957	4.016527959	0.00066938
-2.271586122	4.250936329	0.000668077
-2.271586122	4.250936329	0.000668077
-2.271586122	4.250936329	0.000668077
-2.269959268	4.719730588	0.000668338
-2.269959268	4.719730588	0.000668338
-2.269959268	4.719730588	0.000668338
-2.268332593	6.594975068	0.000671987
-2.268332593	6.594975068	0.000671987
-2.268332593	6.594975068	0.000671987
-2.266455577	11.28307503	0.000667816
-2.266455577	11.28307503	0.000667816
-2.265079061	69.41554149	0.000675376
-2.265079061	69.41554149	0.000675376
-2.265079061	69.41554149	0.000675376
-2.263327214	199.9792051	0.000712916
-2.263327214	199.9792051	0.000712916
-2.263327214	199.9792051	0.000712916
-2.261575371	401.9191721	0.000786693
-2.261575371	401.9191721	0.000786693
-2.259948693	647.5757718	0.000874547
-2.259948693	647.5757718	0.000874547
-2.259948693	647.5757718	0.000874547
-2.257946507	925.6974024	0.000963965
-2.257946507	925.6974024	0.000963965
-2.257946507	925.6974024	0.000963965
-2.256444822	1289.72852	0.001090142
-2.256444822	1289.72852	0.001090142
-2.256444822	1289.72852	0.001090142
-2.254567806	1637.116936	0.001206933
-2.254567806	1637.116936	0.001206933
-2.252941132	1990.951436	0.001331806
-2.252941132	1990.951436	0.001331806
-2.252941132	1990.951436	0.001331806
-2.251189285	2383.424021	0.001480662
-2.251189285	2383.424021	0.001480662
-2.251189285	2383.424021	0.001480662
-2.249437438	2743.001447	0.001649332
-2.249437438	2743.001447	0.001649332
-2.247810584	3059.91736	0.001886303
-2.247810584	3059.91736	0.001886303
-2.247810584	3059.91736	0.001886303
-2.245933567	3239.94047	0.002239544
-2.245933567	3239.94047	0.002239544
-2.245933567	3239.94047	0.002239544
-2.244432062	3323.388546	0.00267699
-2.244432062	3323.388546	0.00267699
-2.244432062	3323.388546	0.00267699
-2.242805208	3351.986097	0.003143112
-2.242805208	3351.986097	0.003143112

-2.240928192	3392.303663	0.003640778
-2.240928192	3392.303663	0.003640778
-2.240928192	3392.303663	0.003640778
-2.239176345	3426.058086	0.004184327
-2.239176345	3426.058086	0.004184327
-2.239176345	3426.058086	0.004184327
-2.237424501	3455.358457	0.004746384
-2.237424501	3455.358457	0.004746384
-2.237424501	3455.358457	0.004746384
-2.235922996	3465.203519	0.005338875
-2.235922996	3465.203519	0.005338875
-2.233920807	3472.470156	0.005947337
-2.233920807	3472.470156	0.005947337
-2.233920807	3472.470156	0.005947337
-2.232419125	3504.34929	0.006561533
-2.232419125	3504.34929	0.006561533
-2.232419125	3504.34929	0.006561533
-2.230792448	3528.727311	0.007177816
-2.230792448	3528.727311	0.007177816
-2.228915432	3537.634739	0.007790448
-2.228915432	3537.634739	0.007790448
-2.228915432	3537.634739	0.007790448
-2.227413747	3560.137785	0.008399951
-2.227413747	3560.137785	0.008399951
-2.227413747	3560.137785	0.008399951
-2.225661903	3587.328729	0.008968788
-2.225661903	3587.328729	0.008968788
-2.225661903	3587.328729	0.008968788
-2.223910056	3567.169924	0.009590805
-2.223910056	3567.169924	0.009590805
-2.22190787	3598.580083	0.010217291
-2.22190787	3598.580083	0.010217291
-2.22190787	3598.580083	0.010217291
-2.220531355	3607.487511	0.010814803
-2.220531355	3607.487511	0.010814803
-2.220531355	3607.487511	0.010814803
-2.218654518	3626.240001	0.011409187
-2.218654518	3626.240001	0.011409187
-2.216902492	3637.256857	0.011994185
-2.216902492	3637.256857	0.011994185
-2.216902492	3637.256857	0.011994185
-2.215400987	3644.992154	0.012578142
-2.215400987	3644.992154	0.012578142
-2.215400987	3644.992154	0.012578142
-2.213649143	3661.400717	0.013161054
-2.213649143	3661.400717	0.013161054
-2.213649143	3661.400717	0.013161054
-2.211897296	3651.086996	0.013745011
-2.211897296	3651.086996	0.013745011
-2.210395611	3639.132147	0.014295597
-2.210395611	3639.132147	0.014295597

-2.210395611	3639.132147	0.014295597
-2.208518595	3687.888481	0.01489311
-2.208518595	3687.888481	0.01489311
-2.208518595	3687.888481	0.01489311
-2.20689192	3698.4367	0.015458296
-2.20689192	3698.4367	0.015458296
-2.20689192	3698.4367	0.015458296
-2.205139893	3711.797842	0.016034952
-2.205139893	3711.797842	0.016034952
-2.20338805	3713.438633	0.016594924
-2.20338805	3713.438633	0.016594924
-2.20338805	3713.438633	0.016594924
-2.201761372	3736.878998	0.017136127
-2.201761372	3736.878998	0.017136127
-2.201761372	3736.878998	0.017136127
-2.200134698	3722.111563	0.017727383
-2.200134698	3722.111563	0.017727383
-2.198257682	3752.584404	0.018296739
-2.198257682	3752.584404	0.018296739
-2.198257682	3752.584404	0.018296739
-2.196505835	3753.990697	0.018853582
-2.196505835	3753.990697	0.018853582
-2.196505835	3753.990697	0.018853582
-2.19487898	3755.162829	0.019403127
-2.19487898	3755.162829	0.019403127
-2.19487898	3755.162829	0.019403127
-2.193252306	3773.446344	0.019952671
-2.193252306	3773.446344	0.019952671
-2.19137529	3781.181618	0.020504448
-2.19137529	3781.181618	0.020504448
-2.19137529	3781.181618	0.020504448
-2.189748435	3793.370629	0.02103835
-2.189748435	3793.370629	0.02103835
-2.189748435	3793.370629	0.02103835
-2.188121758	3790.792204	0.021611878
-2.188121758	3790.792204	0.021611878
-2.188121758	3790.792204	0.021611878
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-1.95487233	3408.711889	0.005276309
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-1.95487233	3408.711889	0.005276309

-1.953120483	3378.708045	0.005274744
-1.953120483	3378.708045	0.005274744
-1.953120483	3378.708045	0.005274744
-1.95136846	3327.139102	0.005275787
-1.95136846	3327.139102	0.005275787
-1.949616613	3217.437401	0.005275266
-1.949616613	3217.437401	0.005275266
-1.949616613	3217.437401	0.005275266
-1.947864766	3094.14042	0.005275787
-1.947864766	3094.14042	0.005275787
-1.947864766	3094.14042	0.005275787
-1.946112922	2656.974767	0.005275787
-1.946112922	2656.974767	0.005275787
-1.944486245	2423.741766	0.005274744
-1.944486245	2423.741766	0.005274744
-1.944486245	2423.741766	0.005274744
-1.942609228	2089.948811	0.00527683
-1.942609228	2089.948811	0.00527683
-1.942609228	2089.948811	0.00527683
-1.941107543	1623.717105	0.005274744
-1.941107543	1623.717105	0.005274744
-1.941107543	1623.717105	0.005274744
-1.9398562	0.50044737	0.005277873

Specimen No.	282B	Temperature	
Init. Width	0.249	Init. Thick.	
Final Width	0.1	Final Thick.	
Init. Gage	1	Final Gage	1.5
Init. Area	0.0487	Final Area	0.0079
Pct. Red.	83.78	Pct. Elong.	50
Modulus	34.09	Xhead Rate	0.05
Yield	77.7	Ultimate	94.7
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.284349724	1.906875109	0.000366714
	-2.284349724	1.906875109	0.000366714
	-2.283974393	2.492907275	0.000366193
	-2.283974393	2.492907275	0.000366193
	-2.282347539	3.31332533	0.000367235
	-2.282347539	3.31332533	0.000367235
	-2.282347539	3.31332533	0.000367235
	-2.280470523	3.31332533	0.000367757
	-2.280470523	3.31332533	0.000367757
	-2.280470523	3.31332533	0.000367757
	-2.278843845	1.906875109	0.000366193
	-2.278843845	1.906875109	0.000366193
	-2.278843845	1.906875109	0.000366193
	-2.277216991	4.250936329	0.000366453
	-2.277216991	4.250936329	0.000366453
	-2.275465147	3.31332533	0.000367496

-2.275465147	3.31332533	0.000367496
-2.275465147	3.31332533	0.000367496
-2.273838469	7.884209863	0.000367757
-2.273838469	7.884209863	0.000367757
-2.273838469	7.884209863	0.000367757
-2.272211795	6.126180808	0.000370364
-2.272211795	6.126180808	0.000370364
-2.272211795	6.126180808	0.000370364
-2.270459768	15.15075693	0.000386527
-2.270459768	15.15075693	0.000386527
-2.268707924	38.70847215	0.000408425
-2.268707924	38.70847215	0.000408425
-2.268707924	38.70847215	0.000408425
-2.266956077	101.4118456	0.000449876
-2.266956077	101.4118456	0.000449876
-2.266956077	101.4118456	0.000449876
-2.265329403	248.9698576	0.000516874
-2.265329403	248.9698576	0.000516874
-2.263452387	480.0933182	0.000597168
-2.263452387	480.0933182	0.000597168
-2.263452387	480.0933182	0.000597168
-2.261950702	753.6440643	0.000674073
-2.261950702	753.6440643	0.000674073
-2.261950702	753.6440643	0.000674073
-2.259948693	1116.034324	0.000782
-2.259948693	1116.034324	0.000782
-2.259948693	1116.034324	0.000782
-2.258447008	1469.634393	0.000890449
-2.258447008	1469.634393	0.000890449
-2.256695164	1823.000076	0.001001245
-2.256695164	1823.000076	0.001001245
-2.256695164	1823.000076	0.001001245
-2.254943317	2193.125699	0.001122468
-2.254943317	2193.125699	0.001122468
-2.254943317	2193.125699	0.001122468
-2.253316463	2561.80634	0.001249426
-2.253316463	2561.80634	0.001249426
-2.253316463	2561.80634	0.001249426
-2.251439447	2895.599295	0.001371431
-2.251439447	2895.599295	0.001371431
-2.249937942	3146.881494	0.00146841
-2.249937942	3146.881494	0.00146841
-2.249937942	3146.881494	0.00146841
-2.248186095	3333.936743	0.001565909
-2.248186095	3333.936743	0.001565909
-2.248186095	3333.936743	0.001565909
-2.246559241	3439.18473	0.00165246
-2.246559241	3439.18473	0.00165246
-2.244807394	3509.037502	0.001737707
-2.244807394	3509.037502	0.001737707
-2.244807394	3509.037502	0.001737707

-2.24305555	3564.357001	0.001818783
-2.24305555	3564.357001	0.001818783
-2.24305555	3564.357001	0.001818783
-2.241178534	3607.487511	0.001906637
-2.241178534	3607.487511	0.001906637
-2.241178534	3607.487511	0.001906637
-2.239676849	3645.226652	0.001984846
-2.239676849	3645.226652	0.001984846
-2.237925002	3662.338351	0.002071396
-2.237925002	3662.338351	0.002071396
-2.237925002	3662.338351	0.002071396
-2.236173155	3706.875132	0.002180106
-2.236173155	3706.875132	0.002180106
-2.236173155	3706.875132	0.002180106
-2.23467165	3729.84686	0.002291423
-2.23467165	3729.84686	0.002291423
-2.232794634	3762.429128	0.002412124
-2.232794634	3762.429128	0.002412124
-2.232794634	3762.429128	0.002412124
-2.231167779	3780.947142	0.002549771
-2.231167779	3780.947142	0.002549771
-2.231167779	3780.947142	0.002549771
-2.229415935	3802.043896	0.002698106
-2.229415935	3802.043896	0.002698106
-2.229415935	3802.043896	0.002698106
-2.227664089	3817.514488	0.002861562
-2.227664089	3817.514488	0.002861562
-2.225912242	3795.245918	0.003023192
-2.225912242	3795.245918	0.003023192
-2.225912242	3795.245918	0.003023192
-2.224285387	3849.628098	0.003241655
-2.224285387	3849.628098	0.003241655
-2.224285387	3849.628098	0.003241655
-2.22253354	3859.941819	0.003448646
-2.22253354	3859.941819	0.003448646
-2.22253354	3859.941819	0.003448646
-2.220781697	3876.584543	0.00366789
-2.220781697	3876.584543	0.00366789
-2.219280189	3885.022975	0.003898344
-2.219280189	3885.022975	0.003898344
-2.219280189	3885.022975	0.003898344
-2.217528165	3899.321751	0.004138184
-2.217528165	3899.321751	0.004138184
-2.217528165	3899.321751	0.004138184
-2.215651148	3911.745259	0.004386625
-2.215651148	3911.745259	0.004386625
-2.213899302	3900.493905	0.004644713
-2.213899302	3900.493905	0.004644713
-2.213899302	3900.493905	0.004644713
-2.212397797	3930.497749	0.004920528
-2.212397797	3930.497749	0.004920528

-2.212397797	3930.497749	0.004920528
-2.210645953	3939.170679	0.005193929
-2.210645953	3939.170679	0.005193929
-2.210645953	3939.170679	0.005193929
-2.209019098	3942.452261	0.005450453
-2.209019098	3942.452261	0.005450453
-2.207142082	3959.56396	0.00573461
-2.207142082	3959.56396	0.00573461
-2.207142082	3959.56396	0.00573461
-2.205390235	3963.783176	0.00601616
-2.205390235	3963.783176	0.00601616
-2.205390235	3963.783176	0.00601616
-2.20388873	3973.1596	0.006306574
-2.20388873	3973.1596	0.006306574
-2.202261876	3955.110246	0.006591252
-2.202261876	3955.110246	0.006591252
-2.202261876	3955.110246	0.006591252
-2.20038486	3983.941958	0.006899393
-2.20038486	3983.941958	0.006899393
-2.20038486	3983.941958	0.006899393
-2.198633013	3999.412888	0.007203884
-2.198633013	3999.412888	0.007203884
-2.198633013	3999.412888	0.007203884
-2.196881166	4001.288155	0.007508376
-2.196881166	4001.288155	0.007508376
-2.195129322	4018.165378	0.007815474
-2.195129322	4018.165378	0.007815474
-2.195129322	4018.165378	0.007815474
-2.193627637	4036.448871	0.008111624
-2.193627637	4036.448871	0.008111624
-2.193627637	4036.448871	0.008111624
-2.19187579	4022.384594	0.0084255
-2.19187579	4022.384594	0.0084255
-2.19187579	4022.384594	0.0084255
-2.190123943	4033.167289	0.008751889
-2.190123943	4033.167289	0.008751889
-2.1883721	4041.605743	0.00907098
-2.1883721	4041.605743	0.00907098
-2.1883721	4041.605743	0.00907098
-2.186620253	4054.263727	0.009389549
-2.186620253	4054.263727	0.009389549
-2.186620253	4054.263727	0.009389549
-2.184993398	4057.779808	0.009710725
-2.184993398	4057.779808	0.009710725
-2.183366721	4067.62487	0.010040243
-2.183366721	4067.62487	0.010040243
-2.183366721	4067.62487	0.010040243
-2.181614877	4078.641726	0.010361194
-2.181614877	4078.641726	0.010361194
-2.181614877	4078.641726	0.010361194
-2.17986303	4067.390371	0.010692798

-2.17986303	4067.390371	0.010692798
-2.17986303	4067.390371	0.010692798
-2.177860845	4028.479099	0.010947236
-2.177860845	4028.479099	0.010947236
-2.17635916	4087.549154	0.011354962
-2.17635916	4087.549154	0.011354962
-2.17635916	4087.549154	0.011354962
-2.174732485	4103.020061	0.011683437
-2.174732485	4103.020061	0.011683437
-2.174732485	4103.020061	0.011683437
-2.172855469	4107.004801	0.012018169
-2.172855469	4107.004801	0.012018169
-2.172855469	4107.004801	0.012018169
-2.171353784	4109.583226	0.012349773
-2.171353784	4109.583226	0.012349773
-2.169727106	4125.288294	0.01268242
-2.169727106	4125.288294	0.01268242
-2.169727106	4125.288294	0.01268242
-2.16785009	4109.114567	0.013034879
-2.16785009	4109.114567	0.013034879
-2.16785009	4109.114567	0.013034879
-2.166223416	4130.679665	0.01338108
-2.166223416	4130.679665	0.01338108
-2.166223416	4130.679665	0.01338108
-2.164471569	4137.243144	0.013733541
-2.164471569	4137.243144	0.013733541
-2.162844714	4138.649437	0.014077657
-2.162844714	4138.649437	0.014077657
-2.162844714	4138.649437	0.014077657
-2.161092868	4151.541582	0.014413431
-2.161092868	4151.541582	0.014413431
-2.161092868	4151.541582	0.014413431
-2.159341024	4151.072945	0.014769019
-2.159341024	4151.072945	0.014769019
-2.157714169	4166.543853	0.015116264
-2.157714169	4166.543853	0.015116264
-2.157714169	4166.543853	0.015116264
-2.15583733	4155.995296	0.015474981
-2.15583733	4155.995296	0.015474981
-2.15583733	4155.995296	0.015474981
-2.154210476	4173.810153	0.015833697
-2.154210476	4173.810153	0.015833697
-2.154210476	4173.810153	0.015833697
-2.152458632	4177.560709	0.016180941
-2.152458632	4177.560709	0.016180941
-2.150831954	4171.700702	0.016534443
-2.150831954	4171.700702	0.016534443
-2.150831954	4171.700702	0.016534443
-2.1492051	4189.749719	0.016897331
-2.1492051	4189.749719	0.016897331
-2.1492051	4189.749719	0.016897331

-2.147453253	4192.562642	0.01724979
-2.147453253	4192.562642	0.01724979
-2.147453253	4192.562642	0.01724979
-2.145826579	4187.405793	0.017543854
-2.145826579	4187.405793	0.017543854
-2.143824393	4198.188488	0.017951579
-2.143824393	4198.188488	0.017951579
-2.143824393	4198.188488	0.017951579
-2.142322708	4205.454788	0.018318638
-2.142322708	4205.454788	0.018318638
-2.142322708	4205.454788	0.018318638
-2.140696031	4218.81593	0.018682568
-2.140696031	4218.81593	0.018682568
-2.138819014	4215.065374	0.019043368
-2.138819014	4215.065374	0.019043368
-2.138819014	4215.065374	0.019043368
-2.13719234	4230.77078	0.019396871
-2.13719234	4230.77078	0.019396871
-2.13719234	4230.77078	0.019396871
-2.135565486	4234.052362	0.019763929
-2.135565486	4234.052362	0.019763929
-2.135565486	4234.052362	0.019763929
-2.133813639	4220.925718	0.020110278
-2.133813639	4220.925718	0.020110278
-2.132061795	4237.56842	0.020496106
-2.132061795	4237.56842	0.020496106
-2.132061795	4237.56842	0.020496106
-2.130309948	4239.912369	0.020861077
-2.130309948	4239.912369	0.020861077
-2.130309948	4239.912369	0.020861077
-2.128558101	4252.101694	0.021219794
-2.128558101	4252.101694	0.021219794
-2.128558101	4252.101694	0.021219794
-2.127056416	4252.570353	0.021591023
-2.127056416	4252.570353	0.021591023
-2.125304572	4257.258566	0.021947654
-2.125304572	4257.258566	0.021947654
-2.125304572	4257.258566	0.021947654
-2.123552725	4266.634631	0.022320968
-2.123552725	4266.634631	0.022320968
-2.123552725	4266.634631	0.022320968
-2.121800879	4239.912369	0.022662999
-2.121800879	4239.912369	0.022662999
-2.120174024	4271.322843	0.023059255
-2.120174024	4271.322843	0.023059255
-2.120174024	4271.322843	0.023059255
-2.118422177	4279.995773	0.023430485
-2.118422177	4279.995773	0.023430485
-2.118422177	4279.995773	0.023430485
-2.116795503	4281.871062	0.023795457
-2.116795503	4281.871062	0.023795457

-2.116795503	4281.871062	0.023795457
-2.115043656	4286.793413	0.024170858
-2.115043656	4286.793413	0.024170858
-2.113291812	4304.13961	0.024510802
-2.113291812	4304.13961	0.024510802
-2.113291812	4304.13961	0.024510802
-2.111539785	4298.982424	0.024882032
-2.111539785	4298.982424	0.024882032
-2.111539785	4298.982424	0.024882032
-2.11003828	4280.464432	0.025240749
-2.11003828	4280.464432	0.025240749
-2.108161264	4304.60827	0.025628662
-2.108161264	4304.60827	0.025628662
-2.108161264	4304.60827	0.025628662
-2.10653459	4306.249061	0.026001978
-2.10653459	4306.249061	0.026001978
-2.10653459	4306.249061	0.026001978
-2.104782563	4306.718057	0.026366949
-2.104782563	4306.718057	0.026366949
-2.104782563	4306.718057	0.026366949
-2.103155888	4319.610203	0.02674652
-2.103155888	4319.610203	0.02674652
-2.101404042	4320.079177	0.027111492
-2.101404042	4320.079177	0.027111492
-2.101404042	4320.079177	0.027111492
-2.099652195	4328.517631	0.027491063
-2.099652195	4328.517631	0.027491063
-2.099652195	4328.517631	0.027491063
-2.097775182	4291.481626	0.027839354
-2.097775182	4291.481626	0.027839354
-2.097775182	4291.481626	0.027839354
-2.096273497	4335.315272	0.02824395
-2.096273497	4335.315272	0.02824395
-2.09452165	4336.956063	0.028619352
-2.092644633	4125.288294	0.005191322
-2.092644633	4125.288294	0.005191322
-2.092644633	4125.288294	0.005191322
-2.092644633	4119.662786	0.005192886
-2.092644633	4119.662786	0.005192886
-2.09151846	4348.676414	0.005192365
-2.09151846	4348.676414	0.005192365
-2.09151846	4348.676414	0.005192365
-2.089766613	4335.54977	0.005194451
-2.089766613	4335.54977	0.005194451
-2.089766613	4335.54977	0.005194451
-2.088014769	4363.209688	0.005193929
-2.088014769	4363.209688	0.005193929
-2.086262742	4355.239893	0.005194451
-2.086262742	4355.239893	0.005194451
-2.086262742	4355.239893	0.005194451
-2.084636068	4361.334398	0.005193408

-2.084636068	4361.334398	0.005193408
-2.084636068	4361.334398	0.005193408
-2.082884221	4365.788112	0.005195493
-2.082884221	4365.788112	0.005195493
-2.082884221	4365.788112	0.005195493
-2.081257547	4379.617914	0.005194451
-2.081257547	4379.617914	0.005194451
-2.07950552	4373.992068	0.005193929
-2.07950552	4373.992068	0.005193929
-2.07950552	4373.992068	0.005193929
-2.077753676	4357.115183	0.005195493
-2.077753676	4357.115183	0.005195493
-2.077753676	4357.115183	0.005195493
-2.076001829	4378.211621	0.005193929
-2.076001829	4378.211621	0.005193929
-2.074249982	4380.086888	0.005196536
-2.074249982	4380.086888	0.005196536
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-1.840499874	4593.533795	0.005209049
-1.840499874	4593.533795	0.005209049
-1.838748027	4597.753011	0.005207485
-1.838748027	4597.753011	0.005207485
-1.837121353	4594.002454	0.005210092
-1.837121353	4594.002454	0.005210092
-1.837121353	4594.002454	0.005210092
-1.835369506	4596.815377	0.005211135
-1.835369506	4596.815377	0.005211135
-1.835369506	4596.815377	0.005211135
-1.833867821	4571.499723	0.005210092
-1.833867821	4571.499723	0.005210092
-1.833867821	4571.499723	0.005210092
-1.831990805	4593.064798	0.005208528
-1.831990805	4593.064798	0.005208528
-1.830113788	4596.815377	0.005210092
-1.830113788	4596.815377	0.005210092
-1.830113788	4596.815377	0.005210092

-1.828487114	4592.127165	0.005209571
-1.828487114	4592.127165	0.005209571
-1.828487114	4592.127165	0.005209571
-1.826860437	4598.690667	0.005209571
-1.826860437	4598.690667	0.005209571
-1.826860437	4598.690667	0.005209571
-1.825108413	4612.754944	0.005210613
-1.825108413	4612.754944	0.005210613
-1.823356566	4590.251875	0.005210613
-1.823356566	4590.251875	0.005210613
-1.823356566	4590.251875	0.005210613
-1.821729891	4590.251875	0.005212178
-1.821729891	4590.251875	0.005212178
-1.821729891	4590.251875	0.005212178
-1.819978045	4592.127165	0.005209049
-1.819978045	4592.127165	0.005209049
-1.818226201	4594.940088	0.005208528
-1.818226201	4594.940088	0.005208528
-1.818226201	4594.940088	0.005208528
-1.816474174	4591.658505	0.005210092
-1.816474174	4591.658505	0.005210092
-1.816474174	4591.658505	0.005210092
-1.814972669	4595.408747	0.005210092
-1.814972669	4595.408747	0.005210092
-1.814972669	4595.408747	0.005210092
-1.813220822	4597.753011	0.005210613
-1.813220822	4597.753011	0.005210613
-1.811468978	4582.751077	0.005210613
-1.811468978	4582.751077	0.005210613
-1.811468978	4582.751077	0.005210613
-1.80946679	4571.030749	0.005209049
-1.80946679	4571.030749	0.005209049
-1.80946679	4571.030749	0.005209049
-1.807965108	4591.189531	0.005212178
-1.807965108	4591.189531	0.005212178
-1.807965108	4591.189531	0.005212178
-1.80633843	4593.533795	0.005209049
-1.80633843	4593.533795	0.005209049
-1.804711576	4591.189531	0.005210092
-1.804711576	4591.189531	0.005210092
-1.804711576	4591.189531	0.005210092
-1.802959729	4590.251875	0.005209049
-1.802959729	4590.251875	0.005209049
-1.802959729	4590.251875	0.005209049
-1.801207885	4600.096959	0.005208528
-1.801207885	4600.096959	0.005208528
-1.799456038	4574.312309	0.005210092
-1.799456038	4574.312309	0.005210092
-1.799456038	4574.312309	0.005210092
-1.797704191	4592.596161	0.005208007
-1.797704191	4592.596161	0.005208007

-1.797704191	4592.596161	0.005208007
-1.796077517	4590.251875	0.005210092
-1.796077517	4590.251875	0.005210092
-1.796077517	4590.251875	0.005210092
-1.794450662	4563.998588	0.005209571
-1.794450662	4563.998588	0.005209571
-1.792698816	4592.127165	0.005210092
-1.792698816	4592.127165	0.005210092
-1.792698816	4592.127165	0.005210092
-1.790946969	4584.157393	0.005209049
-1.790946969	4584.157393	0.005209049
-1.790946969	4584.157393	0.005209049
-1.789320114	4590.720872	0.005209049
-1.789320114	4590.720872	0.005209049
-1.789320114	4590.720872	0.005209049
-1.787443278	4574.312309	0.005209049
-1.787443278	4574.312309	0.005209049
-1.785816424	4586.970316	0.005209571
-1.785816424	4586.970316	0.005209571
-1.785816424	4586.970316	0.005209571
-1.784189746	4586.501656	0.005209571
-1.784189746	4586.501656	0.005209571
-1.784189746	4586.501656	0.005209571
-1.782437902	4577.594228	0.005209049
-1.782437902	4577.594228	0.005209049
-1.780685876	4582.751077	0.005209049
-1.780685876	4582.751077	0.005209049
-1.780685876	4582.751077	0.005209049
-1.778934032	4582.751077	0.005209049
-1.778934032	4582.751077	0.005209049
-1.778934032	4582.751077	0.005209049
-1.777432524	4576.187598	0.005210613
-1.777432524	4576.187598	0.005210613
-1.777432524	4576.187598	0.005210613
-1.77568068	4572.437379	0.005210092
-1.77568068	4572.437379	0.005210092
-1.773928653	4577.594228	0.005209049
-1.773928653	4577.594228	0.005209049
-1.773928653	4577.594228	0.005209049
-1.77205164	4571.499723	0.005208528
-1.77205164	4571.499723	0.005208528
-1.77205164	4571.499723	0.005208528
-1.770424962	4567.749166	0.005209571
-1.770424962	4567.749166	0.005209571
-1.768673116	4577.125231	0.005210613
-1.768673116	4577.125231	0.005210613
-1.768673116	4577.125231	0.005210613
-1.766921272	4574.312309	0.005210092
-1.766921272	4574.312309	0.005210092
-1.766921272	4574.312309	0.005210092
-1.765419587	4560.717028	0.005210092

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-1.76366774	4561.654661	0.005208007
-1.76366774	4561.654661	0.005208007
-1.761915893	4549.93431	0.005209049
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-1.760289219	4565.40488	0.005211135
-1.760289219	4565.40488	0.005211135
-1.760289219	4565.40488	0.005211135
-1.758537195	4561.185665	0.005210613
-1.758537195	4561.185665	0.005210613
-1.758537195	4561.185665	0.005210613
-1.756910517	4562.592295	0.005210092
-1.756910517	4562.592295	0.005210092
-1.755158674	4556.966449	0.005210613
-1.755158674	4556.966449	0.005210613
-1.755158674	4556.966449	0.005210613
-1.753406827	4527.900238	0.005212178
-1.753406827	4527.900238	0.005212178
-1.753406827	4527.900238	0.005212178
-1.75165498	4552.747233	0.005211135
-1.75165498	4552.747233	0.005211135
-1.749902956	4547.121387	0.005210613
-1.749902956	4547.121387	0.005210613
-1.749902956	4547.121387	0.005210613
-1.748276279	4547.590384	0.005212178
-1.748276279	4547.590384	0.005212178
-1.748276279	4547.590384	0.005212178
-1.746524435	4541.026882	0.005209571
-1.746524435	4541.026882	0.005209571
-1.746524435	4541.026882	0.005209571
-1.744897757	4540.558223	0.005208528
-1.744897757	4540.558223	0.005208528
-1.743270903	4534.932377	0.005210092
-1.743270903	4534.932377	0.005210092
-1.743270903	4534.932377	0.005210092
-1.741644228	4511.960671	0.005209049
-1.741644228	4511.960671	0.005209049
-1.741644228	4511.960671	0.005209049
-1.73964204	4526.493945	0.005210092
-1.73964204	4526.493945	0.005210092
-1.738140535	4519.461807	0.005210092
-1.738140535	4519.461807	0.005210092
-1.738140535	4519.461807	0.005210092
-1.736388511	4510.554378	0.005211135
-1.736388511	4510.554378	0.005211135
-1.736388511	4510.554378	0.005211135
-1.734636664	4503.990899	0.005210613
-1.734636664	4503.990899	0.005210613
-1.734636664	4503.990899	0.005210613

-1.73300999	4502.11561	0.005209571
-1.73300999	4502.11561	0.005209571
-1.731258143	4496.490101	0.005210092
-1.731258143	4496.490101	0.005210092
-1.731258143	4496.490101	0.005210092
-1.729381127	4434.607101	0.005208528
-1.729381127	4434.607101	0.005208528
-1.729381127	4434.607101	0.005208528
-1.727879442	4479.143904	0.005210092
-1.727879442	4479.143904	0.005210092
-1.727879442	4479.143904	0.005210092
-1.726127598	4469.767817	0.005210092
-1.726127598	4469.767817	0.005210092
-1.724375751	4459.454096	0.005210613
-1.724375751	4459.454096	0.005210613
-1.724375751	4459.454096	0.005210613
-1.722623904	4455.703539	0.005210092
-1.722623904	4455.703539	0.005210092
-1.722623904	4455.703539	0.005210092
-1.72087206	4445.858455	0.005210092
-1.72087206	4445.858455	0.005210092
-1.719370375	4430.387885	0.005210092
-1.719370375	4430.387885	0.005210092
-1.719370375	4430.387885	0.005210092
-1.717618528	4410.228765	0.005210092
-1.717618528	4410.228765	0.005210092
-1.717618528	4410.228765	0.005210092
-1.715866682	4406.478523	0.005210613
-1.715866682	4406.478523	0.005210613
-1.715866682	4406.478523	0.005210613
-1.714114838	4396.633462	0.005209049
-1.714114838	4396.633462	0.005209049
-1.712362811	4381.162554	0.005210092
-1.712362811	4381.162554	0.005210092
-1.712362811	4381.162554	0.005210092
-1.710736136	4377.880972	0.005210613
-1.710736136	4377.880972	0.005210613
-1.710736136	4377.880972	0.005210613
-1.709109459	4362.410402	0.005211135
-1.709109459	4362.410402	0.005211135
-1.709109459	4362.410402	0.005211135
-1.707357615	4337.563407	0.005210092
-1.707357615	4337.563407	0.005210092
-1.705355426	4312.716412	0.005211656
-1.705355426	4312.716412	0.005211656
-1.705355426	4312.716412	0.005211656
-1.703853744	4310.841122	0.005211135
-1.703853744	4310.841122	0.005211135
-1.703853744	4310.841122	0.005211135
-1.702227067	4295.370215	0.005210092
-1.702227067	4295.370215	0.005210092

-1.702227067	4295.370215	0.005210092
-1.700350051	4272.867483	0.005209571
-1.700350051	4272.867483	0.005209571
-1.698848366	4261.147132	0.005210092
-1.698848366	4261.147132	0.005210092
-1.698848366	4261.147132	0.005210092
-1.697096522	4271.92985	0.005208528
-1.697096522	4271.92985	0.005208528
-1.697096522	4271.92985	0.005208528
-1.695344675	4206.76529	0.005210092
-1.695344675	4206.76529	0.005210092
-1.693718001	4200.201788	0.005211656
-1.693718001	4200.201788	0.005211656
-1.693718001	4200.201788	0.005211656
-1.691965974	4173.9485	0.005208528
-1.691965974	4173.9485	0.005208528
-1.691965974	4173.9485	0.005208528
-1.69021413	4156.60264	0.005210613
-1.69021413	4156.60264	0.005210613
-1.69021413	4156.60264	0.005210613
-1.688587453	4134.568568	0.005209049
-1.688587453	4134.568568	0.005209049
-1.686835606	4103.158094	0.005210092
-1.686835606	4103.158094	0.005210092
-1.686835606	4103.158094	0.005210092
-1.685083762	4088.156161	0.005209049
-1.685083762	4088.156161	0.005209049
-1.685083762	4088.156161	0.005209049
-1.683331915	4037.055878	0.005210613
-1.683331915	4037.055878	0.005210613
-1.683331915	4037.055878	0.005210613
-1.681329729	4011.271249	0.005209571
-1.681329729	4011.271249	0.005209571
-1.679953214	3991.112467	0.005212178
-1.679953214	3991.112467	0.005212178
-1.679953214	3991.112467	0.005212178
-1.67820137	3961.1086	0.005209571
-1.67820137	3961.1086	0.005209571
-1.67820137	3961.1086	0.005209571
-1.676574513	3936.261605	0.005208528
-1.676574513	3936.261605	0.005208528
-1.674822669	3894.068751	0.005208528
-1.674822669	3894.068751	0.005208528
-1.674822669	3894.068751	0.005208528
-1.673195991	3874.378964	0.005210092
-1.673195991	3874.378964	0.005210092
-1.673195991	3874.378964	0.005210092
-1.671318975	3818.590469	0.005210092
-1.671318975	3818.590469	0.005210092
-1.671318975	3818.590469	0.005210092
-1.669692301	3789.524259	0.005210092

-1.669692301	3789.524259	0.005210092
-1.668065446	3750.14399	0.005209571
-1.668065446	3750.14399	0.005209571
-1.668065446	3750.14399	0.005209571
-1.666313599	3705.138212	0.005210092
-1.666313599	3705.138212	0.005210092
-1.666313599	3705.138212	0.005210092
-1.664561753	3677.009635	0.005212178
-1.664561753	3677.009635	0.005212178
-1.664561753	3677.009635	0.005212178
-1.662935078	3635.754436	0.005210613
-1.662935078	3635.754436	0.005210613
-1.661308224	3594.030218	0.005209571
-1.661308224	3594.030218	0.005209571
-1.661308224	3594.030218	0.005209571
-1.659556377	3535.429137	0.005212178
-1.659556377	3535.429137	0.005212178
-1.659556377	3535.429137	0.005212178
-1.657804533	3496.048868	0.005210092
-1.657804533	3496.048868	0.005210092
-1.657804533	3496.048868	0.005210092
-1.656177856	3443.073319	0.005210092
-1.656177856	3443.073319	0.005210092
-1.654300839	3386.816164	0.005212178
-1.654300839	3386.816164	0.005212178
-1.654300839	3386.816164	0.005212178
-1.652673985	3345.091969	0.005211135
-1.652673985	3345.091969	0.005211135
-1.652673985	3345.091969	0.005211135
-1.650922138	3293.991686	0.005210092
-1.650922138	3293.991686	0.005210092
-1.649295464	3226.014203	0.005210092
-1.649295464	3226.014203	0.005210092
-1.649295464	3226.014203	0.005210092
-1.647543617	3174.91392	0.005210092
-1.647543617	3174.91392	0.005210092
-1.647543617	3174.91392	0.005210092
-1.645791593	3109.74936	0.005210092
-1.645791593	3109.74936	0.005210092
-1.645791593	3109.74936	0.005210092
-1.644164916	3057.242784	0.005209571
-1.644164916	3057.242784	0.005209571
-1.642413072	2993.484494	0.005209571
-1.642413072	2993.484494	0.005209571
-1.642413072	2993.484494	0.005209571
-1.640786394	2933.476806	0.005211656
-1.640786394	2933.476806	0.005211656
-1.640786394	2933.476806	0.005211656
-1.63903437	2867.37459	0.005210613
-1.63903437	2867.37459	0.005210613
-1.63903437	2867.37459	0.005210613

-1.637282524	2786.132093	0.005210092
-1.637282524	2786.132093	0.005210092
-1.63553068	2726.124404	0.005211135
-1.63553068	2726.124404	0.005211135
-1.63553068	2726.124404	0.005211135
-1.634029172	2649.239471	0.005212178
-1.634029172	2649.239471	0.005212178
-1.634029172	2649.239471	0.005212178
-1.632277148	2581.730804	0.005208528
-1.632277148	2581.730804	0.005208528
-1.630400132	2509.533926	0.005212178
-1.630400132	2509.533926	0.005212178
-1.630400132	2509.533926	0.005212178
-1.628773457	2432.883513	0.005210092
-1.628773457	2432.883513	0.005210092
-1.628773457	2432.883513	0.005210092
-1.62702161	2361.389949	0.005212178
-1.62702161	2361.389949	0.005212178
-1.62702161	2361.389949	0.005212178
-1.625269764	2261.767808	0.005211135
-1.625269764	2261.767808	0.005211135
-1.623642909	2199.88483	0.005209571
-1.623642909	2199.88483	0.005209571
-1.623642909	2199.88483	0.005209571
-1.622016235	2108.7013	0.005210092
-1.622016235	2108.7013	0.005210092
-1.622016235	2108.7013	0.005210092
-1.620890061	2.727293164	0.005212178
-1.620890061	2.727293164	0.005212178

Specimen No.	282T	Temperature			
Init. Width	0.251	Init. Thick.			
Final Width	0.12	Final Thick.			
Init. Gage	1	Final Gage	1.27		
Init. Area	0.0495	Final Area	0.0113		
Pct. Red.	77.17	Pct. Elong.	27		
Modulus	23.6	Xhead Rate	0.05		
Yield	67.8	Ultimate	86.1		
Full Scale	3.00001	22480.90247	0.05		
Time	Stroke	Load	Strain	Strain (%)	Stress (PSI)
	-2.256695164	2.844486109	0.008736769	0	57.46436583
	-2.256820334	1.086457055	0.008741983	0.00104279	21.94862737
	-2.256820334	1.086457055	0.008741983	0.00104279	21.94862737
	-2.256820334	1.086457055	0.008741983	0.00104279	21.94862737
	-2.25569398	2.141283479	0.008744068	0.00145987	43.25825211
	-2.25569398	2.141283479	0.008744068	0.00145987	43.25825211
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	-2.253942136	2.844486109	0.00874459	0.00156418	57.46436583
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-2.214650144	3630.693715	0.017626233	1.77789286	73347.34778
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-2.204389231	3742.739342	0.022533695	2.75938526	75610.89581
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-2.202637384	3761.257334	0.023261555	2.90495709	75984.99664
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-2.20088536	3767.586337	0.023956046	3.04385528	76112.8553
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-2.120299194	4173.810153	0.005009357	-0.7454824	84319.39702
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-2.011057466	3946.905975	0.005014571	-0.7444396	79735.47425
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-1.973642313	3386.20918	0.005016657	-0.7440225	68408.26626
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-1.968386775	3267.600051	0.005016135	-0.7441267	66012.12224
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-1.966634928	3221.65664	0.005018221	-0.7437097	65083.97252

-1.965008074	3185.558268	0.005017699	-0.743814	64354.71248
-1.965008074	3185.558268	0.005017699	-0.743814	64354.71248
-1.965008074	3185.558268	0.005017699	-0.743814	64354.71248
-1.963256227	3140.317992	0.005015614	-0.744231	63440.76751
-1.963256227	3140.317992	0.005015614	-0.744231	63440.76751
-1.963256227	3140.317992	0.005015614	-0.744231	63440.76751
-1.961629553	3096.484346	0.005016135	-0.7441267	62555.23931
-1.961629553	3096.484346	0.005016135	-0.7441267	62555.23931
-1.959877706	3045.149587	0.005014571	-0.7444396	61518.17348
-1.959877706	3045.149587	0.005014571	-0.7444396	61518.17348
-1.959877706	3045.149587	0.005014571	-0.7444396	61518.17348
-1.958125682	2995.455935	0.005015092	-0.7443354	60514.26131
-1.958125682	2995.455935	0.005015092	-0.7443354	60514.26131
-1.958125682	2995.455935	0.005015092	-0.7443354	60514.26131
-1.956373835	2955.372508	0.005016657	-0.7440225	59704.49511
-1.956373835	2955.372508	0.005016657	-0.7440225	59704.49511
-1.954621988	2898.646379	0.005015092	-0.7443354	58558.51272
-1.954621988	2898.646379	0.005015092	-0.7443354	58558.51272
-1.954621988	2898.646379	0.005015092	-0.7443354	58558.51272
-1.952995314	2853.171943	0.005015092	-0.7443354	57639.83722
-1.952995314	2853.171943	0.005015092	-0.7443354	57639.83722
-1.952995314	2853.171943	0.005015092	-0.7443354	57639.83722
-1.95136846	2795.50818	0.005018221	-0.7437097	56474.91274
-1.95136846	2795.50818	0.005018221	-0.7437097	56474.91274
-1.95136846	2795.50818	0.005018221	-0.7437097	56474.91274
-1.949616613	2724.249115	0.005016135	-0.7441267	55035.33566
-1.949616613	2724.249115	0.005016135	-0.7441267	55035.33566
-1.947864766	2661.194163	0.005015614	-0.744231	53761.49824
-1.947864766	2661.194163	0.005015614	-0.744231	53761.49824
-1.947864766	2661.194163	0.005015614	-0.744231	53761.49824
-1.946112922	2513.284504	0.005016135	-0.7441267	50773.42433
-1.946112922	2513.284504	0.005016135	-0.7441267	50773.42433
-1.946112922	2513.284504	0.005016135	-0.7441267	50773.42433
-1.944361075	1874.764984	0.005015092	-0.7443354	37874.04009
-1.944361075	1874.764984	0.005015092	-0.7443354	37874.04009
-1.944361075	1874.764984	0.005015092	-0.7443354	37874.04009
-1.942609228	504.4714065	0.005016135	-0.7441267	10191.34154
-1.942609228	504.4714065	0.005016135	-0.7441267	10191.34154
-1.941232716	0.734878221	0.005016135	-0.7441267	14.84602466
-1.941232716	0.734878221	0.005016135	-0.7441267	14.84602466
-1.941232716	0.734878221	0.005016135	-0.7441267	14.84602466
-1.939480869	1.20367248	0.005017178	-0.7439182	24.31661576
-1.939480869	1.20367248	0.005017178	-0.7439182	24.31661576
-1.939480869	1.20367248	0.005017178	-0.7439182	24.31661576
-1.937603853	1.906875109	0.005017178	-0.7439182	38.52272948
-1.937603853	1.906875109	0.005017178	-0.7439182	38.52272948
-1.935976998	1.320865425	0.005016657	-0.7440225	26.68414999
-1.935976998	1.320865425	0.005016657	-0.7440225	26.68414999
-1.935976998	1.320865425	0.005016657	-0.7440225	26.68414999
-1.934350321	3.5477337	0.005017178	-0.7439182	71.67138787
-1.934350321	3.5477337	0.005017178	-0.7439182	71.67138787

-1.934350321	3.5477337	0.005017178	-0.7439182	71.67138787
-1.932598477	1.320865425	0.005016135	-0.7441267	26.68414999
				86071.51769

Specimen No.	302B	Temperature	
Init. Width	0.249	Init. Thick.	
Final Width	0.13	Final Thick.	
Init. Gage	1	Final Gage	1.34
Init. Area	0.0487	Final Area	0.0133
Pct. Red.	72.69	Pct. Elong.	34
Modulus	28.63	Xhead Rate	0.05
Yield	70.1	Ultimate	90
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.265704734	3.07891696	0.00055285
	-2.265704734	3.07891696	0.00055285
	-2.265704734	2.375691849	0.000553893
	-2.265704734	2.375691849	0.000553893
	-2.265704734	2.375691849	0.000553893
	-2.263952887	4.133743384	0.000553893
	-2.263952887	4.133743384	0.000553893
	-2.262201041	5.657364068	0.0005565
	-2.262201041	5.657364068	0.0005565
	-2.262201041	5.657364068	0.0005565
	-2.260574366	8.470219547	0.000558064
	-2.260574366	8.470219547	0.000558064
	-2.260574366	8.470219547	0.000558064
	-2.258822342	30.26990571	0.000578398
	-2.258822342	30.26990571	0.000578398
	-2.258822342	30.26990571	0.000578398
	-2.257195665	126.6103969	0.00062402
	-2.257195665	126.6103969	0.00062402
	-2.255568991	295.6164713	0.000689715
	-2.255568991	295.6164713	0.000689715
	-2.255568991	295.6164713	0.000689715
	-2.253942136	537.6397525	0.000770009
	-2.253942136	537.6397525	0.000770009
	-2.253942136	537.6397525	0.000770009
	-2.251940127	816.5817787	0.000862034
	-2.251940127	816.5817787	0.000862034
	-2.250438442	1138.771621	0.000973611
	-2.250438442	1138.771621	0.000973611
	-2.250438442	1138.771621	0.000973611
	-2.248686596	1476.666554	0.00110448
	-2.248686596	1476.666554	0.00110448
	-2.248686596	1476.666554	0.00110448
	-2.246934752	1823.351812	0.001248383
	-2.246934752	1823.351812	0.001248383
	-2.246934752	1823.351812	0.001248383
	-2.245182725	2179.29592	0.001414706

-2.245182725	2179.29592	0.001414706
-2.243430881	2510.940398	0.001601885
-2.243430881	2510.940398	0.001601885
-2.243430881	2510.940398	0.001601885
-2.241679034	2818.479886	0.001810441
-2.241679034	2818.479886	0.001810441
-2.241679034	2818.479886	0.001810441
-2.240177529	3062.026788	0.002060708
-2.240177529	3062.026788	0.002060708
-2.240177529	3062.026788	0.002060708
-2.238425505	3271.116131	0.002382144
-2.238425505	3271.116131	0.002382144
-2.236673659	3413.165603	0.002817765
-2.236673659	3413.165603	0.002817765
-2.236673659	3413.165603	0.002817765
-2.234921812	3483.721533	0.003340458
-2.234921812	3483.721533	0.003340458
-2.234921812	3483.721533	0.003340458
-2.233295137	3537.166079	0.003968211
-2.233295137	3537.166079	0.003968211
-2.23154329	3569.045213	0.004658269
-2.23154329	3569.045213	0.004658269
-2.23154329	3569.045213	0.004658269
-2.229916436	3604.909064	0.005393621
-2.229916436	3604.909064	0.005393621
-2.229916436	3604.909064	0.005393621
-2.22803942	3616.629415	0.006217938
-2.22803942	3616.629415	0.006217938
-2.22803942	3616.629415	0.006217938
-2.226537915	3636.085063	0.007022441
-2.226537915	3636.085063	0.007022441
-2.224660899	3663.041508	0.007837895
-2.224660899	3663.041508	0.007837895
-2.224660899	3663.041508	0.007837895
-2.222909052	3671.47994	0.008643441
-2.222909052	3671.47994	0.008643441
-2.222909052	3671.47994	0.008643441
-2.221282197	3697.030407	0.009466714
-2.221282197	3697.030407	0.009466714
-2.219405181	3708.047286	0.010271515
-2.219405181	3708.047286	0.010271515
-2.219405181	3708.047286	0.010271515
-2.217903676	3712.969974	0.011030658
-2.217903676	3712.969974	0.011030658
-2.217903676	3712.969974	0.011030658
-2.216151829	3725.627644	0.011899292
-2.216151829	3725.627644	0.011899292
-2.216151829	3725.627644	0.011899292
-2.214399805	3740.160918	0.012699103
-2.214399805	3740.160918	0.012699103
-2.212773128	3759.382044	0.013481188

-2.212773128	3759.382044	0.013481188
-2.212773128	3759.382044	0.013481188
-2.211021284	3762.194967	0.014271614
-2.211021284	3762.194967	0.014271614
-2.211021284	3762.194967	0.014271614
-2.209144268	3785.635332	0.015020329
-2.209144268	3785.635332	0.015020329
-2.209144268	3785.635332	0.015020329
-2.207642583	3789.385911	0.015783642
-2.207642583	3789.385911	0.015783642
-2.205890736	3787.041962	0.016521931
-2.205890736	3787.041962	0.016521931
-2.205890736	3787.041962	0.016521931
-2.204138892	3809.544694	0.017314442
-2.204138892	3809.544694	0.017314442
-2.204138892	3809.544694	0.017314442
-2.202512215	3814.467067	0.018053772
-2.202512215	3814.467067	0.018053772
-2.200760368	3834.626187	0.018785803
-2.200760368	3834.626187	0.018785803
-2.200760368	3834.626187	0.018785803
-2.198883352	3840.486194	0.019529304
-2.198883352	3840.486194	0.019529304
-2.198883352	3840.486194	0.019529304
-2.19738167	3849.393622	0.020243754
-2.19738167	3849.393622	0.020243754
-2.19738167	3849.393622	0.020243754
-2.195754992	3855.956764	0.02097787
-2.195754992	3855.956764	0.02097787
-2.193877976	3828.765843	0.021632734
-2.193877976	3828.765843	0.021632734
-2.193877976	3828.765843	0.021632734
-2.192251121	3879.162968	0.022429417
-2.192251121	3879.162968	0.022429417
-2.192251121	3879.162968	0.022429417
-2.190499275	3882.679049	0.023138507
-2.190499275	3882.679049	0.023138507
-2.190499275	3882.679049	0.023138507
-2.1888726	3890.180184	0.023847596
-2.1888726	3890.180184	0.023847596
-2.187120753	3895.337033	0.024550429
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-2.18536891	3906.822886	0.025234491
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-2.18536891	3906.822886	0.025234491
-2.183742055	3913.151889	0.025941494
-2.183742055	3913.151889	0.025941494
-2.183742055	3913.151889	0.025941494
-2.181865039	3897.212323	0.026640156
-2.181865039	3897.212323	0.026640156

-2.180238361	3931.200884	0.027359673
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-2.178861849	3895.337033	0.027993685
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-2.178861849	3895.337033	0.027993685
-2.176734671	3944.09339	0.028748655
-2.176734671	3944.09339	0.028748655
-2.175107816	3950.656532	0.02940352
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-2.173481139	3957.454172	0.03007924
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-2.171854464	3963.783176	0.030759132
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-2.170102438	3945.030686	0.031439024
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-2.168350594	3975.738025	0.032139772
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-2.166723916	3983.707797	0.032832176
-2.163845899	3756.100485	0.005191322
-2.163845899	3754.225195	0.005189237
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-2.160592367	4021.44696	0.005191322
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-2.15884052	4027.541443	0.005189758
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-2.157088496	4029.416732	0.005188194
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-2.155336649	4031.292022	0.005189758
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-2.153584806	4052.15394	0.005190801
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-2.151832959	4032.698315	0.005189758
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-2.150206281	4053.794731	0.005191844
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-2.145075736	4072.078584	0.005189237
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-2.141697035	4086.846019	0.005189237
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-2.112666139	4167.481149	0.005190279
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-2.110789123	4172.872519	0.005190279
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-2.109287438	4175.685442	0.005188715
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-2.107535591	4181.779925	0.005189237
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-2.105783747	4156.932952	0.005191322
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-2.104156893	4192.562642	0.005191844
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-2.102279877	4193.500276	0.005191322
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-2.100778372	4197.250855	0.005191322
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-2.099026525	4204.517155	0.005191322
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-2.097274678	4210.377499	0.005191322
-2.095647823	4213.424583	0.005191844
-2.095647823	4213.424583	0.005191844
-2.095647823	4213.424583	0.005191844
-2.093770807	4194.437932	0.005191844
-2.093770807	4194.437932	0.005191844
-2.092144133	4221.160194	0.005189237
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-2.092144133	4221.160194	0.005189237
-2.090517455	4226.317066	0.005191322
-2.090517455	4226.317066	0.005191322
-2.090517455	4226.317066	0.005191322
-2.088765432	4224.676274	0.005191844
-2.088765432	4224.676274	0.005191844
-2.088765432	4224.676274	0.005191844
-2.087013585	4231.004941	0.005191844
-2.087013585	4231.004941	0.005191844
-2.085261738	4236.630787	0.005192365
-2.085261738	4236.630787	0.005192365
-2.085261738	4236.630787	0.005192365
-2.083635063	4238.740552	0.005192365

-2.083635063	4238.740552	0.005192365
-2.083635063	4238.740552	0.005192365
-2.081758047	4191.859507	0.005193408
-2.081758047	4191.859507	0.005193408
-2.081758047	4191.859507	0.005193408
-2.080256362	4243.662925	0.005190279
-2.080256362	4243.662925	0.005190279
-2.078504518	4244.366083	0.005191322
-2.078504518	4244.366083	0.005191322
-2.078504518	4244.366083	0.005191322
-2.076752671	4243.194266	0.005193929
-2.076752671	4243.194266	0.005193929
-2.076752671	4243.194266	0.005193929
-2.075125994	4254.91428	0.005191322
-2.075125994	4254.91428	0.005191322
-2.07337397	4266.634631	0.005195493
-2.07337397	4266.634631	0.005195493
-2.07337397	4266.634631	0.005195493
-2.071747296	4255.617775	0.005192365
-2.071747296	4255.617775	0.005192365
-2.071747296	4255.617775	0.005192365
-2.069745107	4257.258566	0.005193408
-2.069745107	4257.258566	0.005193408
-2.069745107	4257.258566	0.005193408
-2.068243602	4264.99384	0.005193929
-2.068243602	4264.99384	0.005193929
-2.066616748	4271.791502	0.005193408
-2.066616748	4271.791502	0.005193408
-2.066616748	4271.791502	0.005193408
-2.064739731	4271.791502	0.005192365
-2.064739731	4271.791502	0.005192365
-2.064739731	4271.791502	0.005192365
-2.063113057	4277.417348	0.005193408
-2.063113057	4277.417348	0.005193408
-2.06148638	4288.903201	0.005192886
-2.06148638	4288.903201	0.005192886
-2.06148638	4288.903201	0.005192886
-2.059734536	4268.275422	0.005194451
-2.059734536	4268.275422	0.005194451
-2.059734536	4268.275422	0.005194451
-2.057982509	4275.073062	0.005194451
-2.057982509	4275.073062	0.005194451
-2.057982509	4275.073062	0.005194451
-2.056230665	4288.668703	0.005192886
-2.056230665	4288.668703	0.005192886
-2.054729157	4298.04479	0.005194451
-2.054729157	4298.04479	0.005194451
-2.054729157	4298.04479	0.005194451
-2.052977133	4298.982424	0.005195493
-2.052977133	4298.982424	0.005195493
-2.052977133	4298.982424	0.005195493

-2.051225286	4299.45142	0.005192365
-2.051225286	4299.45142	0.005192365
-2.051225286	4299.45142	0.005192365
-2.049473443	4361.334398	0.005194451
-2.049473443	4361.334398	0.005194451
-2.047721596	4287.496571	0.005195493
-2.047721596	4287.496571	0.005195493
-2.047721596	4287.496571	0.005195493
-2.046094921	4309.296482	0.005193929
-2.046094921	4309.296482	0.005193929
-2.046094921	4309.296482	0.005193929
-2.044342894	4311.640408	0.005195493
-2.044342894	4311.640408	0.005195493
-2.04271622	4308.827485	0.005195493
-2.04271622	4308.827485	0.005195493
-2.04271622	4308.827485	0.005195493
-2.040964373	4313.984357	0.005194451
-2.040964373	4313.984357	0.005194451
-2.040964373	4313.984357	0.005194451
-2.039212526	4312.578064	0.005193929
-2.039212526	4312.578064	0.005193929
-2.039212526	4312.578064	0.005193929
-2.037585672	4327.814473	0.005196536
-2.037585672	4327.814473	0.005196536
-2.035958998	4308.827485	0.005195493
-2.035958998	4308.827485	0.005195493
-2.035958998	4308.827485	0.005195493
-2.034207151	4321.954129	0.005195493
-2.034207151	4321.954129	0.005195493
-2.034207151	4321.954129	0.005195493
-2.032455304	4329.455265	0.005193929
-2.032455304	4329.455265	0.005193929
-2.032455304	4329.455265	0.005193929
-2.03070346	4319.375705	0.005194451
-2.03070346	4319.375705	0.005194451
-2.029076606	4338.831352	0.005195493
-2.029076606	4338.831352	0.005195493
-2.029076606	4338.831352	0.005195493
-2.027324759	4335.080773	0.005194451
-2.027324759	4335.080773	0.005194451
-2.027324759	4335.080773	0.005194451
-2.025698081	4331.330554	0.005194972
-2.025698081	4331.330554	0.005194972
-2.025698081	4331.330554	0.005194972
-2.023695896	4336.018429	0.005195493
-2.023695896	4336.018429	0.005195493
-2.022194211	4339.065828	0.005195493
-2.022194211	4339.065828	0.005195493
-2.022194211	4339.065828	0.005195493
-2.020442367	4344.691696	0.005197058
-2.020442367	4344.691696	0.005197058

-2.020442367	4344.691696	0.005197058
-2.01869052	4338.831352	0.005192886
-2.01869052	4338.831352	0.005192886
-2.017063846	4353.833263	0.005193929
-2.017063846	4353.833263	0.005193929
-2.017063846	4353.833263	0.005193929
-2.015186829	4350.551703	0.005193929
-2.015186829	4350.551703	0.005193929
-2.015186829	4350.551703	0.005193929
-2.013685144	4341.644275	0.005193929
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-2.011933297	4348.441915	0.005194972
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-2.010181451	4348.910912	0.005194451
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-2.008554776	4358.521475	0.005195493
-2.008554776	4358.521475	0.005195493
-2.008554776	4358.521475	0.005195493
-2.00667776	4355.708552	0.005195493
-2.00667776	4355.708552	0.005195493
-2.00667776	4355.708552	0.005195493
-2.005176075	4358.521475	0.005193408
-2.005176075	4358.521475	0.005193408
-2.003424231	4363.209688	0.005192886
-2.003424231	4363.209688	0.005192886
-2.003424231	4363.209688	0.005192886
-2.001672384	4325.704708	0.005195493
-2.001672384	4325.704708	0.005195493
-2.001672384	4325.704708	0.005195493
-1.999920537	4366.022273	0.005193408
-1.999920537	4366.022273	0.005193408
-1.998168514	4365.08464	0.005195493
-1.998168514	4365.08464	0.005195493
-1.998168514	4365.08464	0.005195493
-1.996667009	4364.615981	0.005194451
-1.996667009	4364.615981	0.005194451
-1.996667009	4364.615981	0.005194451
-1.994915162	4366.49127	0.005194451
-1.994915162	4366.49127	0.005194451
-1.994915162	4366.49127	0.005194451
-1.993163315	4370.241826	0.005193929
-1.993163315	4370.241826	0.005193929
-1.991411291	4373.054749	0.005194451
-1.991411291	4373.054749	0.005194451
-1.991411291	4373.054749	0.005194451
-1.989659444	4349.379549	0.005194451
-1.989659444	4349.379549	0.005194451
-1.989659444	4349.379549	0.005194451
-1.987907597	4371.648119	0.005195493

-1.987907597	4371.648119	0.005195493
-1.987907597	4371.648119	0.005195493
-1.98565525	4347.035623	0.005193408
-1.98565525	4347.035623	0.005193408
-1.984654068	4368.835196	0.005195493
-1.984654068	4368.835196	0.005195493
-1.984654068	4368.835196	0.005195493
-1.982902222	4373.523409	0.005195493
-1.982902222	4373.523409	0.005195493
-1.982902222	4373.523409	0.005195493
-1.981275547	4372.585753	0.005193408
-1.981275547	4372.585753	0.005193408
-1.981275547	4372.585753	0.005193408
-1.9795237	4375.1642	0.005196536
-1.9795237	4375.1642	0.005196536
-1.977646684	4348.676414	0.005195493
-1.977646684	4348.676414	0.005195493
-1.977646684	4348.676414	0.005195493
-1.976144999	4379.149255	0.005195493
-1.976144999	4379.149255	0.005195493
-1.976144999	4379.149255	0.005195493
-1.974393155	4375.867335	0.005195493
-1.974393155	4375.867335	0.005195493
-1.972641308	4368.366537	0.005194451
-1.972641308	4368.366537	0.005194451
-1.972641308	4368.366537	0.005194451
-1.971014631	4373.992068	0.005196536
-1.971014631	4373.992068	0.005196536
-1.971014631	4373.992068	0.005196536
-1.969262607	4383.133972	0.005195493
-1.969262607	4383.133972	0.005195493
-1.969262607	4383.133972	0.005195493
-1.967635933	4373.054749	0.005193929
-1.967635933	4373.054749	0.005193929
-1.965633744	4363.209688	0.005194451
-1.965633744	4363.209688	0.005194451
-1.965633744	4363.209688	0.005194451
-1.964132239	4370.241826	0.005195493
-1.964132239	4370.241826	0.005195493
-1.964132239	4370.241826	0.005195493
-1.962505385	4370.007328	0.005193929
-1.962505385	4370.007328	0.005193929
-1.962505385	4370.007328	0.005193929
-1.96087871	4363.678347	0.005195493
-1.96087871	4363.678347	0.005195493
-1.959001694	4369.304193	0.005194451
-1.959001694	4369.304193	0.005194451
-1.959001694	4369.304193	0.005194451
-1.957124678	4368.132061	0.005195493
-1.957124678	4368.132061	0.005195493
-1.957124678	4368.132061	0.005195493

-1.955623173	4354.536421	0.005195493
-1.955623173	4354.536421	0.005195493
-1.954121488	4321.954129	0.005193929
-1.954121488	4321.954129	0.005193929
-1.954121488	4321.954129	0.005193929
-1.952119302	4356.646186	0.005195493
-1.952119302	4356.646186	0.005195493
-1.952119302	4356.646186	0.005195493
-1.950492625	4360.396765	0.005195493
-1.950492625	4360.396765	0.005195493
-1.950492625	4360.396765	0.005195493
-1.948740778	4353.833263	0.005195493
-1.948740778	4353.833263	0.005195493
-1.947113923	4349.14541	0.005194451
-1.947113923	4349.14541	0.005194451
-1.947113923	4349.14541	0.005194451
-1.94536208	4354.30226	0.005194451
-1.94536208	4354.30226	0.005194451
-1.94536208	4354.30226	0.005194451
-1.943610233	4325.236049	0.005196536
-1.943610233	4325.236049	0.005196536
-1.943610233	4325.236049	0.005196536
-1.941983558	4333.205821	0.005196536
-1.941983558	4333.205821	0.005196536
-1.940231711	4328.517631	0.005197579
-1.940231711	4328.517631	0.005197579
-1.940231711	4328.517631	0.005197579
-1.938479688	4323.829419	0.005196014
-1.938479688	4323.829419	0.005196014
-1.938479688	4323.829419	0.005196014
-1.93685301	4317.500415	0.005195493
-1.93685301	4317.500415	0.005195493
-1.935101163	4306.952218	0.005196014
-1.935101163	4306.952218	0.005196014
-1.935101163	4306.952218	0.005196014
-1.933474309	4306.014562	0.005194451
-1.933474309	4306.014562	0.005194451
-1.933474309	4306.014562	0.005194451
-1.931597473	4284.918146	0.005195493
-1.931597473	4284.918146	0.005195493
-1.931597473	4284.918146	0.005195493
-1.929970618	4284.449487	0.005196536
-1.929970618	4284.449487	0.005196536
-1.928343941	4276.948352	0.005195493
-1.928343941	4276.948352	0.005195493
-1.928343941	4276.948352	0.005195493
-1.926592097	4261.71228	0.005193929
-1.926592097	4261.71228	0.005193929
-1.926592097	4261.71228	0.005193929
-1.92484007	4248.116639	0.005196014
-1.92484007	4248.116639	0.005196014

-1.923213396	4237.099761	0.005197058
-1.923213396	4237.099761	0.005197058
-1.923213396	4237.099761	0.005197058
-1.921586721	4220.69122	0.005193408
-1.921586721	4220.69122	0.005193408
-1.921586721	4220.69122	0.005193408
-1.919584533	4203.813997	0.005196014
-1.919584533	4203.813997	0.005196014
-1.919584533	4203.813997	0.005196014
-1.918082851	4196.313199	0.005195493
-1.918082851	4196.313199	0.005195493
-1.916456173	4183.655214	0.005196536
-1.916456173	4183.655214	0.005196536
-1.916456173	4183.655214	0.005196536
-1.914579157	4158.808219	0.005195493
-1.914579157	4158.808219	0.005195493
-1.914579157	4158.808219	0.005195493
-1.912952482	4150.604286	0.005195493
-1.912952482	4150.604286	0.005195493
-1.912952482	4150.604286	0.005195493
-1.911325628	4130.91414	0.005197579
-1.911325628	4130.91414	0.005197579
-1.909573781	4109.114567	0.005195493
-1.909573781	4109.114567	0.005195493
-1.909573781	4109.114567	0.005195493
-1.907571773	4085.908363	0.005196014
-1.907571773	4085.908363	0.005196014
-1.907571773	4085.908363	0.005196014
-1.906070091	4066.218239	0.005196014
-1.906070091	4066.218239	0.005196014
-1.904443413	4049.106856	0.005196014
-1.904443413	4049.106856	0.005196014
-1.904443413	4049.106856	0.005196014
-1.902566397	4023.087729	0.005196014
-1.902566397	4023.087729	0.005196014
-1.902566397	4023.087729	0.005196014
-1.900939542	4009.492111	0.005195493
-1.900939542	4009.492111	0.005195493
-1.900939542	4009.492111	0.005195493
-1.899312868	3984.879614	0.005197579
-1.899312868	3984.879614	0.005197579
-1.897561021	3941.983602	0.005196536
-1.897561021	3941.983602	0.005196536
-1.897561021	3941.983602	0.005196536
-1.895809174	3924.871903	0.005196014
-1.895809174	3924.871903	0.005196014
-1.895809174	3924.871903	0.005196014
-1.894057151	3896.509165	0.005195493
-1.894057151	3896.509165	0.005195493
-1.892430473	3875.64691	0.005197579
-1.892430473	3875.64691	0.005197579

-1.892430473	3875.64691	0.005197579
-1.890553457	3842.361461	0.005197058
-1.890553457	3842.361461	0.005197058
-1.890553457	3842.361461	0.005197058
-1.889051952	3815.639199	0.005200707
-1.889051952	3815.639199	0.005200707
-1.889051952	3815.639199	0.005200707
-1.887299928	3782.119274	0.005197579
-1.887299928	3782.119274	0.005197579
-1.885548081	3733.362918	0.005197579
-1.885548081	3733.362918	0.005197579
-1.885548081	3733.362918	0.005197579
-1.883796237	3711.797842	0.005197579
-1.883796237	3711.797842	0.005197579
-1.883796237	3711.797842	0.005197579
-1.88204439	3675.230496	0.005198621
-1.88204439	3675.230496	0.005198621
-1.88204439	3675.230496	0.005198621
-1.880542705	3637.022696	0.005198621
-1.880542705	3637.022696	0.005198621
-1.878790859	3602.799299	0.0051981
-1.878790859	3602.799299	0.0051981
-1.878790859	3602.799299	0.0051981
-1.877039015	3558.731155	0.005197579
-1.877039015	3558.731155	0.005197579
-1.877039015	3558.731155	0.005197579
-1.875287168	3530.602578	0.0051981
-1.875287168	3530.602578	0.0051981
-1.873535321	3454.186663	0.005197579
-1.873535321	3454.186663	0.005197579
-1.873535321	3454.186663	0.005197579
-1.871908467	3440.356524	0.005197579
-1.871908467	3440.356524	0.005197579
-1.871908467	3440.356524	0.005197579
-1.87015662	3393.00682	0.0051981
-1.87015662	3393.00682	0.0051981
-1.87015662	3393.00682	0.0051981
-1.868529945	3322.45089	0.0051981
-1.868529945	3322.45089	0.0051981

Specimen No.	302T	Temperature	
Init. Width	0.251	Init. Thick.	
Final Width	0.13	Final Thick.	
Init. Gage	1	Final Gage	1.33
Init. Area	0.0495	Final Area	0.0133
Pct. Red.	73.13	Pct. Elong.	33
Modulus	24.59	Xhead Rate	0.05
Yield	62.9	Ultimate	81
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain

-2.281471704	4.133743384	0.001306779
-2.281471704	4.133743384	0.001306779
-2.281471704	4.836946014	0.001307822
-2.281471704	4.836946014	0.001307822
-2.279970019	9.407830547	0.001309386
-2.279970019	9.407830547	0.001309386
-2.279970019	9.407830547	0.001309386
-2.278218175	73.9864485	0.001331024
-2.278218175	73.9864485	0.001331024
-2.278218175	73.9864485	0.001331024
-2.276591498	222.2476856	0.001392547
-2.276591498	222.2476856	0.001392547
-2.274964643	471.6547068	0.001488222
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-2.039963369	3997.537599	0.005081309
-2.039963369	3997.537599	0.005081309
-2.039963369	3997.537599	0.005081309
-2.038211345	3991.208595	0.005080787
-2.038211345	3991.208595	0.005080787
-2.038211345	3991.208595	0.005080787
-2.036584668	4001.756814	0.005079745
-2.036584668	4001.756814	0.005079745
-2.036584668	4001.756814	0.005079745
-2.034707654	3996.599965	0.005079223
-2.034707654	3996.599965	0.005079223
-2.033080977	4008.085818	0.005080787
-2.033080977	4008.085818	0.005080787
-2.033080977	4008.085818	0.005080787
-2.031454122	4004.101078	0.005079223
-2.031454122	4004.101078	0.005079223
-2.031454122	4004.101078	0.005079223
-2.029702276	3986.286244	0.005080787
-2.029702276	3986.286244	0.005080787
-2.027950432	4003.397606	0.005080266
-2.027950432	4003.397606	0.005080266

-2.027950432	4003.397606	0.005080266
-2.026323754	4002.694448	0.005080787
-2.026323754	4002.694448	0.005080787
-2.026323754	4002.694448	0.005080787
-2.024571908	4007.617159	0.00508183
-2.024571908	4007.617159	0.00508183
-2.024571908	4007.617159	0.00508183
-2.022945053	4009.023451	0.005080787
-2.022945053	4009.023451	0.005080787
-2.021068037	4006.210529	0.005080787
-2.021068037	4006.210529	0.005080787
-2.021068037	4006.210529	0.005080787
-2.019441362	4007.38266	0.005079223
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-2.019441362	4007.38266	0.005079223
-2.017689516	3965.423967	0.005078702
-2.017689516	3965.423967	0.005078702
-2.017689516	3965.423967	0.005078702
-2.016062661	4007.85132	0.005079223
-2.016062661	4007.85132	0.005079223
-2.014310814	4005.038397	0.005078702
-2.014310814	4005.038397	0.005078702
-2.014310814	4005.038397	0.005078702
-2.01268414	4005.038397	0.005079745
-2.01268414	4005.038397	0.005079745
-2.01268414	4005.038397	0.005079745
-2.010807124	4007.85132	0.005079223
-2.010807124	4007.85132	0.005079223
-2.009305439	4006.210529	0.005080787
-2.009305439	4006.210529	0.005080787
-2.009305439	4006.210529	0.005080787
-2.007553595	4005.97603	0.005080266
-2.007553595	4005.97603	0.005080266
-2.007553595	4005.97603	0.005080266
-2.005676579	3986.754881	0.005079745
-2.005676579	3986.754881	0.005079745
-2.005676579	3986.754881	0.005079745
-2.004175071	4002.459972	0.005079745
-2.004175071	4002.459972	0.005079745
-2.002298054	4005.507371	0.005079745
-2.002298054	4005.507371	0.005079745
-2.002298054	4005.507371	0.005079745
-2.0006712	3998.006258	0.005079745
-2.0006712	3998.006258	0.005079745
-2.0006712	3998.006258	0.005079745
-1.998919356	3998.943892	0.005080787
-1.998919356	3998.943892	0.005080787
-1.998919356	3998.943892	0.005080787
-1.997292679	3998.006258	0.005082352
-1.997292679	3998.006258	0.005082352
-1.995540835	3997.068939	0.005080787

-1.995540835	3997.068939	0.005080787
-1.995540835	3997.068939	0.005080787
-1.993663819	3976.44116	0.005079223
-1.993663819	3976.44116	0.005079223
-1.993663819	3976.44116	0.005079223
-1.992162134	3986.754881	0.005079745
-1.992162134	3986.754881	0.005079745
-1.990410287	3988.630171	0.005078702
-1.990410287	3988.630171	0.005078702
-1.990410287	3988.630171	0.005078702
-1.98865844	3981.129373	0.005079223
-1.98865844	3981.129373	0.005079223
-1.98865844	3981.129373	0.005079223
-1.986906596	3986.989379	0.005079745
-1.986906596	3986.989379	0.005079745
-1.986906596	3986.989379	0.005079745
-1.985404911	4003.632104	0.005078702
-1.985404911	4003.632104	0.005078702
-1.983653064	3975.03453	0.005078702
-1.983653064	3975.03453	0.005078702
-1.983653064	3975.03453	0.005078702
-1.981901217	3970.346677	0.005081309
-1.981901217	3970.346677	0.005081309
-1.981901217	3970.346677	0.005081309
-1.980149373	3967.76823	0.005079223
-1.980149373	3967.76823	0.005079223
-1.978397527	3972.690604	0.005078702
-1.978397527	3972.690604	0.005078702
-1.978397527	3972.690604	0.005078702
-1.976645503	3968.002391	0.005080266
-1.976645503	3968.002391	0.005080266
-1.976645503	3968.002391	0.005080266
-1.975018825	3970.112179	0.005078702
-1.975018825	3970.112179	0.005078702
-1.975018825	3970.112179	0.005078702
-1.973392151	3963.783176	0.005078702
-1.973392151	3963.783176	0.005078702
-1.971640304	3941.280467	0.005079223
-1.971640304	3941.280467	0.005079223
-1.971640304	3941.280467	0.005079223
-1.97001345	3931.435383	0.005079223
-1.97001345	3931.435383	0.005079223
-1.97001345	3931.435383	0.005079223
-1.968136433	3945.499682	0.005080266
-1.968136433	3945.499682	0.005080266
-1.968136433	3945.499682	0.005080266
-1.966634928	3946.202818	0.005078702
-1.966634928	3946.202818	0.005078702
-1.964882905	3937.998547	0.005078702
-1.964882905	3937.998547	0.005078702
-1.964882905	3937.998547	0.005078702

-1.963131058	3933.779331	0.005078181
-1.963131058	3933.779331	0.005078181
-1.963131058	3933.779331	0.005078181
-1.961379211	3939.639676	0.005078702
-1.961379211	3939.639676	0.005078702
-1.959627364	3910.807603	0.005078702
-1.959627364	3910.807603	0.005078702
-1.959627364	3910.807603	0.005078702
-1.95800069	3918.777398	0.005080787
-1.95800069	3918.777398	0.005080787
-1.95800069	3918.777398	0.005080787
-1.956373835	3911.2766	0.005078702
-1.956373835	3911.2766	0.005078702
-1.956373835	3911.2766	0.005078702
-1.954621988	3899.321751	0.005079745
-1.954621988	3899.321751	0.005079745
-1.952870145	3896.274667	0.005079745
-1.952870145	3896.274667	0.005079745
-1.952870145	3896.274667	0.005079745
-1.951118298	3886.898264	0.005078702
-1.951118298	3886.898264	0.005078702
-1.951118298	3886.898264	0.005078702
-1.949366451	3888.773554	0.005078702
-1.949366451	3888.773554	0.005078702
-1.947614604	3864.395533	0.005080787
-1.947614604	3864.395533	0.005080787
-1.947614604	3864.395533	0.005080787
-1.94598775	3867.442617	0.005078702
-1.94598775	3867.442617	0.005078702
-1.94598775	3867.442617	0.005078702
-1.944361075	3855.488105	0.005078702
-1.944361075	3855.488105	0.005078702
-1.944361075	3855.488105	0.005078702
-1.942609228	3843.767776	0.005079223
-1.942609228	3843.767776	0.005079223
-1.940982374	3841.189329	0.005079745
-1.940982374	3841.189329	0.005079745
-1.940982374	3841.189329	0.005079745
-1.939230527	3830.875608	0.005078702
-1.939230527	3830.875608	0.005078702
-1.939230527	3830.875608	0.005078702
-1.937603853	3816.108173	0.005080787
-1.937603853	3816.108173	0.005080787
-1.937603853	3816.108173	0.005080787
-1.935726836	3808.138401	0.005079745
-1.935726836	3808.138401	0.005079745
-1.934099982	3797.355683	0.005079223
-1.934099982	3797.355683	0.005079223
-1.934099982	3797.355683	0.005079223
-1.932348135	3790.792204	0.005080787
-1.932348135	3790.792204	0.005080787

-1.932348135	3790.792204	0.005080787
-1.930596291	3771.336557	0.005078702
-1.930596291	3771.336557	0.005078702
-1.928844444	3773.914981	0.005078702
-1.928844444	3773.914981	0.005078702
-1.928844444	3773.914981	0.005078702
-1.927342759	3761.257334	0.005079745
-1.927342759	3761.257334	0.005079745
-1.927342759	3761.257334	0.005079745
-1.925590913	3731.25349	0.005078702
-1.925590913	3731.25349	0.005078702
-1.925590913	3731.25349	0.005078702
-1.923839069	3729.84686	0.005080266
-1.923839069	3729.84686	0.005080266
-1.922337561	3681.09084	0.005079745
-1.922337561	3681.09084	0.005079745
-1.922337561	3681.09084	0.005079745
-1.920335375	3701.249623	0.005080787
-1.920335375	3701.249623	0.005080787
-1.920335375	3701.249623	0.005080787
-1.918708521	3686.247712	0.005078702
-1.918708521	3686.247712	0.005078702
-1.918708521	3686.247712	0.005078702
-1.917081846	3676.168152	0.005079745
-1.917081846	3676.168152	0.005079745
-1.915329999	3660.93172	0.005078702
-1.915329999	3660.93172	0.005078702
-1.915329999	3660.93172	0.005078702
-1.913578153	3620.848631	0.005078702
-1.913578153	3620.848631	0.005078702
-1.913578153	3620.848631	0.005078702
-1.911951298	3624.59921	0.005079223
-1.911951298	3624.59921	0.005079223
-1.911951298	3624.59921	0.005079223
-1.910199454	3603.736932	0.005079745
-1.910199454	3603.736932	0.005079745
-1.908447607	3587.563205	0.005078702
-1.908447607	3587.563205	0.005078702
-1.908447607	3587.563205	0.005078702
-1.90682093	3568.10758	0.005079745
-1.90682093	3568.10758	0.005079745
-1.90682093	3568.10758	0.005079745
-1.905069086	3551.230357	0.005080266
-1.905069086	3551.230357	0.005080266
-1.903317059	3528.961809	0.005080787
-1.903317059	3528.961809	0.005080787
-1.903317059	3528.961809	0.005080787
-1.901565216	3491.456807	0.005080787
-1.901565216	3491.456807	0.005080787
-1.901565216	3491.456807	0.005080787
-1.899938538	3483.721533	0.005079745

-1.899938538	3483.721533	0.005079745
-1.899938538	3483.721533	0.005079745
-1.898311864	3454.186663	0.005079745
-1.898311864	3454.186663	0.005079745
-1.896559837	3428.63651	0.005080787
-1.896559837	3428.63651	0.005080787
-1.896559837	3428.63651	0.005080787
-1.894807993	3405.898966	0.005080787
-1.894807993	3405.898966	0.005080787
-1.894807993	3405.898966	0.005080787
-1.893181316	3376.12962	0.005080787
-1.893181316	3376.12962	0.005080787
-1.893181316	3376.12962	0.005080787
-1.891429472	3353.39239	0.005080787
-1.891429472	3353.39239	0.005080787
-1.889552455	3289.634123	0.005079745
-1.889552455	3289.634123	0.005079745
-1.889552455	3289.634123	0.005079745
-1.887925601	3293.619178	0.005080787
-1.887925601	3293.619178	0.005080787
-1.887925601	3293.619178	0.005080787
-1.886298924	3258.692623	0.005081309
-1.886298924	3258.692623	0.005081309
-1.884547077	3216.968765	0.005080266
-1.884547077	3216.968765	0.005080266
-1.884547077	3216.968765	0.005080266
-1.882795233	3192.590429	0.005078702
-1.882795233	3192.590429	0.005078702
-1.882795233	3192.590429	0.005078702
-1.881168379	3153.913632	0.005080266
-1.881168379	3153.913632	0.005080266
-1.881168379	3153.913632	0.005080266
-1.879416532	3107.267064	0.005080787
-1.879416532	3107.267064	0.005080787
-1.877539515	2968.968149	0.005081309
-1.877539515	2968.968149	0.005081309
-1.877539515	2968.968149	0.005081309

Specimen No.	320T	Temperature	
Init. Width	0.249	Init. Thick.	
Final Width	0.13	Final Thick.	
Init. Gage	1	Final Gage	1.32
Init. Area	0.0487	Final Area	0.0133
Pct. Red.	72.69	Pct. Elong.	32
Modulus	27.07	Xhead Rate	0.05
Yield	67.8	Ultimate	89.4
Full Scale	3.00001	22480.90247	0.05
Time	Stroke	Load	Strain
	-2.321264197	-2.243728952	0.000276253
	-2.321264197	-4.117422249	0.000275471

-2.321264197	-4.117422249	0.000275471
-2.320012853	23.98795473	0.000294762
-2.320012853	23.98795473	0.000294762
-2.320012853	23.98795473	0.000294762
-2.318010665	110.646191	0.000337516
-2.318010665	110.646191	0.000337516
-2.318010665	110.646191	0.000337516
-2.31650916	263.1178089	0.000399561
-2.31650916	263.1178089	0.000399561
-2.314882305	489.483164	0.000485069
-2.314882305	489.483164	0.000485069
-2.314882305	489.483164	0.000485069
-2.313255631	764.7986834	0.000583873
-2.313255631	764.7986834	0.000583873
-2.313255631	764.7986834	0.000583873
-2.311503784	1080.047277	0.000689454
-2.311503784	1080.047277	0.000689454
-2.311503784	1080.047277	0.000689454
-2.309626768	1459.001443	0.000820844
-2.309626768	1459.001443	0.000820844
-2.308000093	1847.792465	0.000958491
-2.308000093	1847.792465	0.000958491
-2.308000093	1847.792465	0.000958491
-2.305997905	2076.031423	0.001038785
-2.305997905	2076.031423	0.001038785
-2.305997905	2076.031423	0.001038785
-2.304621392	2542.615698	0.001219185
-2.304621392	2542.615698	0.001219185
-2.304621392	2542.615698	0.001219185
-2.302869545	2894.167217	0.001410014
-2.302869545	2894.167217	0.001410014
-2.300992529	3223.468263	0.001905334
-2.300992529	3223.468263	0.001905334
-2.300992529	3223.468263	0.001905334
-2.299365855	3343.384522	0.002847224
-2.299365855	3343.384522	0.002847224
-2.299365855	3343.384522	0.002847224
-2.297488838	3397.019009	0.003998191
-2.297488838	3397.019009	0.003998191
-2.295987153	3416.224422	0.005230948
-2.295987153	3416.224422	0.005230948
-2.295987153	3416.224422	0.005230948
-2.294235306	3450.419336	0.006497403
-2.294235306	3450.419336	0.006497403
-2.294235306	3450.419336	0.006497403
-2.292483463	3488.361501	0.007669485
-2.292483463	3488.361501	0.007669485
-2.292483463	3488.361501	0.007669485
-2.290731616	3513.188061	0.008824363
-2.290731616	3513.188061	0.008824363
-2.288979592	3533.330096	0.009940136

-2.288979592	3533.330096	0.009940136
-2.288979592	3533.330096	0.009940136
-2.287478084	3556.517191	0.011020231
-2.287478084	3556.517191	0.011020231
-2.287478084	3556.517191	0.011020231
-2.28572624	3573.614501	0.012060923
-2.28572624	3573.614501	0.012060923
-2.28572624	3573.614501	0.012060923
-2.283974393	3573.614501	0.013107874
-2.283974393	3573.614501	0.013107874
-2.282222369	3601.485785	0.014130838
-2.282222369	3601.485785	0.014130838
-2.282222369	3601.485785	0.014130838
-2.280595692	3621.862003	0.015097494
-2.280595692	3621.862003	0.015097494
-2.280595692	3621.862003	0.015097494
-2.278843845	3641.535715	0.016065194
-2.278843845	3641.535715	0.016065194
-2.277216991	3656.525239	0.017018293
-2.277216991	3656.525239	0.017018293
-2.277216991	3656.525239	0.017018293
-2.275465147	3664.956971	0.017930724
-2.275465147	3664.956971	0.017930724
-2.275465147	3664.956971	0.017930724
-2.2737133	3703.836096	0.018774332
-2.2737133	3703.836096	0.018774332
-2.2737133	3703.836096	0.018774332
-2.271961453	3679.478195	0.019691977
-2.271961453	3679.478195	0.019691977
-2.270334779	3710.159726	0.020567015
-2.270334779	3710.159726	0.020567015
-2.270334779	3710.159726	0.020567015
-2.268457763	3717.420338	0.021420008
-2.268457763	3717.420338	0.021420008
-2.268457763	3717.420338	0.021420008
-2.266956077	3724.446789	0.022260487
-2.266956077	3724.446789	0.022260487
-2.265204231	3744.588824	0.023090538
-2.265204231	3744.588824	0.023090538
-2.265204231	3744.588824	0.023090538
-2.263452387	3752.317758	0.023910162
-2.263452387	3752.317758	0.023910162
-2.263452387	3752.317758	0.023910162
-2.261825532	3772.928452	0.024706845
-2.261825532	3772.928452	0.024706845
-2.261825532	3772.928452	0.024706845
-2.260198855	3766.136162	0.025543153
-2.260198855	3766.136162	0.025543153
-2.258447008	3786.746833	0.026341921
-2.258447008	3786.746833	0.026341921
-2.258447008	3786.746833	0.026341921

-2.256695164	3795.881048	0.02711775
-2.256695164	3795.881048	0.02711775
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-2.024571908	4304.82267	0.005249718
-2.024571908	4304.82267	0.005249718
-2.022819884	4298.733201	0.005248154
-2.022819884	4298.733201	0.005248154
-2.021068037	4300.138482	0.005247632
-2.021068037	4300.138482	0.005247632
-2.021068037	4300.138482	0.005247632
-2.019441362	4291.472588	0.005247632
-2.019441362	4291.472588	0.005247632
-2.019441362	4291.472588	0.005247632
-2.017689516	4246.503994	0.005248154
-2.017689516	4246.503994	0.005248154
-2.017689516	4246.503994	0.005248154
-2.015937672	4277.654185	0.005247632
-2.015937672	4277.654185	0.005247632
-2.014310814	4272.501337	0.005248675
-2.014310814	4272.501337	0.005248675
-2.014310814	4272.501337	0.005248675
-2.012558971	4266.411867	0.005247632
-2.012558971	4266.411867	0.005247632
-2.012558971	4266.411867	0.005247632
-2.010681954	4262.664661	0.005248675
-2.010681954	4262.664661	0.005248675
-2.010681954	4262.664661	0.005248675
-2.009180449	4255.63821	0.005248154
-2.009180449	4255.63821	0.005248154
-2.007428422	4245.801174	0.005248154
-2.007428422	4245.801174	0.005248154
-2.007428422	4245.801174	0.005248154
-2.005676579	4217.227407	0.005247632
-2.005676579	4217.227407	0.005247632
-2.005676579	4217.227407	0.005247632
-2.004049901	4233.622212	0.005247632
-2.004049901	4233.622212	0.005247632
-2.002298054	4222.614393	0.005246589
-2.002298054	4222.614393	0.005246589
-2.002298054	4222.614393	0.005246589

-2.0006712	4210.903777	0.005246589
-2.0006712	4210.903777	0.005246589
-2.0006712	4210.903777	0.005246589
-1.998919356	4199.661774	0.005247632
-1.998919356	4199.661774	0.005247632
-1.998919356	4199.661774	0.005247632
-1.997292679	4187.716996	0.005248675
-1.997292679	4187.716996	0.005248675
-1.995540835	4184.437752	0.005249196
-1.995540835	4184.437752	0.005249196
-1.995540835	4184.437752	0.005249196
-1.993663819	4141.57726	0.005247632
-1.993663819	4141.57726	0.005247632
-1.993663819	4141.57726	0.005247632
-1.992162134	4155.395663	0.005247632
-1.992162134	4155.395663	0.005247632
-1.992162134	4155.395663	0.005247632
-1.990410287	4146.72977	0.005247632
-1.990410287	4146.72977	0.005247632
-1.98865844	4126.119413	0.005249718
-1.98865844	4126.119413	0.005249718
-1.98865844	4126.119413	0.005249718
-1.987031765	4116.985198	0.005246068
-1.987031765	4116.985198	0.005246068
-1.987031765	4116.985198	0.005246068
-1.985154749	4130.569441	0.005247632
-1.985154749	4130.569441	0.005247632
-1.983527895	4089.816375	0.005247632
-1.983527895	4089.816375	0.005247632
-1.983527895	4089.816375	0.005247632
-1.981650878	4060.774287	0.005248154
-1.981650878	4060.774287	0.005248154
-1.981650878	4060.774287	0.005248154
-1.980149373	4055.153139	0.005246589
-1.980149373	4055.153139	0.005246589
-1.980149373	4055.153139	0.005246589
-1.978397527	4044.379459	0.005249718
-1.978397527	4044.379459	0.005249718
-1.976645503	4019.552899	0.005248154
-1.976645503	4019.552899	0.005248154
-1.976645503	4019.552899	0.005248154
-1.975143998	4008.076758	0.005249196
-1.975143998	4008.076758	0.005249196
-1.975143998	4008.076758	0.005249196
-1.973141809	3992.853073	0.005246068
-1.973141809	3992.853073	0.005246068
-1.973141809	3992.853073	0.005246068
-1.971640304	3953.973949	0.005248675
-1.971640304	3953.973949	0.005248675
-1.970138619	3921.652638	0.005248675
-1.970138619	3921.652638	0.005248675

-1.970138619	3921.652638	0.005248675
-1.968136433	3917.905409	0.005248154
-1.968136433	3917.905409	0.005248154
-1.968136433	3917.905409	0.005248154
-1.966509759	3905.25781	0.005246589
-1.966509759	3905.25781	0.005246589
-1.964632743	3879.494606	0.005247111
-1.964632743	3879.494606	0.005247111
-1.964632743	3879.494606	0.005247111
-1.963131058	3855.136706	0.005248675
-1.963131058	3855.136706	0.005248675
-1.963131058	3855.136706	0.005248675
-1.961379211	3846.704974	0.005247632
-1.961379211	3846.704974	0.005247632
-1.961379211	3846.704974	0.005247632
-1.959627364	3792.368003	0.005248154
-1.959627364	3792.368003	0.005248154
-1.95787552	3776.441497	0.005246068
-1.95787552	3776.441497	0.005246068
-1.95787552	3776.441497	0.005246068
-1.956373835	3747.867731	0.005249718
-1.956373835	3747.867731	0.005249718
-1.956373835	3747.867731	0.005249718
-1.954621988	3721.402043	0.005247632
-1.954621988	3721.402043	0.005247632
-1.952744972	3688.143751	0.005247632
-1.952744972	3688.143751	0.005247632
-1.952744972	3688.143751	0.005247632
-1.951118298	3656.993898	0.005248675
-1.951118298	3656.993898	0.005248675
-1.951118298	3656.993898	0.005248675
-1.949366451	3636.851527	0.005248154
-1.949366451	3636.851527	0.005248154
-1.949366451	3636.851527	0.005248154
-1.947614604	3584.388159	0.005247632
-1.947614604	3584.388159	0.005247632
-1.94598775	3563.075005	0.005248154
-1.94598775	3563.075005	0.005248154
-1.94598775	3563.075005	0.005248154
-1.944361075	3528.177585	0.005249196
-1.944361075	3528.177585	0.005249196
-1.944361075	3528.177585	0.005249196
-1.942609228	3490.235105	0.005248154
-1.942609228	3490.235105	0.005248154
-1.942609228	3490.235105	0.005248154
-1.940857205	3456.97715	0.005248154
-1.940857205	3456.97715	0.005248154
-1.939230527	3415.990261	0.005248154
-1.939230527	3415.990261	0.005248154
-1.939230527	3415.990261	0.005248154
-1.937603853	3393.271803	0.005248154

-1.937603853	3393.271803	0.005248154
-1.937603853	3393.271803	0.005248154
-1.935601667	3330.5031	0.005248154
-1.935601667	3330.5031	0.005248154
-1.934099982	3296.308163	0.005247632
-1.934099982	3296.308163	0.005247632
-1.934099982	3296.308163	0.005247632
-1.932348135	3250.871247	0.005249196
-1.932348135	3250.871247	0.005249196
-1.932348135	3250.871247	0.005249196
-1.930596291	3201.686787	0.005248154
-1.930596291	3201.686787	0.005248154
-1.930596291	3201.686787	0.005248154
-1.928844444	3160.934059	0.005249718
-1.928844444	3160.934059	0.005249718
-1.927217767	3111.046778	0.005248154
-1.927217767	3111.046778	0.005248154
-1.927217767	3111.046778	0.005248154
-1.925590913	3067.249304	0.005248154
-1.925590913	3067.249304	0.005248154
-1.925590913	3067.249304	0.005248154
-1.923839069	3003.778118	0.005247632
-1.923839069	3003.778118	0.005247632
-1.922587723	2922.038186	0.005249718
-1.922587723	2922.038186	0.005249718
-1.922587723	2922.038186	0.005249718
-1.920585537	2907.048639	0.005247632
-1.920585537	2907.048639	0.005247632
-1.920585537	2907.048639	0.005247632
-1.918708521	2834.91156	0.005249718
-1.918708521	2834.91156	0.005249718
-1.918708521	2834.91156	0.005249718

Specimen No.	320B	Temperature			
Init. Width	0.251	Init. Thick.			
Final Width	0.13	Final Thick.			
Init. Gage	1	Final Gage	1.34		
Init. Area	0.0495	Final Area	0.0133		
Pct. Red.	73.13	Pct. Elong.	34		
Modulus	29.9	Xhead Rate	0.05		
Yield	71.3	Ultimate	92.2		
Full Scale	3.00001	22480.90247	0.05		
Time	Stroke	Load	Strain	Strain (%)	Stress (PSI)
	-2.3345283	-5.639806484	0.000538772	0	-113.9354845
	-2.3345283	-5.639806484	0.000538772	8E-08	-113.9354845
	-2.334027799	-5.639806484	0.000537469	-0.00026062	-113.9354845
	-2.334027799	-5.639806484	0.000537469	-0.00026062	-113.9354845
	-2.334027799	-5.639806484	0.000537469	-0.00026062	-113.9354845
	-2.332275952	-6.693756153	0.000538512	-5.206E-05	-135.227397
	-2.332275952	-6.693756153	0.000538512	-5.206E-05	-135.227397

-2.330524105	-5.405600442	0.000538772	8E-08	-109.2040493
-2.330524105	-5.405600442	0.000538772	8E-08	-109.2040493
-2.330524105	-5.405600442	0.000538772	8E-08	-109.2040493
-2.328897431	-3.649010165	0.000539815	0.00020864	-73.71737708
-2.328897431	-3.649010165	0.000539815	0.00020864	-73.71737708
-2.328897431	-3.649010165	0.000539815	0.00020864	-73.71737708
-2.327270577	-5.522680982	0.000539294	0.00010436	-111.5693128
-2.327270577	-5.522680982	0.000539294	0.00010436	-111.5693128
-2.327270577	-5.522680982	0.000539294	0.00010436	-111.5693128
-2.32539356	-4.702959835	0.000538512	-5.206E-05	-95.00928959
-2.32539356	-4.702959835	0.000538512	-5.206E-05	-95.00928959
-2.323766886	-4.117422249	0.000538251	-0.00010419	-83.18024746
-2.323766886	-4.117422249	0.000538251	-0.00010419	-83.18024746
-2.323766886	-4.117422249	0.000538251	-0.00010419	-83.18024746
-2.322015039	-2.712163517	0.000538251	-0.00010419	-54.79118216
-2.322015039	-2.712163517	0.000538251	-0.00010419	-54.79118216
-2.322015039	-2.712163517	0.000538251	-0.00010419	-54.79118216
-2.320263192	-3.531907144	0.000538251	-0.00010419	-71.35165948
-2.320263192	-3.531907144	0.000538251	-0.00010419	-71.35165948
-2.320263192	-3.531907144	0.000538251	-0.00010419	-71.35165948
-2.318511168	-4.117422249	0.00053773	-0.00020847	-83.18024746
-2.318511168	-4.117422249	0.00053773	-0.00020847	-83.18024746
-2.316759322	-0.487161157	0.000539033	5.222E-05	-9.841639526
-2.316759322	-0.487161157	0.000539033	5.222E-05	-9.841639526
-2.316759322	-0.487161157	0.000539033	5.222E-05	-9.841639526
-2.315132647	-0.955595721	0.000535383	-0.00067773	-19.30496407
-2.315132647	-0.955595721	0.000535383	-0.00067773	-19.30496407
-2.315132647	-0.955595721	0.000535383	-0.00067773	-19.30496407
-2.31350597	2.323378789	0.000535123	-0.00072986	46.93694524
-2.31350597	2.323378789	0.000535123	-0.00072986	46.93694524
-2.31350597	2.323378789	0.000535123	-0.00072986	46.93694524
-2.311879115	70.36180763	0.000550764	0.00239848	1421.450659
-2.311879115	70.36180763	0.000550764	0.00239848	1421.450659
-2.310002099	238.2914064	0.000609421	0.01412973	4813.967806
-2.310002099	238.2914064	0.000609421	0.01412973	4813.967806
-2.310002099	238.2914064	0.000609421	0.01412973	4813.967806
-2.308500594	515.4806416	0.000696493	0.03154413	10413.75034
-2.308500594	515.4806416	0.000696493	0.03154413	10413.75034
-2.308500594	515.4806416	0.000696493	0.03154413	10413.75034
-2.306998909	746.9986645	0.000768184	0.04588234	15090.88211
-2.306998909	746.9986645	0.000768184	0.04588234	15090.88211
-2.304996723	1116.584296	0.000883671	0.06897989	22557.25851
-2.304996723	1116.584296	0.000883671	0.06897989	22557.25851
-2.304996723	1116.584296	0.000883671	0.06897989	22557.25851
-2.303495218	1462.982968	0.000998898	0.09202528	29555.21148
-2.303495218	1462.982968	0.000998898	0.09202528	29555.21148
-2.303495218	1462.982968	0.000998898	0.09202528	29555.21148
-2.301618202	1860.088485	0.001141498	0.12054528	37577.54514
-2.301618202	1860.088485	0.001141498	0.12054528	37577.54514
-2.301618202	1860.088485	0.001141498	0.12054528	37577.54514
-2.299866355	2249.58217	0.001294787	0.15120297	45446.10444

-2.299866355	2249.58217	0.001294787	0.15120297	45446.10444
-2.297989339	2593.90808	0.001453289	0.18290344	52402.18343
-2.297989339	2593.90808	0.001453289	0.18290344	52402.18343
-2.297989339	2593.90808	0.001453289	0.18290344	52402.18343
-2.296487654	2971.925444	0.001664191	0.22508382	60038.89786
-2.296487654	2971.925444	0.001664191	0.22508382	60038.89786
-2.296487654	2971.925444	0.001664191	0.22508382	60038.89786
-2.29473581	3253.447334	0.001919411	0.27612786	65726.20876
-2.29473581	3253.447334	0.001919411	0.27612786	65726.20876
-2.29473581	3253.447334	0.001919411	0.27612786	65726.20876
-2.292983963	3443.392907	0.002281777	0.34860096	69563.49307
-2.292983963	3443.392907	0.002281777	0.34860096	69563.49307
-2.291357286	3556.282715	0.002812812	0.45480795	71844.09525
-2.291357286	3556.282715	0.002812812	0.45480795	71844.09525
-2.291357286	3556.282715	0.002812812	0.45480795	71844.09525
-2.289480273	3624.672565	0.00351017	0.59427961	73225.70839
-2.289480273	3624.672565	0.00351017	0.59427961	73225.70839
-2.289480273	3624.672565	0.00351017	0.59427961	73225.70839
-2.287978588	3660.038644	0.004348564	0.76195843	73940.17463
-2.287978588	3660.038644	0.004348564	0.76195843	73940.17463
-2.285976402	3675.49649	0.005247632	0.94177201	74252.45435
-2.285976402	3675.49649	0.005247632	0.94177201	74252.45435
-2.285976402	3675.49649	0.005247632	0.94177201	74252.45435
-2.284474894	3716.71754	0.006138165	1.11987858	75085.20284
-2.284474894	3716.71754	0.006138165	1.11987858	75085.20284
-2.284474894	3716.71754	0.006138165	1.11987858	75085.20284
-2.28272305	3732.878184	0.007000543	1.29235424	75411.68049
-2.28272305	3732.878184	0.007000543	1.29235424	75411.68049
-2.28272305	3732.878184	0.007000543	1.29235424	75411.68049
-2.281096196	3751.615275	0.007837373	1.4597202	75790.20757
-2.281096196	3751.615275	0.007837373	1.4597202	75790.20757
-2.279219179	3779.95488	0.008674724	1.62719033	76362.72485
-2.279219179	3779.95488	0.008674724	1.62719033	76362.72485
-2.279219179	3779.95488	0.008674724	1.62719033	76362.72485
-2.277717671	3798.925794	0.009476099	1.78746543	76745.97565
-2.277717671	3798.925794	0.009476099	1.78746543	76745.97565
-2.277717671	3798.925794	0.009476099	1.78746543	76745.97565
-2.275965828	3797.052191	0.010268387	1.94592304	76708.12507
-2.275965828	3797.052191	0.010268387	1.94592304	76708.12507
-2.275965828	3797.052191	0.010268387	1.94592304	76708.12507
-2.274464143	3769.883706	0.010984775	2.08920068	76159.26678
-2.274464143	3769.883706	0.010984775	2.08920068	76159.26678
-2.272587126	3830.778805	0.011779373	2.24812023	77389.47081
-2.272587126	3830.778805	0.011779373	2.24812023	77389.47081
-2.272587126	3830.778805	0.011779373	2.24812023	77389.47081
-2.270835279	3850.452518	0.012518702	2.39598609	77786.91955
-2.270835279	3850.452518	0.012518702	2.39598609	77786.91955
-2.270835279	3850.452518	0.012518702	2.39598609	77786.91955
-2.268958263	3858.181452	0.013250734	2.54239238	77943.05963
-2.268958263	3858.181452	0.013250734	2.54239238	77943.05963
-2.268958263	3858.181452	0.013250734	2.54239238	77943.05963

-2.267331589	3874.342118	0.013944182	2.68108196	78269.53774
-2.267331589	3874.342118	0.013944182	2.68108196	78269.53774
-2.265454572	3892.610549	0.014615731	2.81539179	78638.59695
-2.265454572	3892.610549	0.014615731	2.81539179	78638.59695
-2.265454572	3892.610549	0.014615731	2.81539179	78638.59695
-2.263952887	3881.134071	0.015315436	2.95533277	78406.74891
-2.263952887	3881.134071	0.015315436	2.95533277	78406.74891
-2.263952887	3881.134071	0.015315436	2.95533277	78406.74891
-2.262326213	3906.663092	0.016013055	3.09485651	78922.4867
-2.262326213	3906.663092	0.016013055	3.09485651	78922.4867
-2.260449197	3911.34728	0.016682518	3.22874911	79017.11677
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-2.258947512	3927.742107	0.017337383	3.35972227	79348.3254
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-2.257195665	3942.263332	0.017992248	3.49069513	79641.68347
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-2.255443818	3944.136935	0.018631472	3.61853994	79679.53404
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-2.253566802	3963.810647	0.019266523	3.74555028	80076.98277
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-2.251940127	3951.631686	0.019909918	3.87422926	79830.94315
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-2.250313273	3978.331871	0.020552416	4.00272883	80370.34084
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-2.248561426	3982.313577	0.021171826	4.12661082	80450.77932
-2.248561426	3982.313577	0.021171826	4.12661082	80450.77932
-2.246934752	3988.168885	0.021797493	4.25174422	80569.06838
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-2.245182725	4005.032035	0.022421075	4.37646068	80909.73807
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-2.24355605	4004.797874	0.023044656	4.50117684	80905.00755
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-2.238425505	4037.821667	0.024861176	4.86448086	81572.1549
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-2.236673659	4044.145298	0.025470158	4.98627729	81699.90501
-2.236673659	4044.145298	0.025470158	4.98627729	81699.90501

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-2.233295137	4064.053194	0.026683953	5.22903628	82102.08472
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-2.231668283	4069.908502	0.027301279	5.35250134	82220.37378
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-2.229916436	4073.656046	0.027901918	5.47262914	82296.08174
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-2.227914427	4077.169114	0.028544271	5.6010998	82367.05281
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-2.226412745	4086.537491	0.029146996	5.72164483	82556.31295
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-2.224786068	4094.969223	0.029753894	5.84302432	82726.65097
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-2.223034044	4099.653411	0.030362877	5.96482105	82821.28104
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-2.219655523	3863.099801	0.00525441	0.94312764	78042.42023
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-2.217403175	4152.350917	0.00525441	0.94312764	83885.87712
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-2.210395611	4146.495609	0.005255974	0.94344049	83767.58806
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-2.20689192	4170.151049	0.005255974	0.94344049	84245.47573
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-2.196881166	4213.480178	0.005255974	0.94344049	85120.81168
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-2.195129322	4216.524924	0.005255974	0.94344049	85182.3217
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				92153.06959

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