

“A STUDY OF THE SETUP BEHAVIOR OF DRILLED SHAFTS”

**Contract No. BC-354
RPWO No. 32**

Submitted To:

Mr. Richard Long, Research Center Director
Mr. Peter Lai, PE, Project Manager
Florida Department of Transportation
605 Suwannee Street, M.S.30
Tallahassee, FL 32399-0450

July 2003

Submitted By:

University of Florida
Department of Civil and Coastal Engineering
345 Weil Hall
PO Box 116580
Gainesville, FL 32611

Paul J. Bullock, PhD, PE, Asst. Professor

1. Report No.		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle A Study of the Setup Behavior of Drilled Shafts				5. Report Date 10 July 2003	
				6. Performing Organization Code	
				8. Performing Organization Report No. 4910-4504-798-12	
7. Author(s) Paul J. Bullock, PhD, PE				10. Work Unit No. (TRAIS) RPWO 32	
9. Performing Organization Name and Address University of Florida Department of Civil and Coastal Engineering 365 Weil Hall / P.O. Box 116580 Gainesville, FL 32611-6580				11. Contract or Grant No. BC-354	
				13. Type of Report and Period Covered Final Report 30 October 2000 – 10 July 2003	
				14. Sponsoring Agency Code	
12. Sponsoring Agency Name and Address Florida Department of Transportation Research Management Center 605 Suwannee Street, MS 30 Tallahassee, FL 32301-8064					
15. Supplementary Notes FDOT Project Manager Mr. Peter Lai					
16. Abstract <p>Many driven pile foundations exhibit a side shear capacity increase with time, often termed "setup". Previous FDOT research investigating setup capacity reported a setup factor $A > 0.20$ for five piles driven in Florida soils. Because of their much greater capacity, a similar setup factor for drilled shafts could significantly decrease foundation cost through reduced shaft size, length, or number. The Florida Department of Transportation (FDOT) set aside five drilled shafts at the site of the new SR20 eastbound bridge for future tests following the initial tests performed during construction to verify their design capacity. These shafts ranged from 5 to 7 ft in diameter and 85 to 104 ft in length, with rock socket lengths in limestone 18 to 35 ft long. They were constructed using temporary casing and mineral slurry through overburden soils that included sand, clay, and mixed soils. Loadtest Inc. performed the initial tests in 1996, 6 to 11 days after construction, using multi-level Osterberg Cell tests (O-cell). Strain gages cast into the shafts provided a shaft load profile from which to estimate the side shear acting on approximately nine segments in each test shaft, three in the rock socket and six in the overburden soils. The University of Florida (UF) performed a second set of tests in 2002, approximately 5.4 years later, focusing on the setup of the shaft segments in the overburden soils. The O-cells and strain instrumentation performed well during the second test set, which was accomplished by staff and students from UF without heavy equipment. This report includes both the 1996 and 2002 tests to insure equivalent analyses. The average side shear setup factor identified for 30 shaft segments in clay, sand, mixed sand and clay, and limestone was $A = 0.18$. However, the measured setup was both negative and positive, with a median of essentially zero setup. A number of factors, including construction techniques and residual stresses, may have affected the SR20 test results, but predictable side shear setup could not be verified based on these tests. Since potential mechanisms for drilled shaft side shear setup do exist, future tests with more careful research control during the construction and subsequent setup periods may prove otherwise.</p>					
17. Key Words Drilled Shaft Capacity, Deep Foundation, Setup Factor, Freeze, Side Shear, Side Friction, Bored Pile, Time Effects, Osterberg Cell Test, Bridge Foundation, Soil			18. Distribution Statement No restrictions.		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 462	22. Price

DISCLAIMER

The opinions, findings and conclusions expressed in this publication are those of the author and not necessarily those of the Florida Department of Transportation or the U.S. Department of Transportation. This publication was prepared in cooperation with the State of Florida Department of Transportation and the U.S. Department of Transportation.

Final Report Contract #BC354 RPWO #27

SI* (MODERN METRIC) CONVERSION FACTORS					
Property	Symbol	When You Know	Multiply By	To Find	Symbol
APPROXIMATE CONVERSIONS TO SI UNITS					
LENGTH	in	inches	25.4	millimeters	mm
	ft	feet	0.305	meters	m
	yd	yards	0.914	meters	m
	mi	miles	1.61	kilometers	km
AREA	in ²	square inches	645.2	square millimeters	mm ²
	ft ²	square feet	0.093	square meters	m ²
	yd ²	square yards	0.836	square meters	m ²
	ac	acres	0.405	hectares	ha
VOLUME	mi ²	square miles	2.59	square kilometers	km ²
	fl oz	fluid ounces	29.57	milliliters	ml
	gal	gallons	3.785	liters	l
	ft ³	cubic feet	0.028	cubic meters	m ³
	yd ³	cubic yards	0.765	cubic meters	m ³
MASS	oz	ounces	28.35	grams	g
	lb	pounds	0.454	kilograms	kg
	T	short tons (2000lb)	0.907	megagrams	Mg
TEMPERATURE (exact)	°F	Fahrenheit temperature	(°F-32)/1.8	Celsius temperature	°C
IILLUMINATION	fc	foot-candles	10.76	lux	lx
	fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE	lbf	poundforce	4.45	Newtons	N
PRESSURE	psi	poundforce/square inch	6.89	kiloPascals	kPa
APPROXIMATE CONVERSIONS FROM SI UNITS					
LENGTH	mm	millimeters	0.039	inches	in
	m	meters	3.28	feet	ft
	m	meters	1.09	yards	yd
	km	kilometers	0.621	miles	mi
AREA	mm ²	square millimeters	0.0016	square inches	in ²
	m ²	square meters	10.764	square feet	ft ²
	m ²	square meters	1.195	square yards	yd ²
	ha	hectares	2.47	acres	ac
	km ²	square kilometers	0.386	square miles	mi ²
VOLUME	ml	milliliters	0.034	fluid ounces	fl oz
	l	liters	0.264	gallons	gal
	m ³	cubic meters	35.71	cubic feet	ft ³
	m ³	cubic meters	1.307	cubic yards	yd ³
MASS	g	grams	0.035	ounces	oz
	kg	kilograms	2.202	pounds	lb
	Mg	megagrams	1.103	short tons (2000lb)	T
TEMPERATURE (exact)	°C	Celsius temperature	1.8°C + 32	Fahrenheit temperature	°F
IILLUMINATION	lx	lux	0.0929	foot-candles	fc
	cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE	N	Newtons	0.225	poundforce	lbf
PRESSURE	kPa	kiloPascals	0.145	poundforce/square inch	psi

* SI is the symbol for the International System of Units.

(Revised August 1992)

Appropriate rounding should be made to comply with Section 4 of ASTM E380

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	viii
ABSTRACT	ix
1. INTRODUCTION	1
1.1 Drilled Shaft Setup.....	1
1.2 SR 20 Drilled Shaft Tests.....	1
1.3 Project Scope	3
1.3.1 Task 1 Previous SR20 Test Results.....	3
1.3.2 Task 2 Literature Review.....	6
1.3.3 Tasks 3-6 Perform Retests and Analyze Results	6
1.3.4 Task 7 Final Report.....	9
2. LITERATURE REVIEW	10
2.1 Osterberg Cell.....	10
2.2 Setup and Side Shear – Piles and Shafts	11
2.3 Causes of Side Shear Setup.....	13
2.4 Setup Factor, A.....	15
3. SR20 TEST SHAFT CONSTRUCTION.....	18
3.1 SR20 Test Shafts.....	18
3.2 Site Stratigraphy	25
3.3 Test Shaft Properties and Instrumentation.....	25
3.4 Shaft Construction Procedures	32
3.4.1 Test Shaft 2.....	33
3.4.2 Test Shaft 10.....	33
3.4.3 Test Shaft 11	34
3.4.4 Test Shaft 7.....	34
3.4.5 Test Shaft 5.....	34
3.5 Shaft Enclosures.....	35
4. TEST EQUIPMENT AND PROCEDURES	38
4.1 Load.....	38
4.2 Shaft Displacements.....	39

Final Report Contract #BC354 RPWO #27

4.2.1	Reference Beams.....	40
4.2.2	Top of Shaft Movement.....	41
4.2.3	Osterberg Cell Expansion and Shaft Compression	41
4.3	Shaft Strain	42
4.4	Test Procedures	44
5.	ANALYSIS OF TEST DATA	51
5.1	Raw Data.....	51
5.2	Top of Shaft and O-cell Movements	52
5.3	Strain Calculations.....	53
5.4	Shaft Load	54
5.5	Shear Stress	55
5.6	Telltale Compression and Strain Gage Comparison.....	56
5.7	Segment Movement.....	57
5.8	Modulus and Shaft Area	58
6.	TEST RESULTS.....	59
6.1	Test Stages.....	59
6.2	Shaft 11 Test Results.....	60
6.3	Shaft 2 Test Results	63
6.4	Shaft 10 Test Results.....	65
6.5	Shaft 5 Test Results	67
6.6	Shaft 7 Test Results	69
7.	SIDE SHEAR SETUP RESULTS	71
7.1	Calculation of Side Shear	71
7.2	1996 vs. 2002 Side Shear Comparison	73
7.2.1	Shaft 11	73
7.2.2	Shaft 2.....	75
7.2.3	Shaft 10.....	77
7.2.4	Shaft 5.....	79
7.2.5	Shaft 7	79
7.3	Time Effects on Side Shear	82
7.4	Summary of SR20 Setup	85

Final Report Contract #BC354 RPWO #27

8.	CONCLUSIONS AND RECOMMENDATIONS.....	89
8.1	Conclusions	89
8.2	Recommendations.....	89
9.	REFERENCES.....	90
APPENDIX A	SPT BORING LOGS	92
APPENDIX B	CALIBRATIONS.....	99
APPENDIX C	TEST SHAFT 11 – ANALYSIS OF 1996 TEST	114
APPENDIX D	TEST SHAFT 11 – ANALYSIS OF 2002 TEST	142
APPENDIX E	TEST SHAFT 2 – ANALYSIS OF 1996 TEST	178
APPENDIX F	TEST SHAFT 2 – ANALYSIS OF 2002 TEST	213
APPENDIX G	TEST SHAFT 10 – ANALYSIS OF 1996 TEST	247
APPENDIX H	TEST SHAFT 10 – ANALYSIS OF 2002 TEST	276
APPENDIX I	TEST SHAFT 5 – ANALYSIS OF 1996 TEST	311
APPENDIX J	TEST SHAFT 5 – ANALYSIS OF 2002 TEST	354
APPENDIX K	TEST SHAFT 7 – ANALYSIS OF 1996 TEST	385
APPENDIX L	TEST SHAFT 7 – ANALYSIS OF 2002 TEST	416

ACKNOWLEDGEMENTS

The author wishes to thank the Florida Department of Transportation for funding this research and providing their support. In particular, Project Manager Mr. Peter Lai, District 3 Geotechnical Engineer Mr. Sam Weede, and District 3 Drilling Supervisor Mr. Mike Suggs are recognized for their valuable assistance during this project. LOADTEST, Inc., (LTI) loaned pumps and gages to UF at no charge for the duration of the project and assisted in recovering field records of the original 1996 shaft tests. Mr. Jack Hayes, President of LTI, and his staff, also provided valuable technical assistance in preparation for the field tests and we are very grateful for their help. We also thank Mr. Michael Sharp from URS Corporation (formerly Dames and Moore), who prepared the Final Geotechnical Report including the 1996 shaft tests for the FDOT and provided background information needed during the project.

The assistance of many people was required to successfully complete the field tests for this project at the relatively remote SR20 Blountstown Bridge site. Several in the Blountstown area deserve special acknowledgment including Mr. Harold Logan, who provided temporary storage for some of the bulky field test equipment at his farm in Marianna, FL, and Mr. Lou Logan from Tallahassee, who provided moral support and the use of his vehicle during the field tests. The Bayou Hunting Club also provided access across their property to the test shafts under the approach of the western bridge.

Many at UF deserve recognition and thanks. UF graduate student Joshua Logan participated in all of the field tests and helped prepare the site, the test instrumentation, and the reference beams. UF Assistant-in-Engineering Mr. Chris Kohlhof participated in the setup and conduct of the field tests and transported equipment to the site. UF Assistant-in-Engineering Mr. Chuck Broward also participated in a field test. Eleven students from UF participated in the field tests, several during more than one test. Ms. Rachel Conn, a UF Civil Engineering student, deserves special recognition for her extensive volunteer. The geotechnical faculty and the staff, and administration of the UF Civil and Coastal Engineering Department and the UF College of Engineering, supported this work indirectly, and deserve thanks as well.

ABSTRACT

Many driven pile foundations exhibit a side shear capacity increase with time, often termed "setup". Previous FDOT research investigating setup capacity reported a setup factor $A > 0.20$ for five piles driven in Florida soils. Because of their much greater design capacity, a similar setup factor for drilled shafts could significantly decrease foundation cost through reduced shaft size, length, or number. The Florida Department of Transportation (FDOT) set aside five drilled shafts at the site of the new SR20 eastbound bridge for future tests following the initial tests performed during construction to verify their design capacity. These shafts ranged in size from 5 to 7 ft in diameter and 85 to 104 ft in length, with rock socket lengths in limestone 18 to 35 ft long. They were constructed using temporary casing and mineral slurry through overburden soils including sand, clay, and mixed soils.

Loadtest Inc. performed the initial tests in 1996, 6 to 11 days after construction, using multi-level Osterberg Cell tests (O-cell). Strain gages cast into the shafts provided a shaft load profile from which to estimate shaft side shear for approximately nine segments in each test shaft, three in the rock socket and six in the overburden soils. The University of Florida (UF) performed a second set of tests in 2002, approximately 5.4 years later, focusing on the setup of the shaft segments in the overburden soils. The O-cells and strain instrumentation performed well during the second test set, which was accomplished by staff and students from UF without heavy equipment. This report includes both the 1996 and 2002 tests to insure equivalent test analyses. The average side shear setup factor identified for 30 shaft segments in clay, sand, mixed sand and clay, and limestone was $A = 0.18$. However, the measured setup was both negative and positive, with a median of essentially zero setup. A number of factors, including construction techniques and residual stresses, may have affected the SR20 test results, but reliable side shear setup could not be verified based on these tests. Potential mechanisms for drilled shaft side shear setup do exist, and future tests with more careful research control during the construction and subsequent setup periods may prove otherwise.

1. INTRODUCTION

1.1 Drilled Shaft Setup

Engineers routinely test the capacity of deep foundation elements during and/or after their installation, using both static and dynamic methods. These tests often indicate a change in side shear capacity with time after the completion of driving. The terms "setup" and "freeze" describe an increase in capacity, which is commonly observed for driven piles. Research by Bullock (1999) indicates that a minimum capacity increase of 10-20 percent per log cycle of time occurs in Florida soils, with potentially much more in cohesive soils. Therefore, if included in design, setup could provide significant cost savings by reducing the number and/or size of driven piles used for foundation support. Since drilled shafts foundations typically have much greater side area than driven piles, their construction costs could also be reduced using setup. However, there is little documentation of side shear setup for drilled shafts, probably due to the expense of testing these high capacity foundation elements. The research described herein provides documentation of time effects on drilled shaft capacity for a bridge site located in North Florida.

1.2 SR 20 Drilled Shaft Tests

The Florida Department of Transportation (FDOT) funded the construction and load testing of six out-of-position, concrete drilled shafts, 5 to 9 ft in diameter, during the initial phase of construction of the new eastbound bridge for State Road 20 over the Apalachicola River between Bristol and Blountstown, FL. **Figure 1.1** shows the location of this site on a Florida map. The General Contractor for this work was Odebrecht Contractors of Florida, Inc. (OFL), and the shafts were installed by their subcontractor, Farmer Drilling, Inc. (FDI).

The SR20 test shafts, constructed during 1996 and 1997, penetrate through the alluvial overburden soils with terminal sockets in the underlying limestone. For testing purposes, each shaft included Osterberg Cells (O-cells) installed near the top and the bottom of the rock socket. Test shaft instrumentation included telltales and vibrating wire Sister Bar strain gages, as well as perimeter access tubes for crosshole sonic

logging. LOADTEST, Inc. (LTI) helped install the test instrumentation and performed the axial O-cell tests. By alternating between the two O-cell levels in each shaft, LTI performed multi-stage tests to determine the ultimate end bearing and side shear for all of the test shafts. Dames and Moore, Inc. (D&M), now URS Corporation, included these test results in their "Final Geotechnical Report" submitted to the FDOT in 1998.

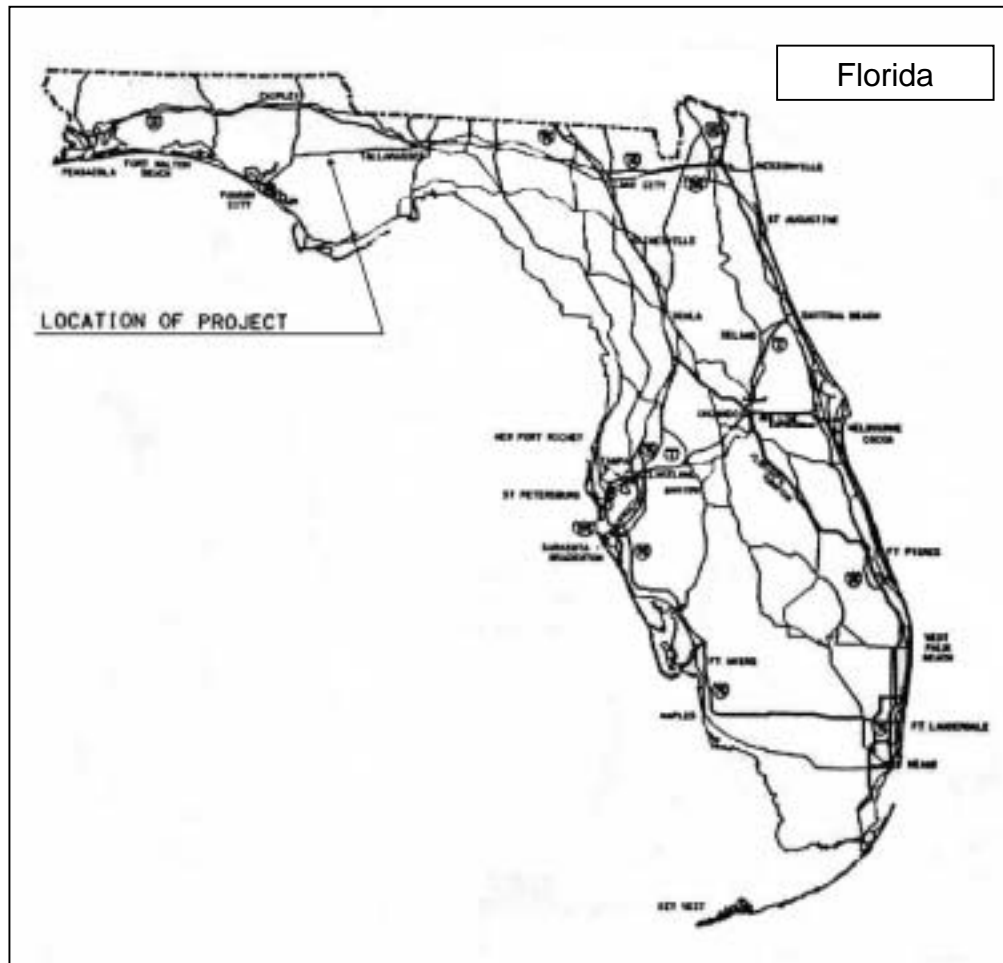


Figure 1.1 Site Location Map

The largest of the SR20 test shafts, Shaft 8, is 134 ft long and 9 ft in diameter and is located near the main channel of the Apalachicola River. It was loaded to an equivalent top load of 15,000 tons, an O-cell world record test at the time. Near the end of the bridge project, Schmertmann and Crapps, Inc. also performed a lateral test on Shaft 8. Due to damage sustained during the lateral test, Shaft 8 is not viable for further load testing. It was left in place as pier protection for the adjacent bridge.

The other five test shafts, located in the flood plain directly under the bridge, vary in overall length from 85 to 99 ft and in diameter from 5 to 7 ft. Soil overburden for these shafts ranges from 58 to 71 ft and their rock sockets are 18 to 35 ft long. Although normally above water, these test shafts are subject to annual flooding (partially controlled by the Woodruff Dam approximately 20 miles upstream) that has degraded the test equipment.

At the end of the bridge project, the flood plain test shafts were enclosed in steel "shelters" (constructed from casing) in anticipation of possible future retests. In 2000, the FDOT funded a research project through the University of Florida Department of Civil and Coastal Engineering to perform these retests. This report presents the results of that research project.

1.3 Project Scope

The primary goal of the research described herein is to measure the change in side shear, if any, which may have occurred for the drilled shafts tested during construction of the SR20 Blountstown Bridge. The proposed research effort was divided into the following seven tasks, which are subsequently reviewed below:

1. Obtain Previous SR20 Test Results and Check Viability of Test Equipment
2. Literature Review
3. Perform (4) Initial O-cell Retests at the SR20 Site
4. Analyze Initial Retests
5. Perform (4) Final O-cell Retests at the SR20 Site
6. Analyze Final Retests
7. Prepare Final Report

1.3.1 Task 1 Previous SR20 Test Results

In early 2001, a copy of the 1998 Dames and Moore "Final Geotechnical Report" was obtained from Mr. Peter Lai, the FDOT Project Manager for this research. A few details

of the test analyses not included in the report were later obtained directly from Mr. Michael Sharp, a Senior Geotechnical Engineer at Dames and Moore and author of the above report. UF Professor Michael McVay provided copies of Excel spreadsheets the 1996-97 test data obtained from FDOT during a previous unrelated research study. Construction and testing field notes were obtained from LOADTEST Inc. and proved invaluable during interpretation of the 1996-97 tests.

Evaluation of the initial tests established that more than half of the 6 in maximum stroke for each O-cell had already been used, and that only one additional test, using the upper O-cell, could be performed for each shaft. Furthermore, it was determined that the direction of the side shear in the rock sockets would be reversed during the retests, thus significantly reducing the rock side shear and limiting the setup study to the overburden soils. This was partially due to the staging of the initial tests and partially due to the large expansion of the lower O-cells during the initial tests. One of the lower O-cells had also been over-stroked during the initial test and had a blown seal. However, the concrete-rock interface is typically very brittle and significant setup was not expected in this zone. An additional test shaft, not anticipated in the research proposal, was also identified, resulting in a total of five test shafts instead of four.

A site visit in January 2001 found that, although the test equipment had been enclosed in steel casing, the casing was not sealed from the annual site floods. **Figure 1.2** shows the typical conditions found at each shaft. Corrosion, insect infestation, and several inches of silt were found inside the enclosures. The high pressure O-cell hoses and the strain gage cables were found unprotected and buried in silt in the center of each shaft. The hose end fittings (20) had to be replaced because of extensive corrosion and potential safety risks. Many of the fittings still leaked during the tests due to the poor condition of the hoses. The strain gage cables were stripped and re-tinned prior to testing (some twice due to intervening flooding). Splices were required for several cables and a few were damaged beyond repair.

The steel shaft enclosures were constructed from 9 ft diameter steel casing that was concreted in place up to the shaft top. They extended 4-5 ft above ground and 2-3 ft

below ground, restricting access to the shaft top, and requiring remote movement indicators. The enclosures also had drain holes at ground level, which trapped floodwaters and silt. Several site trips were required to clean the shafts and equipment. To remove the additional side shear around the large enclosures, a trench was excavated by hand down to the casing bottom at each shaft prior to testing. Excavation was difficult and time consuming due to concrete debris in the fill.



Figure 1.2 Typical Site Conditions Found Inside the Shaft Enclosures

No telltales were found at the test site and approximately 1100 ft of rods were needed for the longest shaft. FDOT District 3 loaned UF about 500 ft of rods, but many had to be rethreaded due to poor condition and incompatible thread sizes. Telltale rods scavenged from previous pile tests performed by UF made up the balance, which were installed and removed for each test. Fiberglass beams for shaft movement reference were designed and constructed to facilitate manual positioning and transport to and from the site. The 3 ft deep by 32 ft long beams weighed less than 100 lbs each and were assembled at the site in 8 ft sections.

The test sites were also overgrown with vegetation, which was cleared by hand. Site access was restricted for the three test shafts on the Blountstown side of the Apalachicola River. The FDOT right-of-way bridge over “Big Bayou Creek” had been dismantled and arrangements were made to use a smaller bridge located 500 ft upstream and owned by the Bayou Hunting Club. However, heavy vehicles could not traverse this span. The challenges described above slowed the project and added unanticipated costs, but did not prevent its successful completion.

1.3.2 Task 2 Literature Review

There are many examples of driven pile setup in the literature, but few for drilled shafts. Several studies, however, support the possibility of drilled shaft setup. A complete literature review is included in **Chapter 2**.

1.3.3 Tasks 3-6 Perform Retests and Analyze Results

The shaft retests were completed between January and March of 2002. Although only one test could be performed at each site, the addition of a fifth shaft (instead of four) and setup periods in excess of five years provided the information needed to conclude the project. Details of the tests and their analyses are included **Chapters 3-6** and the **Appendices**. Key features of the tests, all of which were directed by Dr. Bullock, include (also see **Figures 1.3 and 1.4**):

- Load by O-cells
 - 185 cfm, 175 psi air compressor with 50 feet of hose (rented)
 - Air-driven water pumps (2) for O-cell pressurization (on loan from LTI)
 - Pump operator (UF)
 - Vibrating wire pressure transducers (2) in series with calibrated 10,000 psi pressure gages (2)
 - Campbell Scientific CR10 datalogger with multiplexer and PC208 Software Package (programmed by UF)
 - Laptop computer for data acquisition and operator (also used for strain gages)

- Movement of Telltale (TT) Rods (shaft compression and O-cell expansion)
 - Telltale rods (1100 ft) with clips (10) and glass plates for indicator stem
 - Digital movement indicators (10) with remote reading capability
 - RS232 connector cables (10) for indicators

Final Report Contract #BC354 RPWO #27

- MicroRidge MPX-4S multiplexer (16-channel) with MicroRidge Wedgelink software package for indicators
- Laptop computer for data acquisition and operator (also used for top of shaft)
- Technicians (6) for manual indicator readings (including top of shaft)

- Movement of Top of Shaft
 - Digital movement indicators (3) with magnetic holders
 - RS232 connector cables (3) for indicators
 - MicroRidge multiplexer, software, laptop computer, and operator (from TT)
 - Fiberglass reference beams (2), 3' deep and 32' long
 - Timber supports (4"x4") and cross braces (2"x4") for reference beams
 - Survey level with tripod and operator
 - Engineering scales (0.02"), shaft top (3), reference supports (2), backsight (1)
- Strain gages (14-18) and LVWDT's
 - CR10 datalogger, multiplexer, software, laptop computer for data acquisition and operator (from load)
 - The two data acquisition systems were synchronized and used during tests to monitor digital indicators, strain gages, and pressure transducers



Figure 1.3 Test Setup Overview (Shaft 7)



Fig

1.3.4 Task 7 Final Report

This Final Report completes the work for this research project. Analyses for all of the load tests, both initial and final, are included. This report includes:

- Literature Review
- Site stratigraphy and shaft construction
- Test procedures and equipment
- Test results and data reduction methods
- Comparison of side shear from the initial and final tests
- Conclusions and Recommendations

2. LITERATURE REVIEW

The research literature provides many documented examples of side shear setup for driven piles (Bullock, 1999), but few studies have investigated the setup of drilled shafts. Due to the large capacity of most drilled shafts, repeated top-load tests require significant added expense. However, with the introduction of the Osterberg Cell, repeated testing to measure time effects became more cost-efficient.

2.1 Osterberg Cell

The Osterberg Cell (O-cell) is a sacrificial jack cast into a drilled shaft (or driven pile), often at the bottom, and subsequently used to load the shaft from within. It uses the shaft end bearing as reaction from which to load the shaft in side shear, thus testing both components simultaneously and separately. The inventor, Dr. Jorj Osterberg, first used the O-cell in a 4-foot diameter “belled” test shaft at the Case International equipment yard in Roselle, Illinois. The results of the test were published in the August 1984 issue of *Foundation Drilling Magazine*. In April 1988, O-cell tests were performed on driven pipe piles at Pines River Bridge in Revere/Saugus, Massachusetts. Thomas K. Dyer, Inc. reported that the Pines River piles had an ultimate skin friction capacity of 215 tons. **Table 2.1** presents additional examples of O-cell testing with typical results.

Table 2.1 O-cell Load Test Examples (Osterberg, 1999)

Location	Shaft Diameter	Depth	Maximum Load
Ohio River Bridge, Kentucky	6 ft	117 ft (from water level)	6,200 tons
St Mary’s River, Georgia	5 ft	75 ft	7,300 tons
Penang, Malaysia	6 m x 1 m (Barrette)	300 ft	15,000 tons
Apalachicola River, Florida	9 ft	127 ft	15,000 tons

The O-cell allows engineers to measure both the bearing and the friction capacity of a drilled shaft. During construction, the O-cell with top and bottom bearing plates just smaller than the shaft diameter, is cast into the lower end of the shaft at or near the shaft tip. During testing, hydraulic pressure is applied to the O-cell through either a

steel pipe or a high-pressure hydraulic hose running along the vertical axis of the shaft. The movements of the top of the shaft, and of the top and bottom plates of the O-cell, are monitored and plotted against the calibrated load applied by the O-cell. Shaft failure typically occurs as a “plunging” failure, with continued movement at a constant load.

When designing drilled shafts, many engineers rely more on skin friction than on bearing capacity. O-cell tests commonly reveal larger skin friction capacity than the designer originally estimated (Osterberg, 1999). As reported by Osterberg (1999), Schmertmann observed that the amount by which the excess capacity exceeds the estimated capacity increases as the strength of the supporting geo-material increases. Some building codes, especially in Asian countries, require the total design load to be carried by the friction capacity of the shaft (Osterberg, 1999).

2.2 Setup and Side Shear – Piles and Shafts

The literature contains many examples of setup for driven piles. O'Neill (2001) cites a series of uplift load tests on a steel pipe pile, 30 in diameter and 230 ft long, offshore from the Mississippi River Delta. Soil at the site consisted of normally consolidated, plastic clay and three load tests were performed over a period of 2.5 years. O'Neill (2001) reports that although the measured lateral stresses decreased, the soil adjacent to the pile hardened, forcing the shear failure surface area further away from the pile, and thereby increasing the overall side shear capacity. Bartolomey and Yushkov (1985) reported 70-80% side shear increases over 6-45 days after driving both single displacement piles and groups of 4 and 9 piles into clay. Lukas and Bushnell (1989) report a 25% increase in side shear during the interval 10-32 days after driving into very stiff Chicago clays, and a 50% increase from 10 to 82 days in soft Chicago clays, when using steel pipe and H-piles. In glacial tills at the John F. Kennedy International Airport, increases in pile capacity of 40 to 80% were observed between 15 and 50 days after driving (York, et al. 1994).

In contrast to driven piles, however, the available literature contains few examples of drilled shaft setup. Most information on shaft setup is anecdotal, which provided the impetus for the research described herein. For instance, the newsletter "Telltale for

LOADTEST, Inc." (1998) reported a 20 to 33% increase in the side shear of a drilled shaft in a Vietnamese river deposit over a 53 day study using O-cell tests. Finno, et al. (1989) performed a more definitive study using multiple load tests on both driven piles and drilled shafts for an ASCE Pile Prediction Symposium at the Lakefill site on the Evanston Campus of Northwestern University. This research included two drilled shafts, 50 ft long with an 18-24 in diameter; one constructed using only slurry and one with slurry plus a temporary casing. These shafts were installed through 23 ft of dense surface sand with the lower section embedded in a medium stiff clay layer. **Table 2.2** presents the capacities reported by Finno, et al. (1989) measured for each shaft at varying times, with the bearing of a surface collar removed, but including a small amount of tip bearing.

Table 2.2 Shaft Load Tests from Finno et al. (1989)

Time after Construction, t (days)	Slurry Shaft Capacity, Q (kips)	Cased Shaft Capacity, Q (kips)
14	85	124
35	128	166
301	124	175
	$Q = 23.28 \log(t) + 72.2$ $R^2 = 0.45$	$Q = 35.01 \log(t) + 93.7$ $R^2 = 0.69$

Figure 2.1 shows the change in capacity for these tests over time, along with an interpreted semilog-linear time (nonlinear least squares) trend for each shaft. Finno, et al. (1989) further observe that the capacity increase occurred mostly in the clay layer and that excess pore pressures stabilized near the time of the final tests. A strong tendency for the capacity to stabilize over time should also be noted in **Figure 2 .1**, contrary to the semilog-linear trend commonly observed for many driven piles. The adjacent driven test piles and reaction piles also caused a global increase in pore pressure in the surrounding clay, and therefore, these shafts may not be a reliable indicator of setup potential.

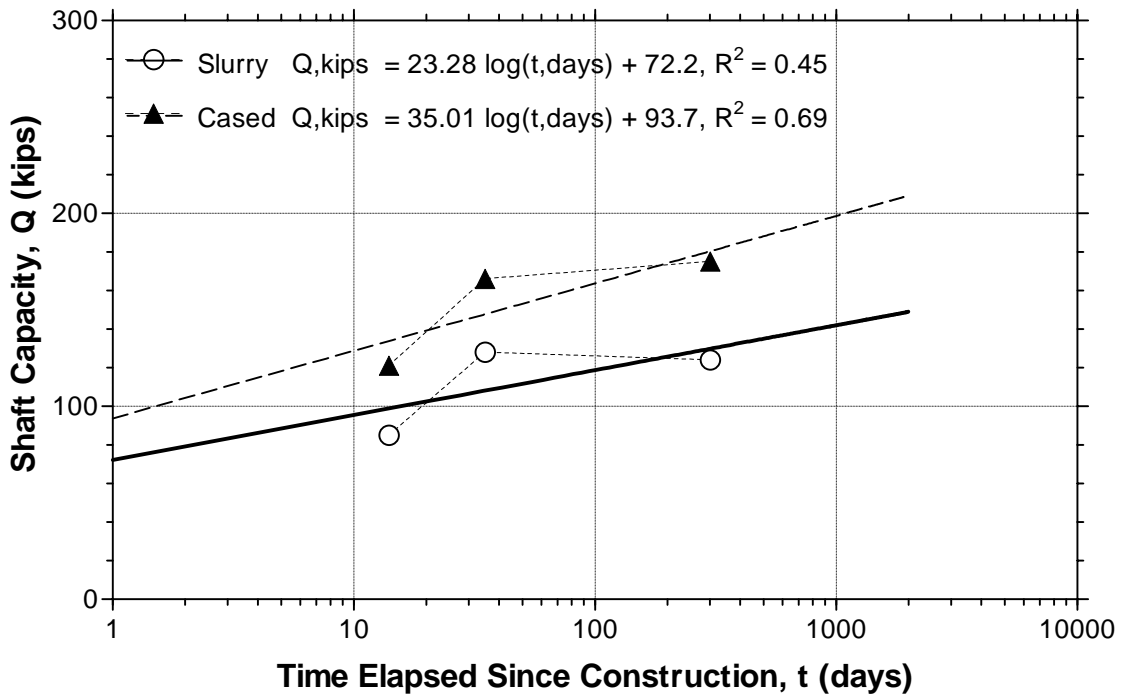


Figure 2.1 Shaft Load Tests from Finno, et al.(1989)

2.3 Causes of Side Shear Setup

The Mohr-Coulomb equation provides a good starting point for understanding time effects on side shear:

$$\tau = c_a' + \sigma_h' \tan \delta'$$

where:

τ	=	Unit side shear capacity of shaft/pile
c_a'	=	Shaft/Pile-soil adhesion
σ_h'	=	Horizontal effective stress
δ'	=	Shaft/Pile-soil drained friction angle

All three components of this equation may change with time because of the soil disturbance associated with shaft construction. Some engineers attribute the chief cause of side shear capacity in drilled shafts to radial consolidation following installation disturbance, potentially increasing both the stress and strength components. In the aforementioned study, Finno, et al. (1989) attributed the gain in capacity of both the driven piles and the drilled shafts to the dissipation of “construction induced pore

pressures” within the clay layer. Bullock (1999) reports that several authors have proposed Terzaghi’s one-dimensional radial consolidation equation to analyze pile setup:

$$T_h = \frac{4c_h t}{r_p^2}$$

where:

T_h	=	Radial consolidation time factor
c_h	=	Coefficient of radial consolidation
t	=	Elapsed time since end of driving
r_p	=	Pile radius

Paikowsky, et al. (1996) use the above relationship to adjust the measured setup rate of seven prestressed concrete piles driven into cohesive soils at three different sites. By adjusting the setup time for pile diameters from 9.8 to 36 in to a standard diameter of 12 in, they found good agreement between the adjusted setup factors at two of the three sites. There is no reason to expect different behavior for drilled shafts if a consolidation process exists.

For drilled shafts constructed in cohesive soil, O’Neill attributed potential changes in the ultimate side shear capacity to four possible factors:

1. Losses in effective stress and soil structure near the shaft wall during excavation
2. Effectiveness of the concreting process in restoring lateral stresses in the soil
3. The degree of roughness on the sides of the borehole
4. The pore pressure response of the composite soil-concrete interface

Osterberg (2001) found that rifling the sides of a borehole with the teeth of a core barrel increased the roughness and generated significant increases in the side shear capacity of clay. He also reported that, in most soils, sufficient roughness could be obtained using ordinary drilling tools and construction methods. Although borehole roughness is primarily dependent on the shaft excavation process, the other factors above should exhibit a dependency on elapsed time. Reese (1978) suggests that water mixed into

the fluid shaft concrete may migrate into cohesive soils reducing their undrained shear strength, s_u . This reduction should be most severe for dry shaft construction, high suction clays, and wet concrete mixes. O'Neill (1989) also points out that rapid construction procedures help reduce the effects of stress removal during excavation and thereby mitigate reduction of shear strength in cohesive soils.

Skov and Denver (1988) attribute setup for driven piles to the equalization of pore water pressure and reestablishment of internal bonds within the soil (especially cohesion). In a series of four case studies, they observed setup for piles driven in both cohesionless and cohesive soils. In a similar study, Soderberg (1962) concluded that pile side shear developed from inter-granular pressures according to friction laws. Soderberg (1962) also found that a decrease in hydrostatic excess pressure yields an increase in inter-granular pressure producing a higher pile capacity. Several researchers, including Karlsrud and Hogan (1985), Lutenecker and Miller (1993), and Marchetti et al. (1986), demonstrated that a portion of the observed setup around driven piles resulted from increases in horizontal effective stress (σ_h') measured during consolidation.

The relative importance of strength versus stress components on the change in drilled shaft side shear is unclear at this time. The components will probably also vary depending on soil type and construction techniques. Documenting side shear change with time is the first step in this investigation.

2.4 Setup Factor, A

Methods of predicting setup have so far been developed exclusively for driven piles. As reported by Bullock (1999), many researchers have observed a strong correlation between pile capacity increase, or setup, and the log of the time elapsed after the completion of driving. Based on four case histories, Skov and Denver (1988) developed a simple mathematical formula governing the observed semilog-linear prediction of setup capacity. From test piles driven in Yoldia Clay (Denmark), chalk, and coarse sands, they proposed the following formula:

$$\frac{Q}{Q_0} - 1 = A \log_{10} \left(\frac{t}{t_0} \right)$$

where: A = Dimensionless setup factor (semilog-linear slope)
 Q = Pile capacity at time t
 Q₀ = Pile capacity at initial reference time t₀
 t = Time elapsed since installation
 t₀ = Reference time, elapsed since installation

Skov and Denver (1988) defined the reference time as the time elapsed (since the end of driving) at the onset of increasing capacity, before which no increase in capacity is observed. However, the determination of this reference time is difficult, and it affects the value of A by changing the reference capacity, Q₀. Furthermore, since the available literature does not currently support end bearing setup, the use of total capacity (including end bearing) to determine the setup factor, A, may lead to an erroneous, lesser value. To further standardize the setup factor, Bullock (1999) proposed using t₀ = 1 day and limiting the setup factor to reflect only the change in side shear (stress or force):

$$A = \frac{Q_s / Q_{s0} - 1}{\log_{10}(t/t_0)} = \frac{\tau A_s / \tau_0 A_s - 1}{\log_{10}(t/t_0)} = \frac{\tau / \tau_0 - 1}{\log_{10}(t/t_0)}$$

where: A = Side shear setup factor, semilog-linear slope
 Q_s, Q_{s0} = Side shear capacity (force) at time t or t₀
 τ, τ₀ = Side shear capacity (stress) at time t or t₀
 A_s = Side area
 t = Time elapsed since installation
 t₀ = Reference time, elapsed since installation, = 1 day

Bullock (1999) further verified the application of the above equation for five piles driven in Florida soils. If shaft setup is a function of stress changes and consolidation, similar to driven pile setup, then the Skov and Denver (1988) equation may apply for shaft setup also. The starting point for shaft setup probably coincides with either the introduction of the fluid concrete or the initial set of the concrete, but the reference time t₀ = 1 day provides a reasonable initial assumption for this investigation. Although less than a perfect fit, **Table 2.2** and **Figure 2.2** demonstrate setup factors calculated using

a nonlinear least squares fit for the shafts tested by Finno et al. (1989). (These shaft capacities include a small amount of end bearing.)

Table 2.2 Shaft Setup Factors for Finno, et al. (1989)

Time after Construction, t (days)	Slurry Shaft		Cased Shaft	
	Capacity, Q (kips)	Q/Q_0 $t_0 = 1$ day $Q_0 = 72.23$ kips	Capacity, Q (kips)	Q/Q_0 $t_0 = 1$ day $Q_0 = 93.68$ kips
14	85	1.177	124	1.292
35	128	1.772	166	1.772
301	124	1.717	175	1.868
	$Q = 0.322 \log(t) + 1.0$ $R^2 = 0.45$		$Q = 0.374 \log(t) + 1.0$ $R^2 = 0.69$	

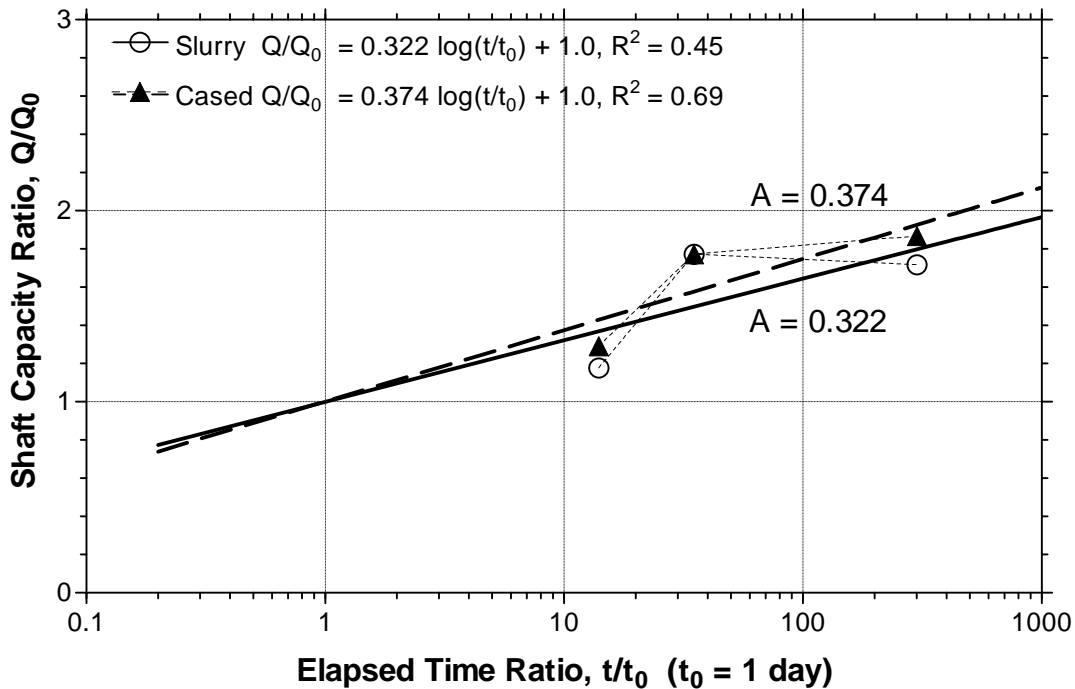


Figure 2.2 Shaft Setup Factors for Finno, et al. (1989)

3. SR20 TEST SHAFT CONSTRUCTION

This investigation includes retests of five shafts previously loaded during the SR20 test program in 1996. All five are located in the flood plain under the eastbound bridge crossing the Apalachicola River between Bristol and Blountstown, FL. Using O-cells at two levels, near the top and bottom of each rock socket, FDOT and LTI engineers designed the shaft tests to achieve failure both in side shear and in end bearing. Much of the shaft capacity was attributed to the rock socket, but significant side shear was also measured in the overburden soil. The construction procedures used for SR20 test shafts likely had a significant effect on the results of the test program. This chapter provides details of the test shaft construction and dimensions.

3.1 SR20 Test Shafts

The SR20 test shafts in this study were essentially cylindrical with nominal diameters ranging from 5 to 7 ft. The shaft lengths varied 85 to 99 ft, including overburden soil 58 to 71 ft thick and rock sockets 18 to 35 ft long. **Tables 3.1 and 3.2** show the size, location and important elevations for each test shaft. Two levels of O-cells were installed in all shafts, at the shaft bottom and near the top of the rock socket. (See **Figures 3.1-3.5**). The multiple O-cell levels provided the testing flexibility required to obtain an end bearing failure as well as side shear failure in both the rock socket and the soil overburden. The tests were staged, using O-cells in either closed (load-bearing) or open (zero-load) configurations, as needed to load specific shaft sections.

The overburden section of each test shaft was loaded to frictional failure twice, once by LTI shortly after their construction in 1996, and then again, during this research project, approximately 5 years later in 2002. The results from the two tests provide a comparison to determine how much, if any, setup occurred during the time interval between tests. The available 6 in expansion of the lower O-cells was largely used up during the 1996 tests, and therefore the 2002 tests were accomplished using the upper O-cells. Because of the resulting load reversal in the rock socket, no useful side shear

results were obtained in the rock during the 2002 tests. **Chapter 4** provides details of the test procedures.

Table 3.1 Test Shaft Construction Details

Test Shaft	Location		Critical Dates			O-cells #	Nominal Diameter ft	Telltales #	Sister Bar Strain Gages #
	Station	Pier	Excavate Below Casing	Place Concrete	Initial O-cell Test				
11	624+03	46	08/15/96	08/19/96	08/26/96	2	5 ft	10	14
2	631+79	53	07/01/96	07/11/96	07/17/96	2	6 ft	10	21
10	636+12	57	08/03/96	08/08/96	08/19/96	2	7 ft	10	18
5	645+97	62	11/19/96	11/27/96	12/06/96	2	6 ft	10	24
7	653+41	69	11/20/96	11/23/96	12/04/96	2	5 ft	10	24

Table 3.2 Test Shaft Dimensions and Elevations

Test Shaft	Elevations, ft					Lengths, ft				Diameter in.	
	Shaft Top	Ground Surface	Casing Bottom	Top of Rock	Shaft Bottom	Soil	Rock Above Upper O-cell	Rock Socket	Overall Shaft	Soil	Rock
11	+48.0	+45.0	- 2.0	-13.0	-37.0	58.0	8.0	24.0	85.0	62.0	62.6
2	+47.8	+46.4	+ 0.5	-16.0	-41.7	62.4	7.6	25.7	89.5	74.0	76.4
10	+48.6	+47.5	-20.9*	-20.5	-55.2	68.0	17.0	34.7	103.8	86.0	91.5
5	+47.0	+45.9	+ 0.9	-24.0	-42.2	69.9	0.9	18.2	89.2	72.0	74.0
7	+47.0	+45.3	+ 1.7	-26.0	-52.1	71.3	2.4	26.1	99.1	62.0	64.0

* Shaft 10 has permanent casing. Other casings were removed after concreting.

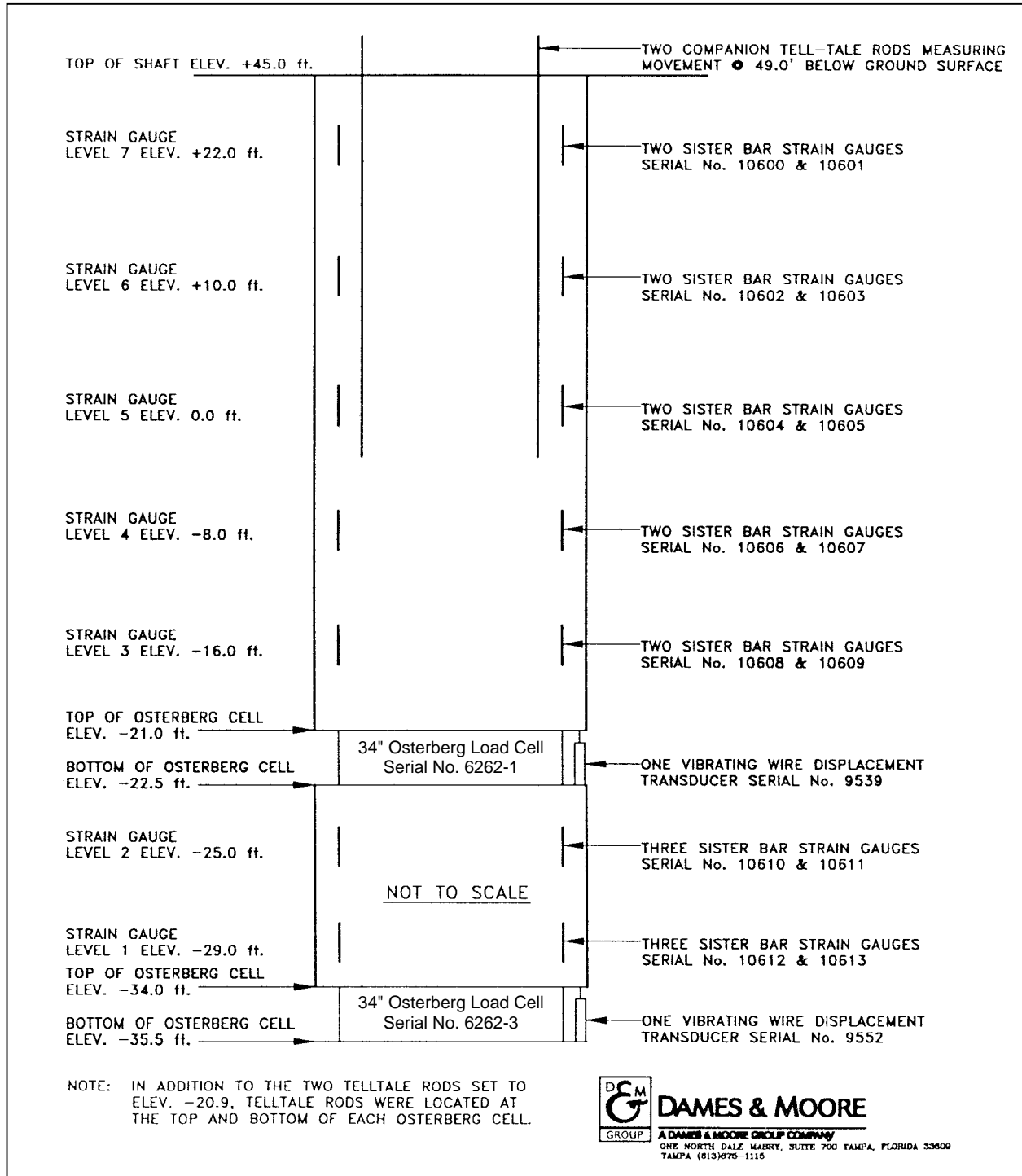


Figure 3.1 Shaft 11 Instrumentation (Sharp, 1998)

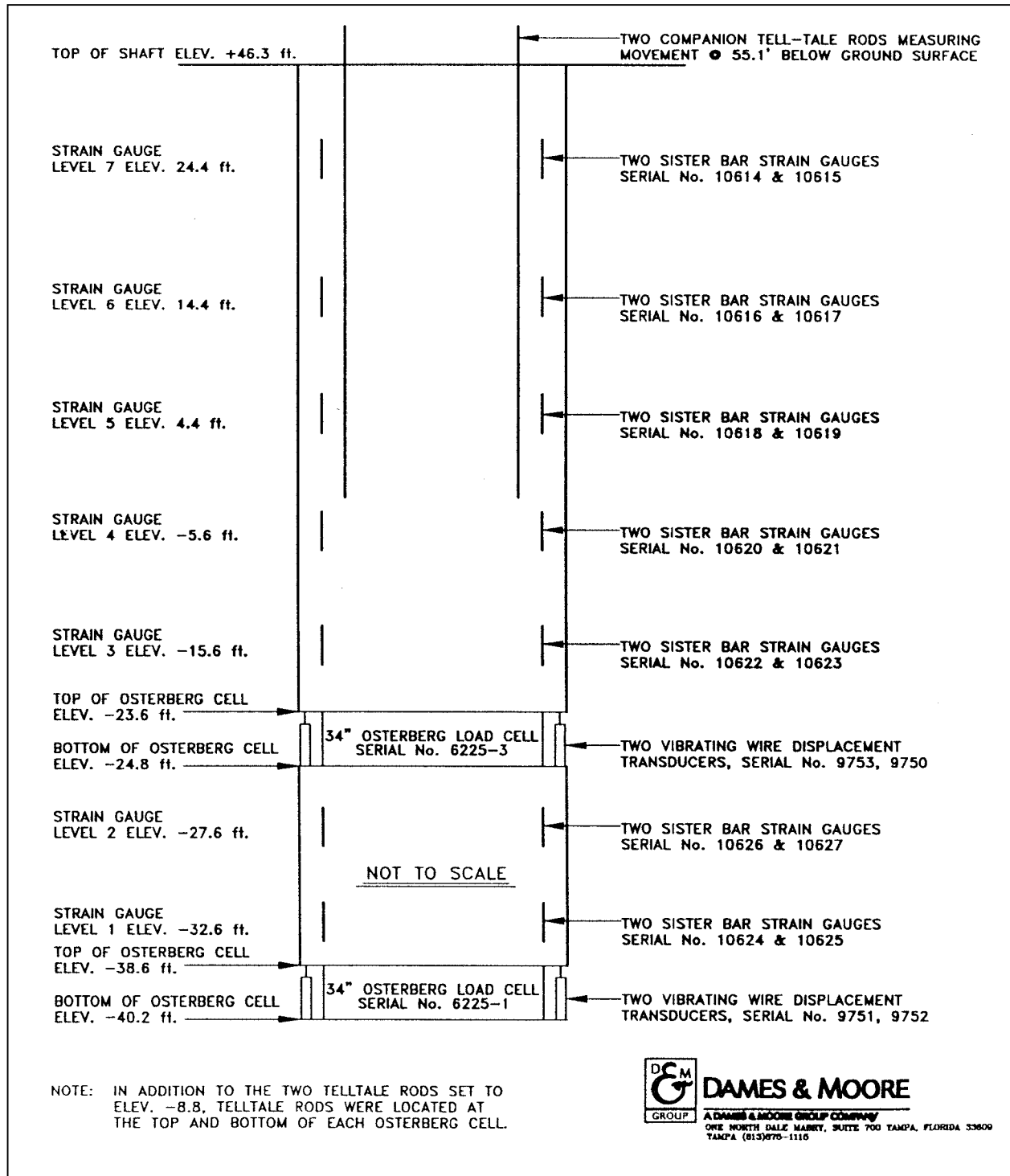


Figure 3.2 Shaft 2 Instrumentation (Sharp, 1998)

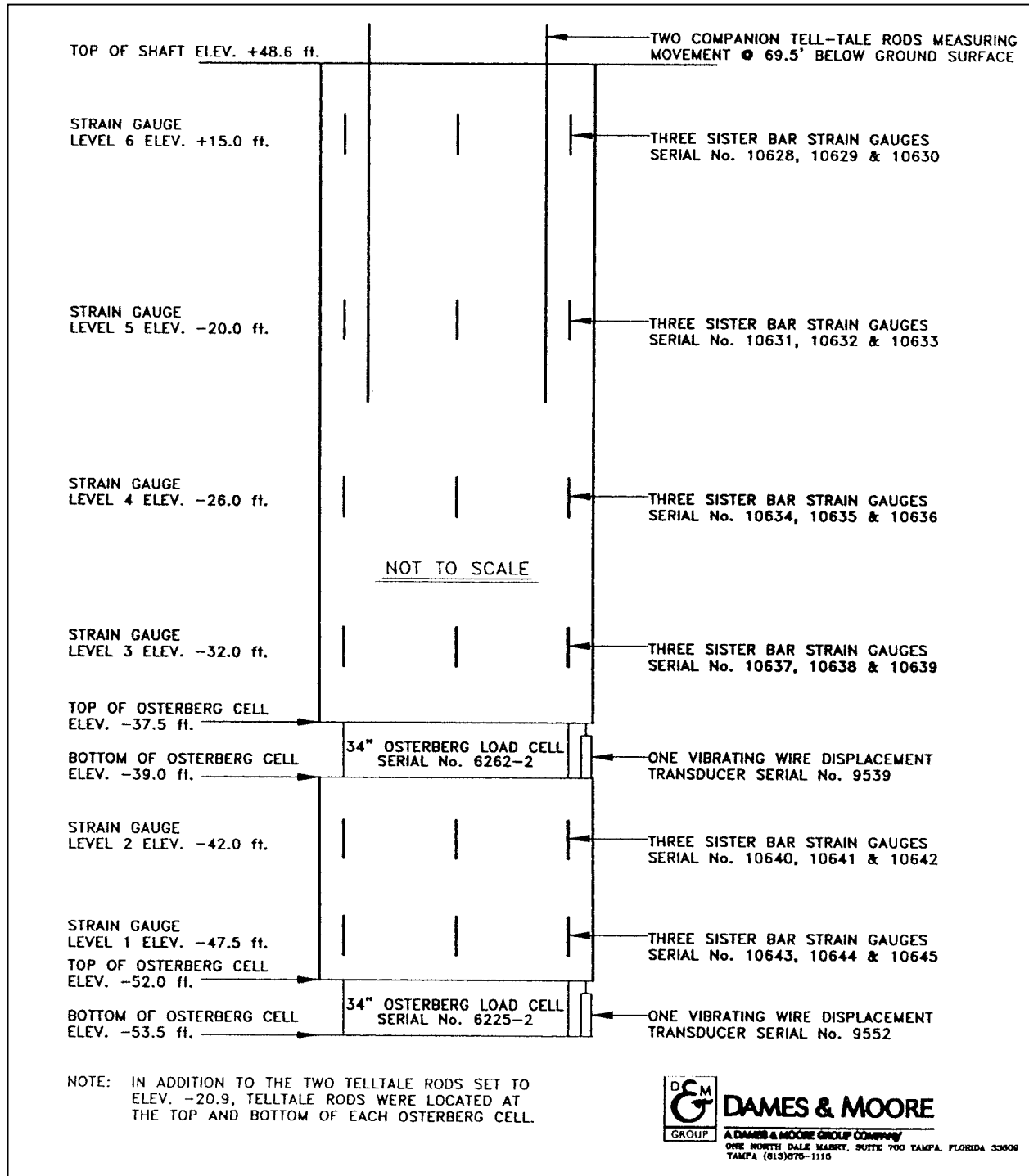


Figure 3.3 Shaft 10 Instrumentation (Sharp, 1998)

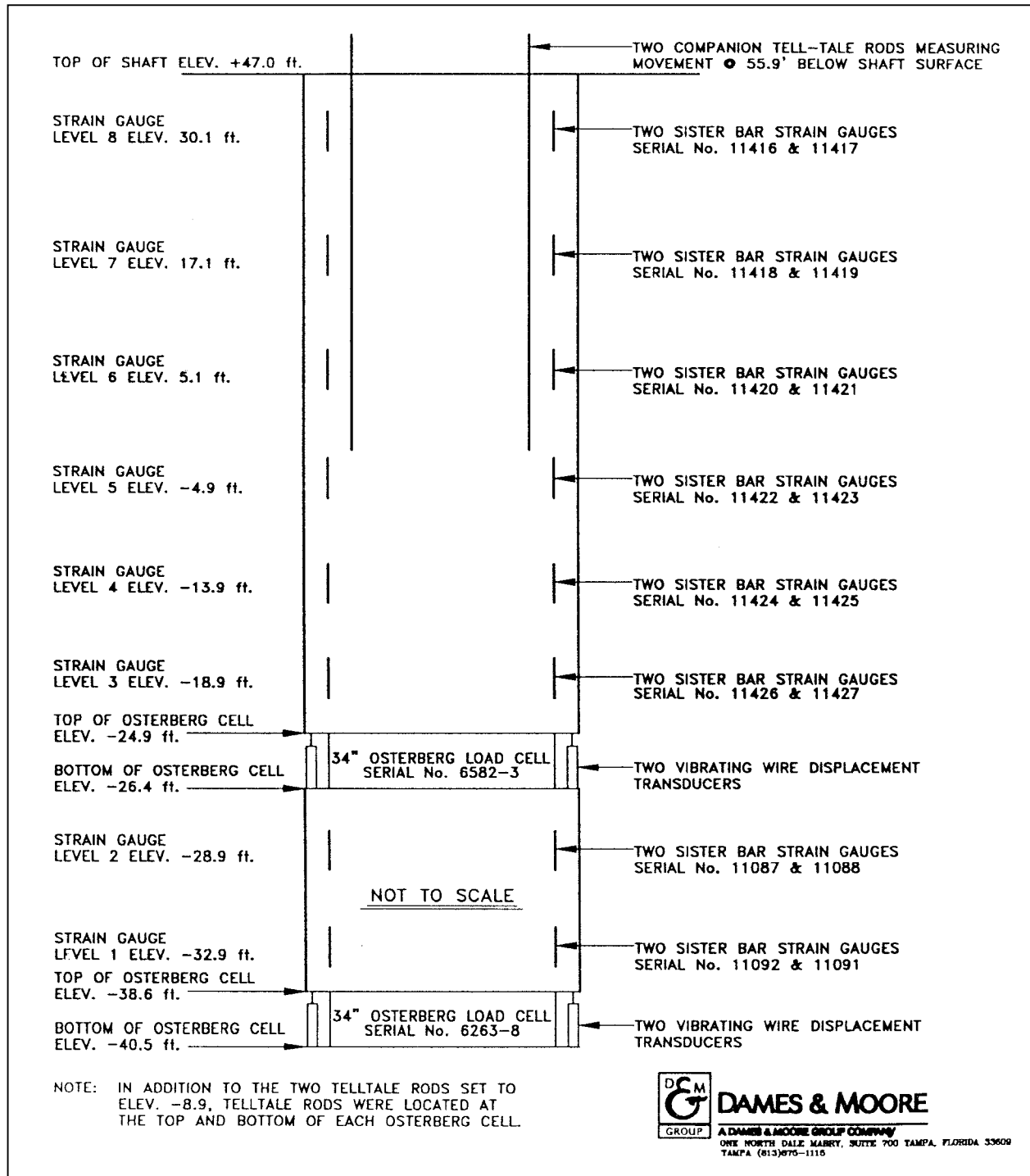


Figure 3.4 Shaft 5 Instrumentation (Sharp, 1998)

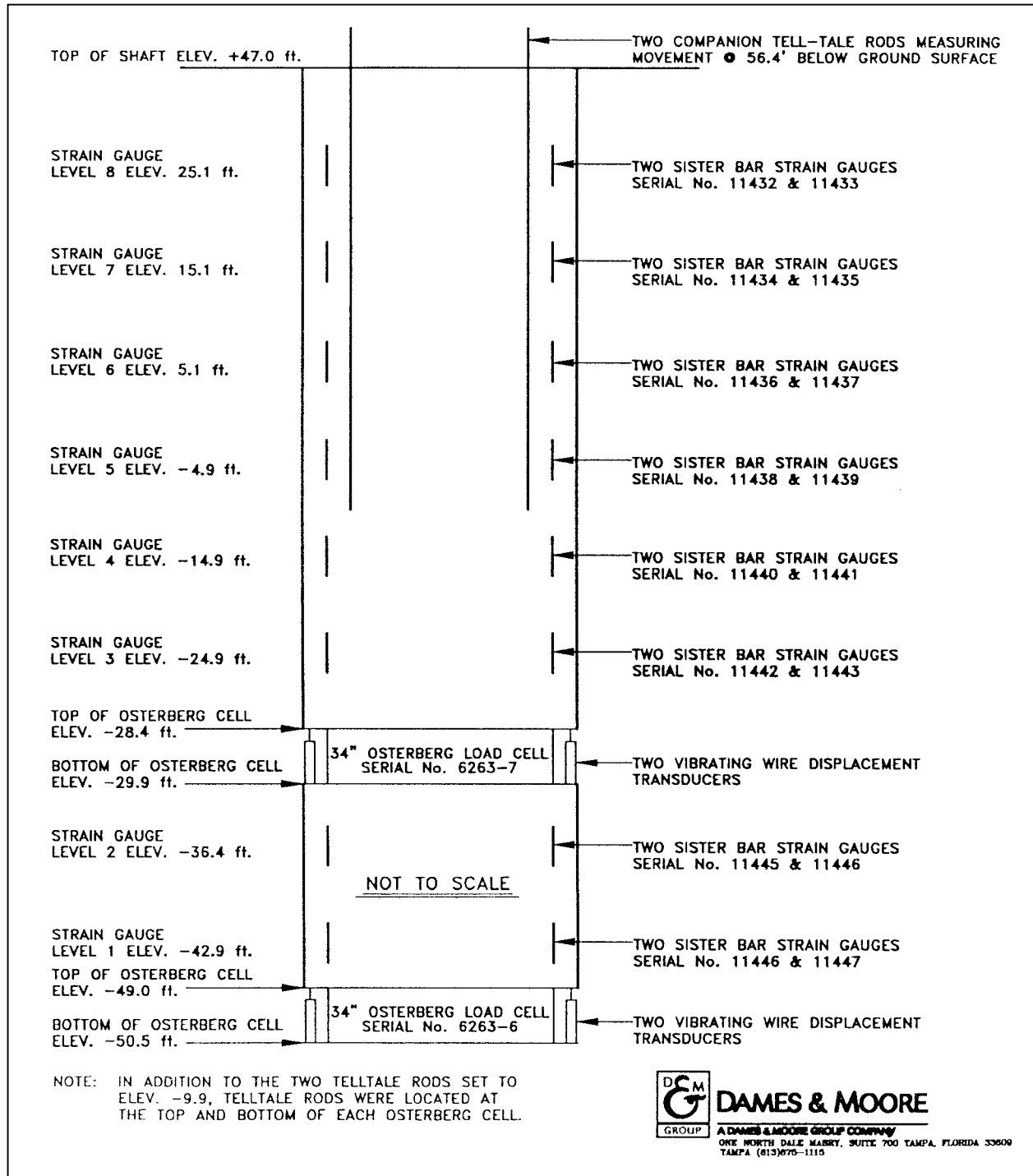


Figure 3.5 Shaft 7 Instrumentation (corrected from Sharp, 1998)

3.2 Site Stratigraphy

The SR20 test shafts are located on FDOT right-of-way adjacent to the Apalachicola River, an alluvial flood plain area inundated annually during spring and summer rains. **Figures 3.6-3.10** show the general stratigraphy at each test site from the D&M geotechnical report (Sharp, 1998). **Appendix A** includes boring logs from Ardaman and Associates, Inc. that provide additional details.

The flood plain area around the shafts is relatively level with a surface elevation of +45 to +47 ft. The overburden soils and depth to rock are similar across the site, with the rock surface dipping downward toward the east. Both sides of the river have a 10 to 20 ft thick surface layer of clayey sand. The soil beneath this layer on the West side consists predominantly of sand, while the East side contains a thick layer of soft clay with some organic content. Beneath the overburden soil, the site is underlain by limestone, starting at an elevation of -14 ft to about -25 ft. The limestone is incompetent near the surface but improves in hardness, consistency, and strength with depth.

3.3 Test Shaft Properties and Instrumentation

The foundation shafts of the new SR20 Bridge support design loads from 550 to 1000 tons using design shaft diameters ranging from 5 to 9 ft. The project plans included separate test shafts with the same size range, designated at appropriate locations along the new bridge. The FDOT specified Class IV concrete for the shafts, with a minimum 28-day compressive strength of 4000 psi. Williams Earth Sciences performed unconfined compression tests on sample cylinders for quality assurance, some of which included deflection measurements to calculate the concrete modulus. D&M used these modulus values to calculate the shaft modulus, a parameter needed to determine the shaft load from the strain measurements. **Chapter 5** provides additional details of these calculations. OFL constructed the reinforcement cages for the test shafts using #11 or #14 bars with a #5 spirals and lateral ties as specified. Section properties for each test shaft are provided with the analyses in the **Appendices C-L**.

Each test shaft included two 34 in diameter O-cells (top and bottom of the rock socket) with plates sized to match the shaft diameter. Two hydraulic pressure hoses were

connected to each O-cell and extended up to the top of the shaft. Full-length PVC pipes (2 in schedule 40) were tied outside the cages for quality assurance testing using cross-hole sonic logging (CSL). No test shaft defects were detected during the CSL tests of the concrete between the pipes.

Shaft instrumentation included ten steel pipes tied along the inside of the cages for the later insertion of unstrained telltale rods. Eight of these telltale pipes were installed in pairs to the top and bottom plates of the O-cells to monitor their expansion during the tests. As specified in the project plans, OFL installed two diametrically-opposed, 3/4 in galvanized steel, telltale pipes (schedule 40) down to each plate. LTI also installed Linear Vibrating Wire Displacement Transducers (LVWDT's) between the upper and lower O-cell plates to measure the expansion directly, a relatively new measurement at the time. The remaining two telltale pipes were installed to measure the compression of the upper 3/4 of the shaft section above the mid-level O-cell. Geokon Model 4911 Sister Bar Strain Gages provided measurement of the shaft strain during testing. These vibrating wire instruments were tied to the rebar cage, with two or three opposing gages at six to eight elevations down each shaft. **Figures 3.6-3.10** show the strain gage elevations.

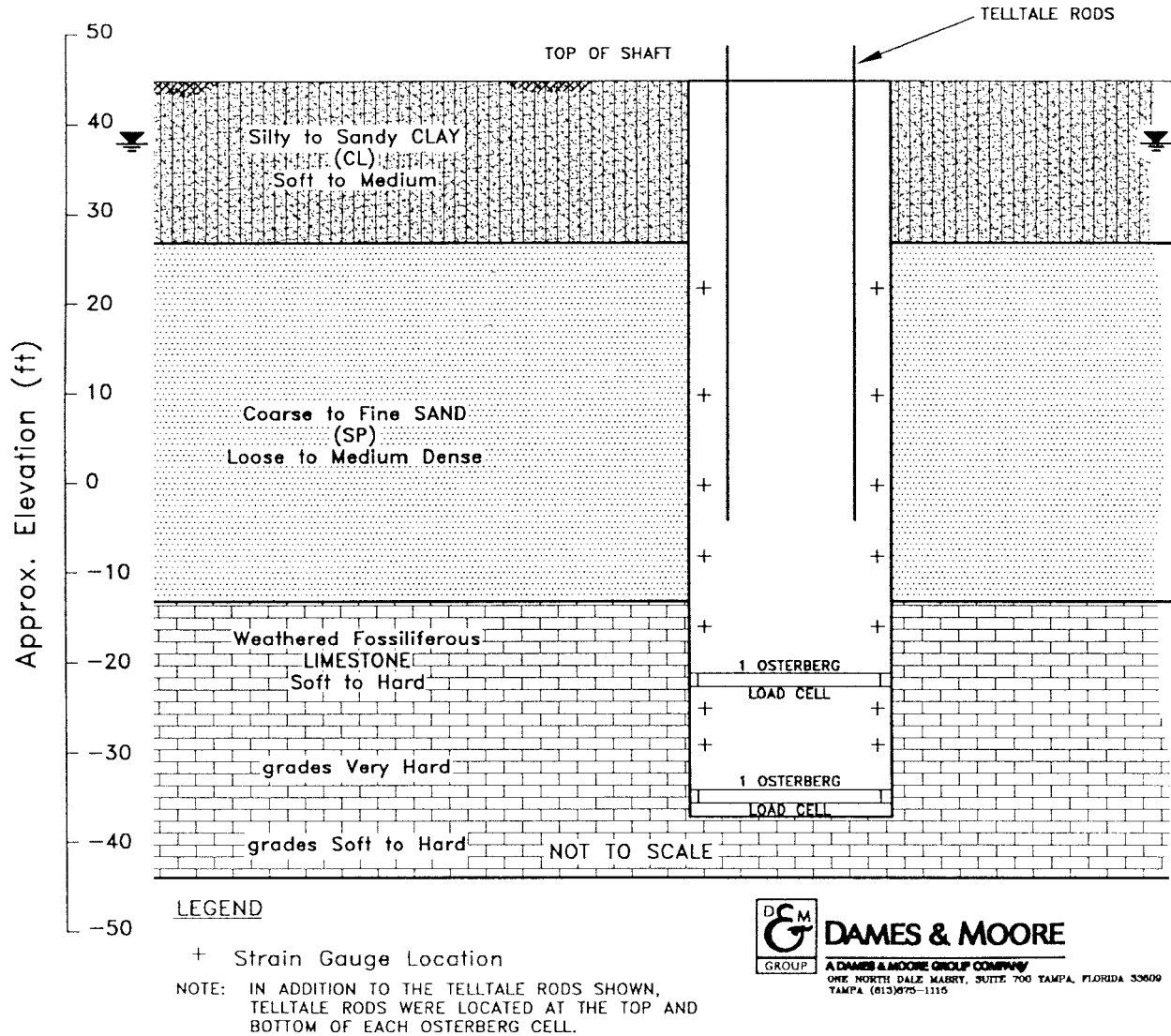


Figure 3.6 Shaft 11 Soil Stratigraphy (Sharp, 1998)

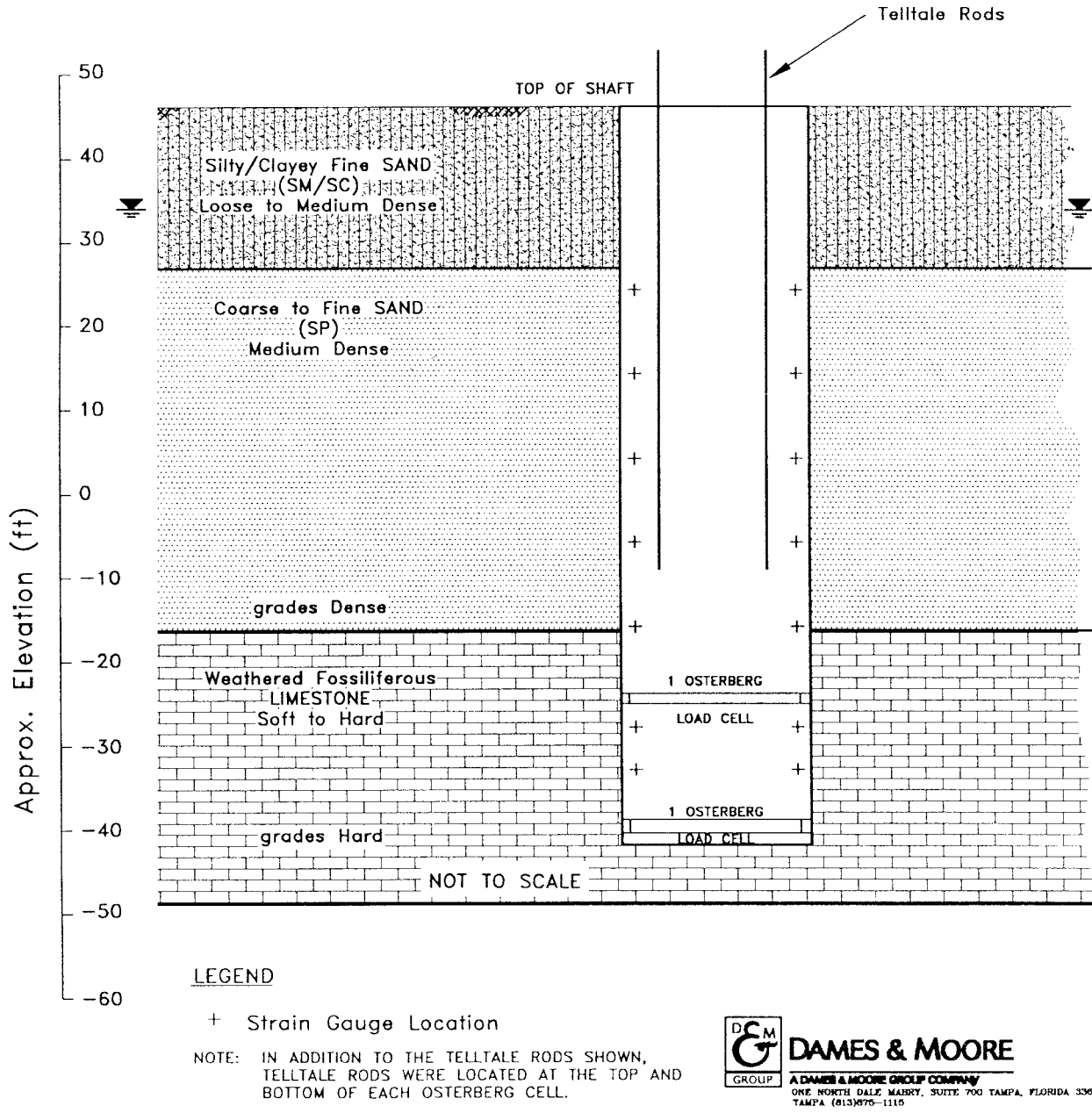


Figure 3.7 Shaft 2 Soil Stratigraphy (Sharp, 1998)

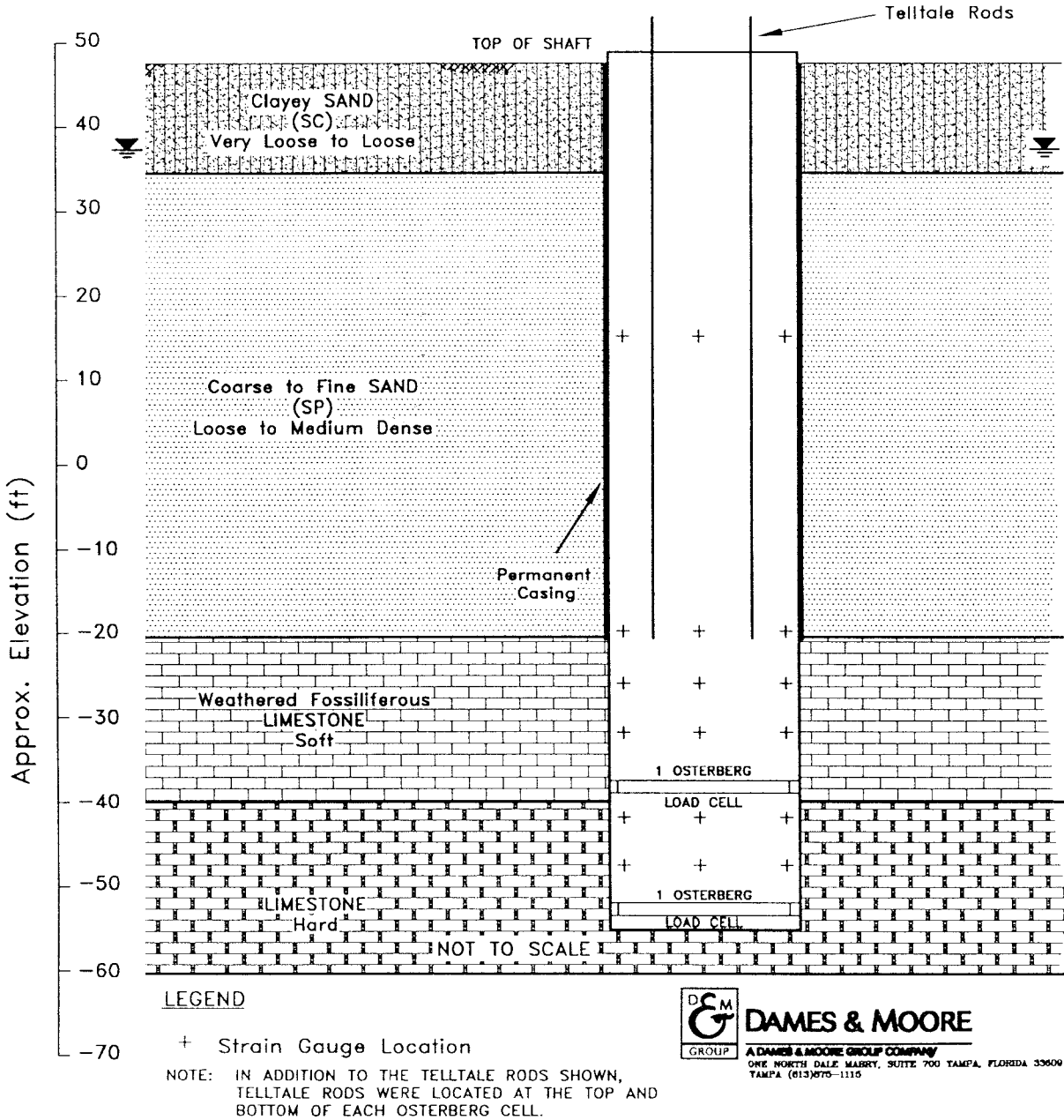


Figure 3.8 Shaft 10 Soil Stratigraphy (Sharp, 1998)

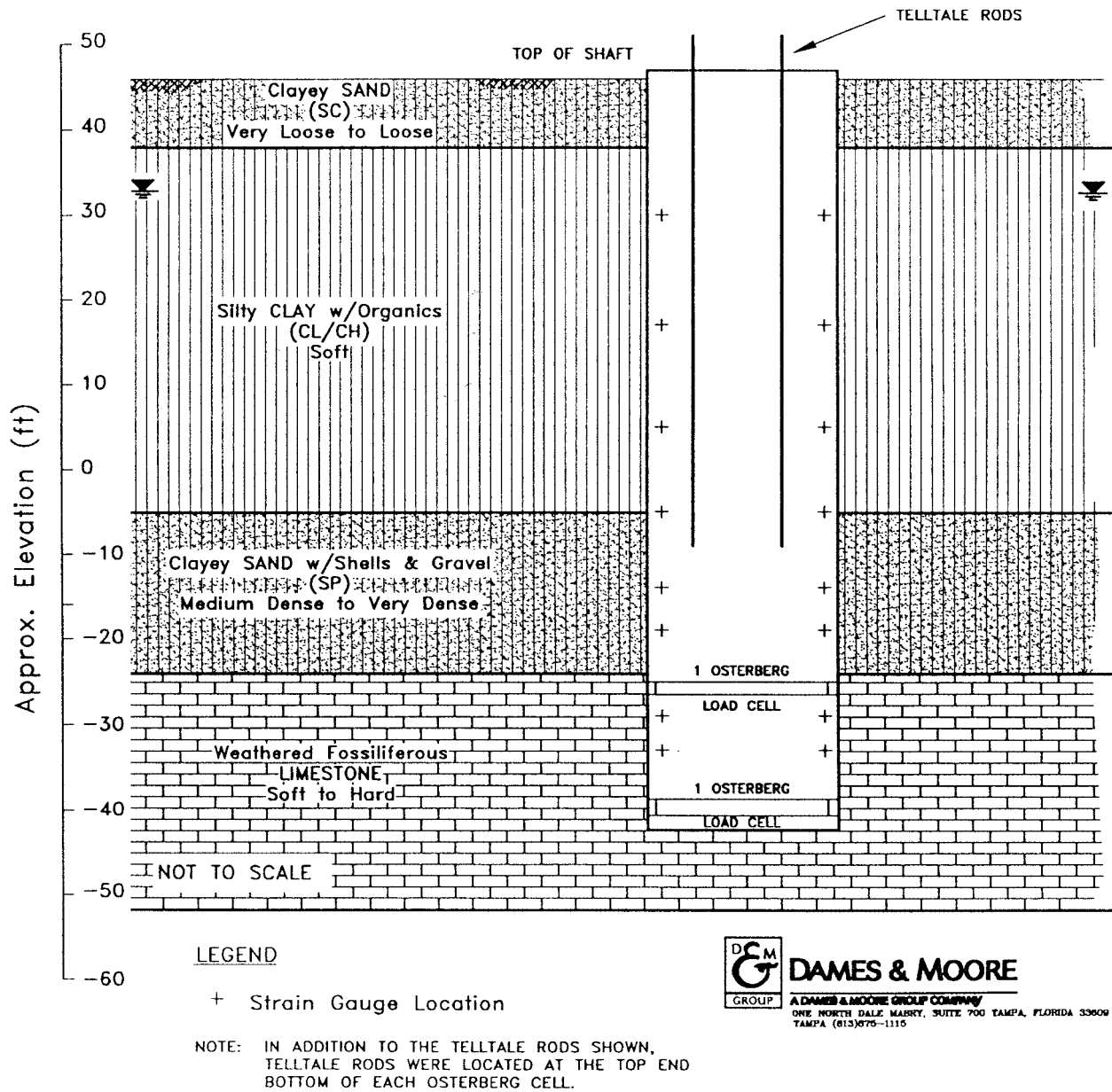


Figure 3.9 Shaft 5 Soil Stratigraphy (Sharp, 1998)

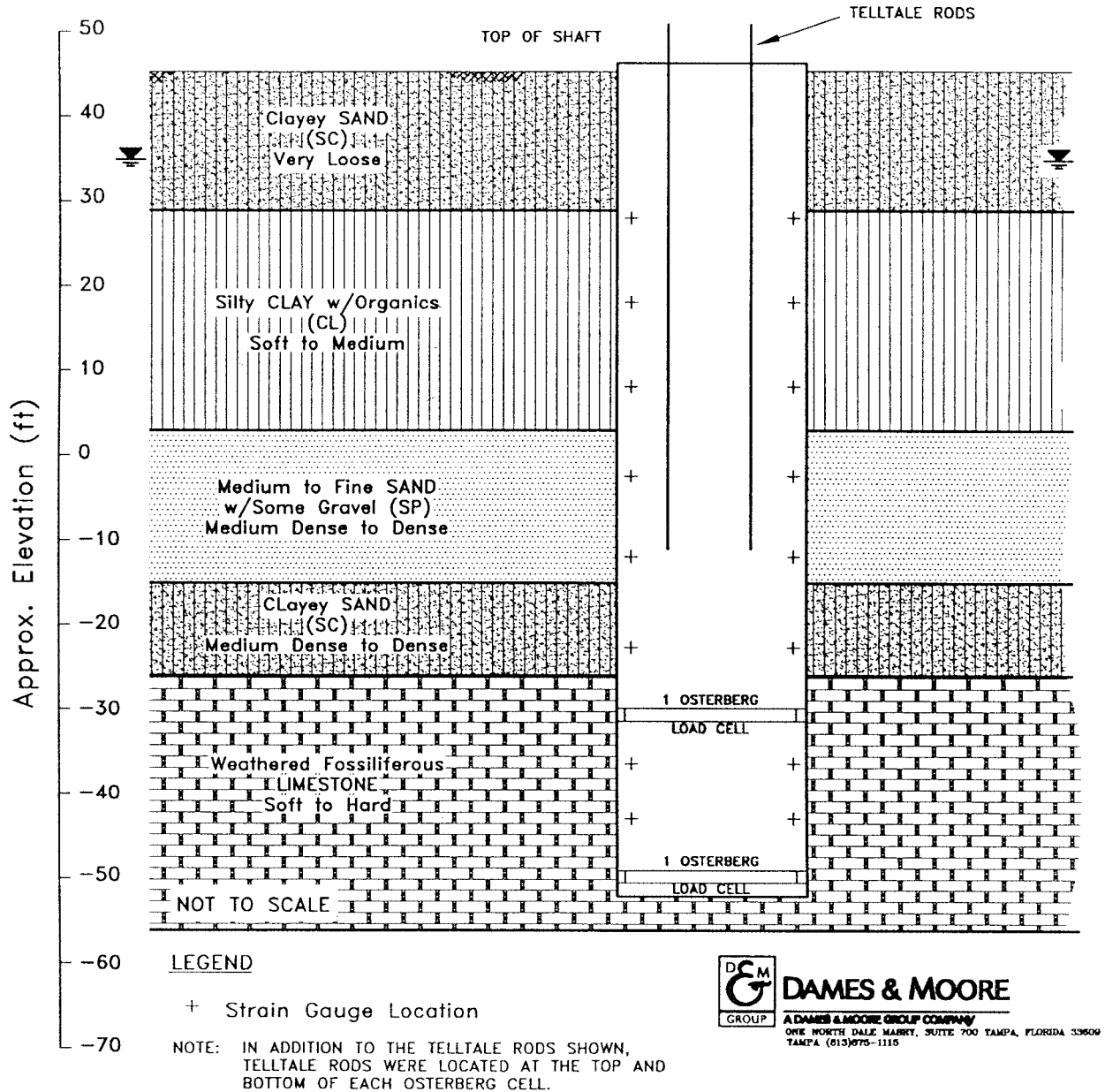


Figure 3.10 Shaft 7 Soil Stratigraphy (Sharp, 1998)

3.4 Shaft Construction Procedures

Farmer Drilling, Inc. (FDI) constructed the SR20 test shafts using wet-hole drilling methods, as required in the project specifications because of the high groundwater level and sandy soils. FDI used mineral slurry and temporary casing to keep the shafts open during excavation. The overburden soils were initially excavated by auger and bucket using only slurry to stabilize the hole. Four of the test shafts were excavated 29 to 50 ft deep before placement of a temporary 50 ft long casing (later pulled after concreting). Shaft 10 was excavated to the top of rock prior to placement of a permanent casing to same depth. FDI used a vibratory hammer to both install and remove the casings.

The rock sockets were excavated with a soil bucket, core barrel, or rock auger, depending on hardness. As required by specification, FDI provided a 5 ft, 4 in diameter core immediately beneath the shaft bottom at Shafts 2 and 11. For the other three test shafts, FDI cored the entire rock socket prior to beginning the shaft excavation.

All of the test shafts were over-reamed due to construction delays. FDI provided an over-reaming tool constructed by bolting four 1.25 in diameter, 12 in long cables to a cleanout bucket so that they protruded from its side in a staggered array. This tool was rotated down the shaft sidewall at approximately 12 rpm to remove any loosened soil or rock. Over-reaming proceeded from the bottom of the casing to the bottom of the shaft, lowering the tool about 12 ft per minute.

After final cleaning, the FDOT's Shaft Inspection Device (SID) was used to visually inspect and insure the bottom cleanliness of each shaft. The rebar cage was then placed in the shaft, with a concrete "slick line" pre-installed in slots cut through the O-cell plates. The slick line extended approximately 18 in below the lower O-cell at the start of concrete placement. As the high-slump concrete was pumped through the slick line to the shaft bottom, the displaced slurry was removed at the shaft top. The following sections briefly summarize significant details specific to each test shaft, in the order constructed. Complete construction records may be found in Sharp (1998).

3.4.1 Test Shaft 2

Test Shaft 2, at station 631+79, is the second test shaft encountered from the West end of the bridge, and was constructed following the 6 ft diameter Trial Shaft 1 used to confirm the proposed construction methods. A 50 ft long, 73 in I.D., 74 in O.D. temporary casing was vibrated to a tip elevation of approximately +0.5 ft at Shaft 2. It terminated in medium dense sand, 16.5 ft above the top of rock found at -16 ft. Before the casing installation, the shaft was first excavated to +9 ft. At the time, the existing surface elevation was +46.4 feet.

Following a satisfactory bottom inspection, the Contractor lifted the reinforcement cage for placement into the excavation. The stiff-back supporting the cage failed and the assembly was laid down again. During a second attempt to place the cage, the mid-level O-cell separated and had to be repaired. The third attempt to place the rebar cage was successful, and concrete was placed just within the time required to maintain an adequate a 4 in slump. During the total delay of 9 days, the shaft was over-reamed twice and re-cleaned twice. Because of the over-reaming and extended delay time, significant disturbance of the shaft side shear is expected in the sand layer exposed between the casing and the rock socket. However, the concreting curve does not indicate any significant changes in the shaft diameter.

3.4.2 Test Shaft 10

Test Shaft 10, at station 636+12, is the third test shaft from the West end of the bridge and is located on the West bank of the Apalachicola River. The 7 ft diameter Trial Shaft 9 was constructed before Shaft 10 and after Shaft 2. Shaft 10 was constructed using a permanent casing with an 86 in O.D. and 85 in ID. It was installed to the top of rock at elevation of -20.9 ft, after the soil had been excavated to this depth using only slurry. The ground surface elevation at the time was +47.5 ft. FDI postponed the concrete placement due to difficulty with the concrete supplier. The shaft was over-reamed and re-cleaned after delay of 3 days. The concrete was again placed just within the time required to maintain an adequate a 4 in slump.

3.4.3 Test Shaft 11

Shaft 11, at station 624+03, is the westernmost test shaft. No 5 ft diameter Trial Shaft was provided in the project plans. It was constructed using a 50 ft long, 61 in I.D., 62 in O.D. temporary casing, which was installed to a tip elevation of -2 ft after slurry-only excavation to +5 ft. The existing surface elevation at the site was +45 ft. The temporary casing terminated in medium dense sand, 11 ft above the rock surface. A slight delay (just over 1 day) resulted in the need to over-ream the bottom 5 ft of the shaft. Concreting was within specifications.

3.4.4 Test Shaft 7

Test Shaft 7, is located at station 653+41 and is the easternmost of the test shafts. It was constructed with a 50 ft long, 61 in I.D., 62 in O.D. temporary casing, which was installed to a tip elevation of +1.7 ft after slurry-only excavation to -5 ft. The casing terminated in loose to medium dense sand, 27.7 ft above the rock surface. The existing surface elevation at the site was +45.3 ft. A delay of 3 days resulted in the need to over-ream the bottom 5 ft of the shaft. Concreting was within specifications.

3.4.5 Test Shaft 5

Test Shaft 5 was located at station 645+97 near the East bank of the Apalachicola River. It was constructed using a 50 ft long, 71 in I.D., 72 in O.D. temporary casing, which terminated in a silty clay at +0.9 ft, 24.9 ft above the rock. The existing ground surface was +45.9 ft with the rock surface at -24 ft.

The Contractor delayed concreting for 1 day, resulting in an initial over-ream and cleanout. The concrete placement was then delayed due to heavy rains resulting in a second over-ream. The cage had already been set and was jammed against the temporary casing during removal. Then, as the cage was swung away from the shaft, the mid-level O-cell separated, and the lower portion of the cage fell about 5 feet to the ground. After repairs to the O-cell and the cage, the Contractor dropped it during the lift and had to repair it again. The concrete was placed successfully after a third over-ream, and a total delay of 8 days.

3.5 Shaft Enclosures

OFL constructed steel enclosures to cover the top of the test shafts and prevent damage prior to the retests. **Figure 3.11** shows one of the shaft enclosures.

Figure 3.12 shows a cross-section of an enclosure. OFL placed a section of 9 ft diameter steel casing around the test shaft and filled the annular space around the shaft with concrete up to the shaft top. A 1/8 in thick steel cover plate was bolted to the top of the casing to prevent vandalism and provide weather protection. The enclosures were 6-8 foot high with 2-3 ft below the ground surface. **Table 3.3** shows enclosure elevations measured during the retests. To eliminate added side shear around the large 9 ft casing, UF personnel excavated a trench to the bottom of the enclosure prior to the retests. The backfill around the shaft enclosures included concrete rubble and was difficult to remove.

The enclosures had drain holes just above ground level, which trapped several inches of silt inside them during the annual floods. The strain gage cables and high-pressure O-cell hoses were left unprotected on the shaft top, and were damaged by the water exposure and found covered in silt. The silt was removed prior to the retests, and the strain gage wires were stripped and tinned. The high-pressure hose connections were replaced because of corrosion damage. Most of these connections leaked slightly due to the poor condition of the hose material.

The SR20 site is remote and the enclosures effectively protected the equipment from vandalism. However, they also limited access to the shaft top for telltale movement readings and reference beams. Therefore, electronic digital indicators were used to remotely monitor telltale movements, and all telltale indicators were referenced to the shaft top. A multiplexer and laptop computer was set up to record and plot the indicator readings during the tests.



Figure 3.11 Shaft Enclosure

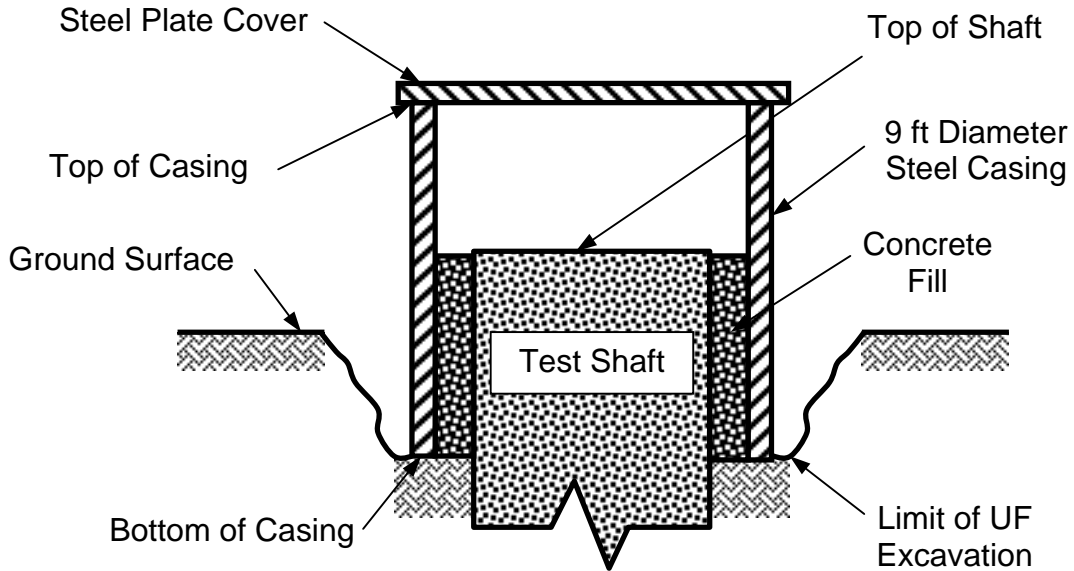


Figure 3.12 Test Shaft Elevations

Table 3.3 Top of Shaft and Casing Elevations

	Test Shaft	Top of Shaft	Top of Casing	Bottom of Casing	Ground Surface
Survey Msmt., ft	11	3.23	0.38	7.38	4.96
Elevation, ft		+ 45.00	+ 47.85	+ 40.47	+ 43.27
Survey Msmt., ft	2	3.74	0.85	6.58	5.84
Elevation, ft		+ 46.30	+ 49.19	+ 42.61	+ 44.20
Survey Msmt., ft	10	3.83	0.30	8.21	5.73
Elevation, ft		+ 48.60	+ 52.13	+ 43.92	+ 46.70
Survey Msmt., ft	5	3.78	0.96	6.02	5.17
Elevation, ft		+ 47.00	+ 49.82	+ 43.80	+ 45.61
Survey Msmt., ft	7	4.04	1.45	5.94	5.37
Elevation, ft		+ 47.00	+ 49.59	+ 43.65	+ 45.67

4. TEST EQUIPMENT AND PROCEDURES

UF personnel used test equipment and procedures similar to those used by LTI during the 1996 shaft tests. A brief description of each measurement is provided below. Any differences between the 1996 and 2002 tests and their impact on the data reduction are also noted.

4.1 Load

Test loads were applied to the SR20 shafts by O-cells embedded near the top and bottom of the rock socket. When pressurized, the O-cells load the shaft in compression through their top and bottom plates, which have a diameter just less than the shaft diameter. These plates are welded to the rebar cage and bear directly on the shaft concrete as well. Tack-welds that keep the O-cells shut during shipment and rebar cage placement typically break at a low pressure during an initial load cycle, sometimes creating a small discontinuity in the load-displacement curve. Although O-cells are normally filled with water, the SR20 O-cells were filled with oil to inhibit corrosion during the time lapse between tests. Although sacrificial, the O-cells are very similar in design to commercial jacks and have a maximum stroke of 6 in. Each O-cell was calibrated by the manufacturer to 2000 psi (600 tons) at the 1, 3 and 5 in stroke positions. Although the differences are minor, the calibration used to calculate the O-cell load from pressure was chosen based on the average stroke during the test. The O-cell calibrations are included in **Appendix B**.

Each O-cell was connected to the surface pump by a 10,000 psi steel-braided hydraulic hose cast into the shaft. A second hose of the same length allowed the operator to flush and saturate the system before testing. LTI loaned two Haskel hydraulic pumps to UF for use during the tests (**Figure 4.1**), one for each O-cell. The pumps were driven by low-pressure air (50-150 psi) from a rented 175 cfm diesel air compressor. During the tests, the pump operator controlled the O-cell pressure using a 10,000 psi Bourdon tube test gage (0.25% span accuracy) connected directly to the pump. However, the pump operated continuously during the tests as the O-cell expanded, and the pumping action caused the pressure to surge, making the pressure gages difficult to read with

accuracy. A vibrating wire piezometer was therefore connected to the secondary hose for better accuracy and for data acquisition.

4.2 Shaft Displacements

Electronic digital indicators (EDI) were used as the primary measurement of shaft displacements during both the 1996 and 2002 tests. The digital display of these indicators is visually easier to read than standard dial gages, and they can also be read remotely using a multiplexer with either a datalogger or a computer. Shown in **Figure 4.2**, the indicators used by UF in 2002 were the Logic Basic model manufactured by Chicago Dial Indicator (CDI). They had either a 2 in or a 4 in stroke with a resolution of 0.0001 in resolution and, although they had internal batteries, were powered (AC) from a generator. LTI used an older CDI indicator in 1996, similar but with fewer features. LTI used 12 indicators, 10 for the telltales and 2 for the top of the shaft. UF added a third indicator for the top of shaft movement, 13 total. During both the 1996 and 2002 tests, the top of shaft indicators were referenced to the reference beams described below. During the 1996 tests, the telltale indicators for the bottom O-cell plates were also referenced to the reference beams. The remaining telltale indicators in the 1996 tests, and all of the telltale indicators in the 2002 tests, were supported from the reinforcement bars extending out the top of the shaft.

For the 1996 tests, LTI used a Geokon multiplexer and datalogger to continuously record the EDI readings at 30 second intervals, beginning at the start of the test. Communications between the datalogger and the indicators used the "BCD" protocol, a proprietary CDI format. The datalogger was initiated and controlled from a laptop using Geokon software.

In the 2002 tests, UF personnel triggered EDI readings manually at the beginning of each load cycle. UF used the RS232 communication protocol and a 16-channel MicroRidge MPX-4S multiplexer (**Figure 4.3**) connected to a laptop computer to monitor and record the EDI readings. Communications between the multiplexer and the laptop were provided through the RS232 serial port by the Windows-compatible MicroRidge program "Wedgmlink". Upon receipt of a manual trigger from the laptop, the multiplexer

in turn triggered each EDI to transmit a 12-character ASCII text packet at 1200 baud containing its current measurement. The multiplexer collected the text packets and, after adding an alphabetical channel identifier to each one, sent them in a data string to the laptop at 9600 baud (**Figure 4.4.**) Wedgeline then added a date/time stamp (resolution in seconds) to each incoming data packet. Data strings were sent in 30 second intervals until stopped by another manual trigger from the laptop.

Wedgeline also transmitted the data string as keystroke commands to a spreadsheet program for manipulation and storage. The Microsoft Excel program was used for this purpose. However, the EDI text packets sent to the multiplexer arrive in random order, and they are therefore arranged randomly within the data string. Using the channel identifier added to each EDI packet, the individual readings were parsed into columns within the Excel spreadsheet and then displayed graphically. The RS232 connector to the EDI proved sensitive to moisture and dirt, and therefore as backup, they were also read manually during the tests.

4.2.1 Reference Beams

Measurement of the top of shaft movement required a stable reference system for the digital indicators, which was constructed from two reference beams supported away from test shafts. The reference beams straddled the 9 ft diameter enclosures, supported at the ends on 4x4 wooden posts. Additional 2x4's were clamped diagonally between the two beams for lateral stability. (See **Figure 4.5.**) The reference beams used for the 1996 tests were 2 ft tall and 32 ft long, constructed of 2x6 wood timbers. These beams weighed more than 500 lbs each, and they could not be easily disassembled. To keep the beam weight under 200 lbs and avoid mobilizing a crane, fiberglass structural channels and tubing were used to fabricate the beams in a truss configuration. The truss section was designed to minimize sag with a section modulus equivalent to the wooden beams. The 2002 reference beams were 3 ft tall and 32 ft long, constructed in 8 ft long modular sections for ease of transport and storage. The fiberglass sections ordered from Tampa Plastics and produced by Extren, Inc. were UV

resistant, with a high strength to weight ratio and a coefficient of thermal expansion comparable to wood.

4.2.2 Top of Shaft Movement

The primary measurement of shaft top movement for both the 1996 and 200s tests was based on digital indicators referenced to the reference beams. Three EDI's with a 4 in stroke were affixed to the shaft enclosure using magnetic mounts, positioned 120 degrees apart around the casing perimeter. (See **Figure 4.6.**) The stem of each EDI rested on a glass plate glued to a wood crossbeam between the reference beams. Only two EDI's, 180 degrees apart, were used during the 1996 tests. The top of shaft gages were set to read upward movement of the shaft as positive.

To verify the accuracy of the digital indicators and the stability of the reference beams during the UF tests, a survey level was set up approximately 30 ft from the test shaft. Steel angles 4 ft long were clamped to the inner wall of the casing near each of the three EDI's, and engineering scales with 0.02 in increments were then glued to the top of each angle. A backsight scale mounted on an adjacent bridge pier was used to check the stability of the survey level. Movement of the reference system was also checked with the survey level. Scales were glued to a support post at each end of the beams and read during the test to insure that the reference remained stable. The survey measurements were secondary, but agreed well with the EDI measurements. Both measurements assumed that the shaft enclosure would move with the shaft, and such was the case observed during all tests.

4.2.3 Osterberg Cell Expansion and Shaft Compression

Unstrained telltale rods, bearing at elevations within the test shafts, provided displacement measurements for the O-cell plates and for the shaft compression. During the 1996 tests, the four indicators for the bottom O-cell plates were supported from the reference beams to measure the plate movement directly. The remaining telltale measurements were referenced to the shaft top. Because of the shaft enclosures, during the 2002 tests all of the telltale EDI's were supported from the shaft top. The actual movements of the telltales referenced to the shaft top were found by adding the

measured telltale displacement to the top of shaft movement. The telltales above the mid-level O-cell measured only shaft compression and used a 2 in stroke EDI. The other six telltales required a 4 in stroke EDI. The expansion of each O-cell was calculated from the combined movement of its top and bottom plates.

Each telltale elevation had two telltale pipes, located on opposite sides of the test shaft. UF personnel cleaned, oiled, and inserted the 3/8 in stainless steel telltale rods into the pipes before each test, connecting the 10 ft lengths together using 10-24 set screws. Then the telltale pipes were filled with oil to minimize any friction along the assembled rods. Telltale clips with glass plates were affixed to the top of each telltale rod for the indicator stem to bear on. (See **Figure 4.8.**) The telltale indicators were clamped to the exposed rebar cage at the shaft top using steel angles. Thin strips of oiled cloth were loosely inserted around each telltale rod to center it within the top of the pipe. The indicators were plumbed with a small level and set so that upward movement of the telltale rod (compression of the shaft) was read as a positive deflection.

LTI also installed a number of vibrating wire displacement transducers between the plates of the O-cells to measure the cell expansion directly. This was a prototype installation and Sharp (1996) preferred the telltale measurements for plate movements. Very few of these instruments still worked during the 2002 tests, probably due to the infiltration of water. All O-cell plate movements calculated herein use the telltale measurements.

4.3 Shaft Strain

LTI installed strain gages on the test shaft reinforcement during construction to obtain an axial distribution of the shaft strain during each load increment. LTI chose the Geokon Vibrating Wire 4911 Sister Bar for these measurements because of their robust stability and longevity. As shown in **Figures 3.1-3.5**, the Sister Bars were tied parallel to the axial rebar around the inner perimeter of the cage, grouped two or three per level at stratigraphic boundaries.

The Sister Bars are constructed with a vibrating wire strain gage at their center, inside of a 6 in length of steel tubing. A 24 in length of rebar connected to each end of the tubing anchors the Sister Bar into the concrete. Strain is indicated by the natural frequency of the vibrating wire, which is stretched tightly between the ends of the tubing. The wire is "plucked" by sending a voltage spike across an electromagnetic coil located at the center of the gage. The resulting vibration of the wire creates a sinusoidal current through the coil, the frequency of which can be measured using a Geokon GK401 control unit, or a Campbell Scientific Vibrating Wire Interface and Datalogger. The strain in the wire varies directly with the square of its natural frequency squared (f^2). Since the wire tension and frequency change with temperature, each Sister Bar also includes a resistance thermistor to measure and correct for temperature. Temperature changes during a static test are usually insignificant, and temperature corrections are required only for long-term strain monitoring.

Prior to the load tests, UF personnel used a GK401 (position B) to check the strain gages and a voltmeter to measure the thermistor resistance. Geokon provides a calibration factor for each strain gage and thermistor, which were included in Sharp (1998) and used to reduce the strain gage measurements. The axial load at each strain level was determined by multiplying the average strain at the level by the shaft area and stiffness. Chapter 5 presents further discussion of the strain gage data reduction

A Campbell Scientific CR10 datalogger was used to monitor the strain gages during the 2002 tests (**Figure 4.9**). LTI also used the CR10 datalogger in repackaged version manufactured by Geokon. The Campbell Scientific "PC208" Windows-compatible software allows the engineer to program and communicate with the CR10 using a laptop computer (**Figure 4.4**). Using the laptop, UF personnel provided manual prompts to the CR10 to begin and end a series of 30 second readings at the start and finish of each load interval. The Geokon software, based on PC208, does not have this capability, and LTI simply initiated a continuous series of 30 second readings at the start of the load test.

4.4 Test Procedures

Both UF and LTI used a modified quick test for the SR20 shafts, similar to that described in ASTM Standard D1143. The load increments were modified to obtain roughly twenty load cycles, with greater increments at the beginning of the test and smaller increments near failure. Each load was held constant for a minimum of 4 minutes. The pump operator typically applied the next load increment within about 1 minute, resulting in roughly a 5 minute cycle for each load. Some time intervals were unintentionally longer due to difficulties with the pump or adjustment of the digital gages.

LTI performed the 1996 tests using a consistent scheme for applying load in the two O-cells as follows:

- Stage 1:** Pressurize the lower O-cell to evaluate the end bearing using the maximum available side shear from the entire shaft. The mid-level O-cell is closed. The test ends if the side shear fails either first or simultaneously with the end bearing.
- Stage 2:** Pressurize the mid-level O-cell with the lower O-cell open so that it cannot develop any end bearing. Failure occurs in side shear, either upwards in the overburden or downwards in the rock socket.
- Stage 3:** Testing is modified to obtain a side shear failure in the remaining un-failed section. If the overburden side shear remains, then the mid-level O-cell is pressurized with the lower O-cell closed to develop end bearing. If the rock socket side shear remains, then the lower O-cell is pressurized with the mid-level O-cell open to eliminate the overburden side shear.

Since little side shear setup was expected in the rock socket, and much of the lower O-cell stroke had been used, all of the 2002 tests were performed specifically to fail the overburden shaft section in side shear. Four of the 2002 tests actively pressurized only the mid-level O-cell. At Test Shaft 7, the lower O-cell was pressurized first to close the open mid-level O-cell.

The dataloggers recorded the digital gage readings, pump pressure, and strain gage readings in 30 seconds intervals, starting at the beginning of the load interval (2002) or continuously from the start of the test (1996). Manual readings were recorded at elapsed times of 30 seconds, and 1, 2, and 4 minutes. Survey level readings were

taken at 1, 3 and 4 minutes. Following the maximum load, the O-cells were depressurized in 5 to 10 intervals. The unloading time interval was quicker, usually about 3 minutes. Manual readings during unloading were taken at 30 seconds and 3 minutes. The datalogger intervals remained at 30 seconds. **Chapter 5** discusses the data reduction and presents the load-deflection curves.

A minimum of seven technicians were required to perform the 2002 tests and manually record all of the test readings. Two of the tests were performed successfully with less personnel by eliminating some of the manual EDI gage readings. **Table 4.1** lists the UF personnel who participated in each test.

Table 4.1 2002 Shaft Test Personnel

Shaft 7 (2/23/02)	Shaft 5 (2/9/02)	Shaft 10 (3/8/02)	Shaft 2 (3/6/02)	Shaft 11 (3/2/02)
Logan, J. Bullock, P. Kohlhof, C. Jacobs, S. Gutz, A. Conn, R. Pham, L.	Logan, J. Bullock, P. Kohlhof, C. Conn, R. Jacobs, S. Gutz, A. Valez, J.	Logan, J. Bullock, P. Kohlhof, C. Badri Seng-Ho Lila	Logan, J. Bullock, P. Kohlhof, C. Broward, C. Nguyen, D.	Logan, J. Bullock, P. Kohlhof, C. Hu, Z. Le, M. Pham, L. Conn, R.

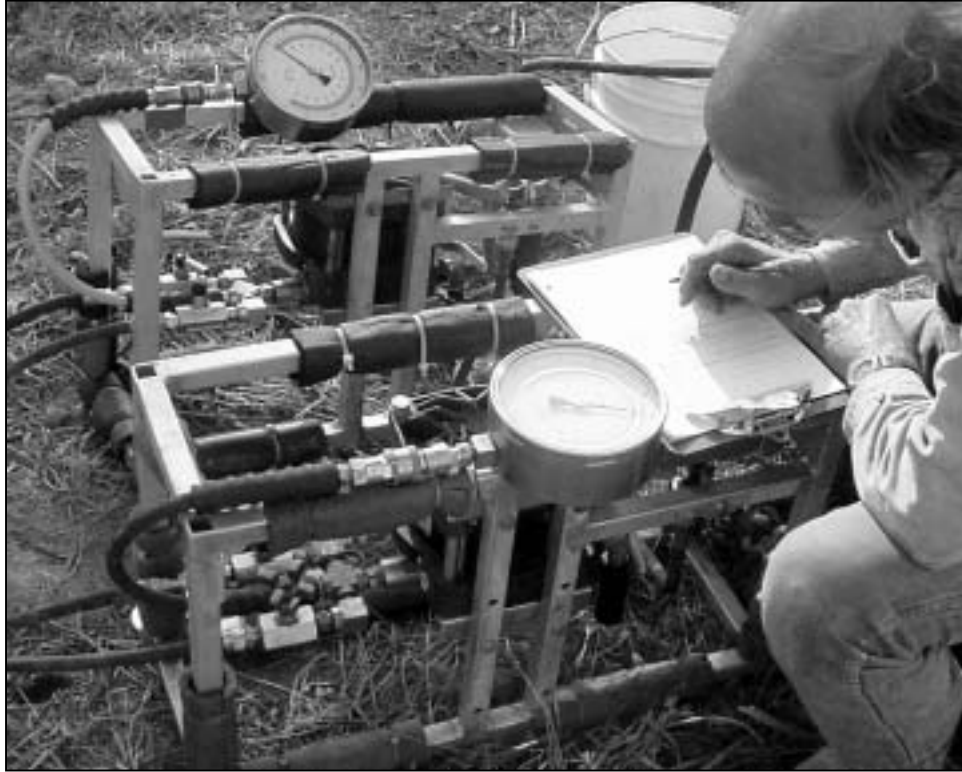


Figure 4.1 Air-Driven Pumps with Gages to Pressurize O-cells



Figure 4.2 Chicago Dial Indicators (Logic Basic Model) and Support Clamp



Figure 4.3 MicroRidge MPX-4S Multiplexer



Figure 4.4 Dataloggers with Laptop Control for 2002 Tests



Figure 4.5 Reference Beams (2002) at Test Shaft 10

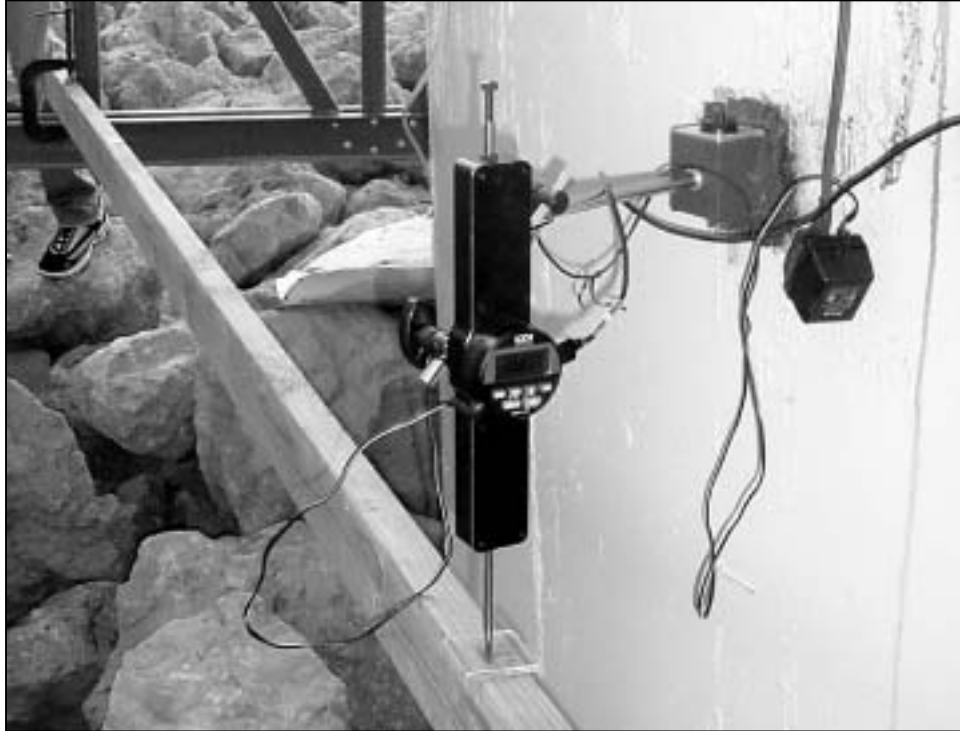


Figure 4.6 Top of Shaft Movement Digital Indicator (2002)

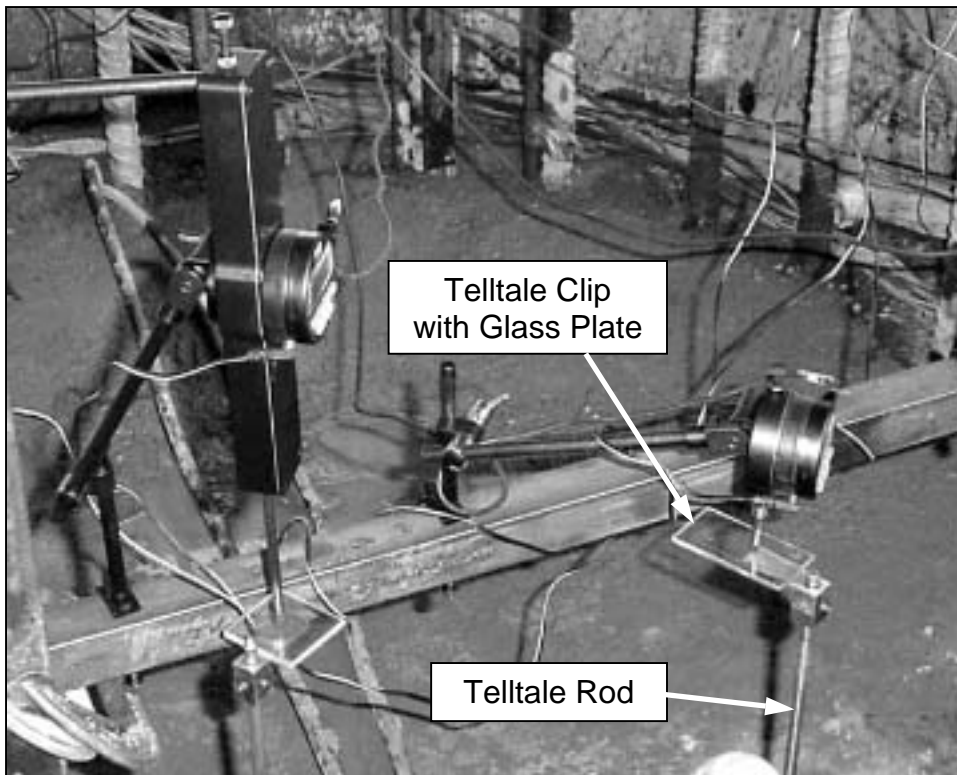


Figure 4.7 Measurement of Telltale Displacement (2002)

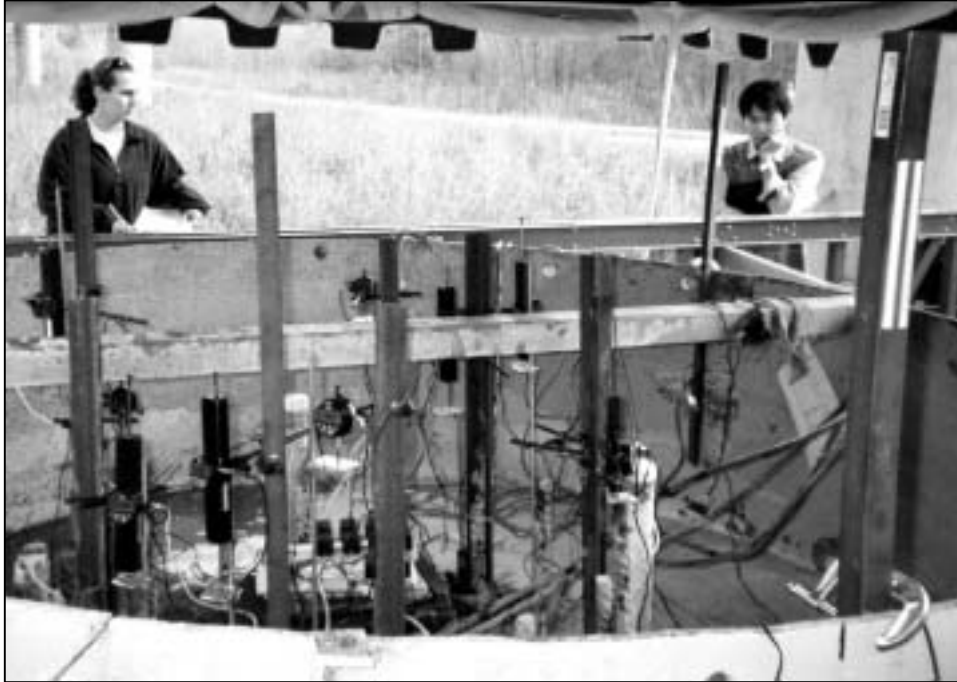


Figure 4.8 Telltale Instrumentation (2002)

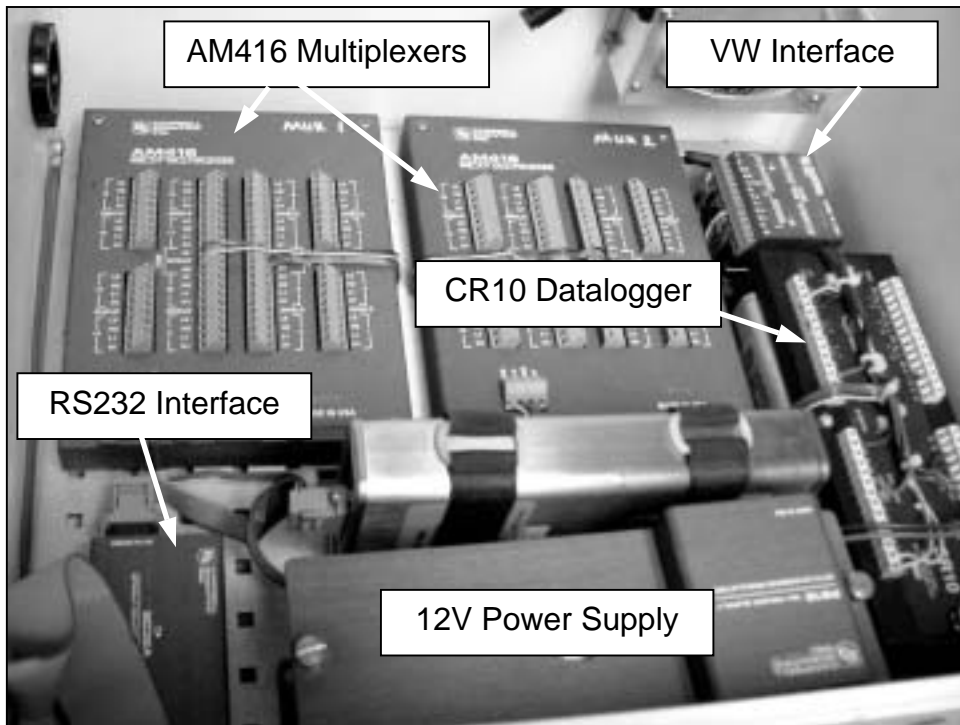


Figure 4.9 CR10 Datalogger Setup for 2002 tests

5. ANALYSIS OF TEST DATA

Strain gage and pressure readings obtained during the 2002 shaft tests were recorded in an ASCII text file in comma-delimited form. For the analysis of each test, this text file was imported into an Excel spreadsheet and combined with the EDI readings, which had been recorded directly into a spreadsheet. The 1996 test data was obtained from spreadsheets transmitted to D&M by LTI after the tests. Both the 1996 and 2002 tests are analyzed herein to insure consistent methods and provide accurate side shear comparisons. Ten worksheets were included in each Excel file for analysis of the 2002 tests, nine for the 1996 tests. A number of graphical plots were also prepared to check and display the test results. The individual worksheets are listed and described in the following sections. **Appendices C-L** include printouts of the worksheets and additional plots for each test. The analysis results are presented in **Chapters 6 and 7**.

5.1 Raw Data

The first worksheet in each Excel shaft test file is entitled "Raw". The rows of this worksheet contain the data obtained during each reading interval along with its time stamp. The rows are arranged in chronological order, starting with the "zero-load" readings at the beginning of the test. For the 1996 tests, this data was obtained from the LTI spreadsheet file. For the 2002 tests, the separate CR10 and digital indicator data files were combined and then paired using the time stamp for each set of readings. Each load interval was assigned an alphanumeric designation to identify the data, "L#" for load intervals and "U#" for unload intervals. This worksheet is quite large and is not included in the **Appendices**.

The only calculations performed in the "Raw" worksheet are for the time elapsed during each interval and the O-cell load. The alphanumeric interval designations and elapsed times are carried forward to all of the other worksheets for identification purposes. The readings from the two vibrating wire pressure transducers were used to calculate first the O-cell pressure, and then the O-cell load. The CR10 program for the 1996 tests calculated the pressure directly. The calibrations for the 2002 pressure transducers and for the O-cells are included in **Appendix B**. The pressure transducer calibrations were:

$$\text{Transducer 64705 Pressure (psi)} = 2.5005 (R_0 - R_n) - 1.3291 (T_n - T_0)$$

$$\text{Transducer 26478 Pressure (psi)} = 3.554 (R_0 - R_n)^{0.976} + 2.6088 (T_n - T_0)$$

where:

R_0	=	Reading at zero Load (f^2 , digits)
R_n	=	Reading at time n (f^2 , digits)
T_0	=	Temperature at zero load ($^{\circ}\text{C}$)
T_n	=	Temperature at time n ($^{\circ}\text{C}$)

Because the CR10 records the transducer frequency in kHz^2 and the above calibration equations assume "digits" from the GK401, the CR10 readings multiplied by 1000 before calculating the pressure. The pressure measured by the vibrating wire pressure transducers was checked against the pressure measured using the Bourdon Tube pressure gage at the pumps. The two pressure readings were plotted against each other as a check and agreed well (see **Appendices**).

The O-cell load was calculated from the transducer pressure using the general calibration formula:

$$\text{O-cell Load (tons)} = X (P) + \text{Constant}$$

where:

X	=	Calibration coefficient (tons/psi)
P	=	Hydraulic pressure within the O-cell (psi)
Constant	=	Internal friction within the O-cell (tons)

Three slightly different calibrations are provided for each O-cell, at cell expansions of 1, 3 and 5 in. The particular calibration chosen for each shaft test was based on the average expansion during the test.

5.2 Top of Shaft and O-cell Movements

The "Dial" worksheet calculates the shaft displacements, subtracting any zero offset and adding the average top of shaft movement as needed. The top of the shaft movement is calculated for both the survey level and the digital indicator measurements, with upward movement of the shaft reported as positive. The EDI and survey level movements generally agreed well, but the more precise EDI measurements were used in all subsequent calculations.

In the 2002 tests, the O-cell telltales measured plate movement with respect to the shaft top. Therefore, to obtain absolute plate movements, the average top of shaft movement was added to each O-cell telltale measurement. In the 1996 tests, the lower plates of each O-cell were supported from the reference beams and measured absolute movement directly. The top compression telltales measured compression directly and were not adjusted to absolute movement.

During many of the tests, one or more of the digital indicators were reset. The initial reset reading was subsequently used as the new zero offset, and the movement at the time of the reset was added to all subsequent movements. After all gages were zeroed and adjusted to absolute measurements (referenced to beam), averages of each pair of measurements were taken. Graphs of the averaged data were prepared for presentation herein.

5.3 Strain Calculations

The "Strn" worksheet calculates the shaft strain for each vibrating wire gage. The columns are headed by strain gage serial numbers and their respective elevations within the shaft. The frequency data is reduced to microstrain ($\mu\epsilon$ or $\mu\text{in/in}$) using the calibration factors in the "Raw" worksheet and the gage zeroes from the end of the test. The end of the test was chosen as more representative of the zero load condition because of residual stresses apparent in the shaft, especially significant during the 1996 tests. Because the CR10 records the strain gage frequency in kHz^2 and the calibration equation assumes "digits" (from the GK401), the CR10 readings were multiplied by 1000 before calculating the strain using the generalized equation:

$$\text{Strain } (\mu\epsilon \text{ or } \mu\text{in/in}) = G (R_0 - R_n)$$

where:

R_0	=	Strain reading at zero load (f^2 , digits)
R_n	=	Strain reading at time n (f^2 , digits)
G	=	Calibration factor ($\mu\epsilon/f^2$)

Note that insignificant temperature changes were measured during the tests, and the influence of temperature change was ignored. The "Strn4" worksheet is an exact copy

of the calculated strain worksheet with all readings except those at the end of each load interval omitted.

The "Strn4Avg" worksheet calculates the average strain for each gage elevation in the "Strn4" worksheet. These averages are then plotted versus elevation to visualize the axial strain profile for each O-cell load interval. Zero strain is assumed at the ground surface, and the strain at the top of the mid-level O-cell is calculated from the measured O-cell load:

$$\text{Strain at O-cell } (\mu\epsilon) = 2 \times 10^6 \left(\frac{P}{EA} \right)$$

where: P = Load at the O-cell (tons)
 E = Shaft modulus (ksi)
 A = Cross-sectional area of shaft (in²)

Axial strain distribution plots are included with the test data in the **Appendices**.

5.4 Shaft Load

The "Load" worksheet calculates the shaft load using the average strain measurements, the shaft cross-section, and the shaft modulus. The columns of this sheet are headed by strain gage elevations. The shaft modulus and diameter change with elevation and are listed at the bottom of each column. The shaft load is calculated as:

$$\text{Shaft Load, P (tons)} = \frac{\mu\epsilon_{\text{avg}} E_{\text{shaft}} A_{\text{shaft}}}{2 \times 10^6}$$

where: $\mu\epsilon_{\text{avg}}$ = Average microstrain ($\mu\text{in/in}$)
 E_{shaft} = Shaft modulus (ksi)
 A_{shaft} = Shaft cross-sectional area (in²)

Axial load distribution plots, shaft load versus elevation, are included with the test data in the **Appendices**.

5.5 Shear Stress

The "Shear" worksheet calculates the average side shear over each segment of shaft, between adjacent strain gage elevations. The centerline elevation and the length of each segment head the columns. The simple free body diagram shown in **Figure 5.1** is used to develop the side shear equation shown below:

$$\text{Average Segment Shear Stress, } \tau \text{ (tsf)} = \frac{Q_s}{A_s} = \frac{(P_b - P_t - W)}{A_s}$$

- where:
- Q_s = Side shear force on segment (tons)
 - P_t = Shaft load at segment top (tons)
 - P_b = Shaft load at segment bottom (tons)
 - W = Segment weight (tons)
 - A_s = Sidewall surface area of segment (ft²)

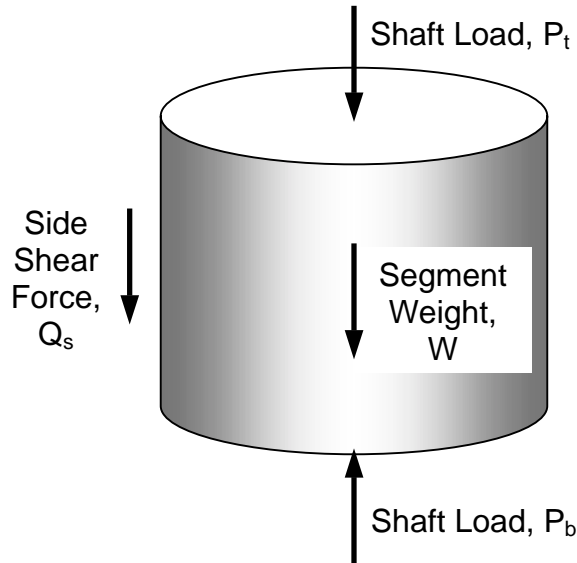


Figure 5.1 Free Body Diagram for Shaft Segment Between Strain Levels

The above calculation assumes that the shear stress changes linearly over each segment, and that downward force and compression are positive. Because of the high water table at the SR20, a buoyant weight is used for the shaft segments below the ground surface. The maximum shear stress calculated during the load test is reported

below the segment weight at the bottom of each column. The **Appendices** include plots of shear stress versus segment displacement (**Section 5.7**) for each load interval.

5.6 Telltale Compression and Strain Gage Comparison

The "Compr" worksheet integrates the measured shaft strain above the mid-level O-cell for comparison with the telltale compression. To calculate the shaft compression, the average of the strain at the top and bottom of each shaft segment was multiplied by the segment length and summed for all the segments:

$$\text{Shaft Compression (in)} = \sum_{i=1}^n \left(\frac{\mu\varepsilon_i + \mu\varepsilon_{i-1}}{2 \times 10^6} \right) \times L_i \times 12$$

where: $\mu\varepsilon_i$ = Microstrain at top of segment ($\mu\text{in/in}$)
 $\mu\varepsilon_{i-1}$ = Microstrain at bottom of segment ($\mu\text{in/in}$)
 L_i = Segment length (ft)

Small errors in the strain measurements and the assumption of linear strain variation create small errors in the calculated shaft compression. Because of the relatively large diameter of the test shafts, the overall shaft compression is also relatively small. Although the absolute differences between the measured shaft and integrated shaft compression were not large, the relative percentage errors were significant.

5.7 Segment Movement

The "Mvmt" worksheet calculates the movement at the centerline of each segment for plotting shear versus movement ("t-z" plots). A linear strain distribution is again assumed. The segment movement is calculated from the movement of the top plate of the mid-level O-cell by subtracting the compression of the shaft segments below its centerline:

Centerline Movement of Segment j (in) =

$$\Delta_j = \Delta_{\text{Ocell}} - \left[\left(\frac{\mu\varepsilon_j + \mu\varepsilon_{j-1}}{2 \times 10^6} \right) \times \frac{L_j}{2} + \sum_{i=1}^{j-1} \left(\frac{\mu\varepsilon_i + \mu\varepsilon_{i-1}}{2 \times 10^6} \right) \times L_i \right] \times 12$$

where:

Δ_{Ocell}	=	Top of mid-level O-cell movement (in)
$\mu\varepsilon_l$	=	Microstrain at top of a segment ($\mu\text{in/in}$)
$\mu\varepsilon_{i-1}$	=	Microstrain at bottom of a segment ($\mu\text{in/in}$)
L_i	=	Segment length (ft)

5.8 Modulus and Shaft Area

The "Modulus" worksheet calculates the shaft modulus and cross-section area at each strain gage elevation (needed for load calculation from strain). The diameter and composition of the tests shafts change with elevation, and therefore, the shaft modulus changes. These changes include differences in reinforcement, permanent casing, shaft diameter, and instrumentation such as O-cell hoses and telltale pipes. The area of the strain gage wires embedded in shaft was assumed negligible.

The steel reinforcement area was found in the project plans and confirmed verbally by D&M. The shaft diameter was obtained from the as-built dimensions reported by Sharp (1998). D&M also provided concrete modulus values from cylinder tests by Williams & Associates, Inc. performed during test shaft construction. The shaft modulus was calculated using the steel and concrete modulus values weighted by their respective cross-sectional areas.

$$\text{Shaft Modulus, } E_{\text{shaft}} \text{ (ksi)} = \frac{E_c A_c + E_s A_s}{A_{\text{shaft}}}$$

where:

E_c	=	Concrete modulus (ksi)
A_c	=	Area of concrete (in ²)
E_s	=	Steel modulus (ksi)
A_s	=	Area of steel (in ²)
A_{shaft}	=	Gross cross-sectional area of shaft (in ²)

Only the Excel files for the 2002 tests include the "Modulus" worksheet. The 1996 test files use the same modulus and area values, but the "Modulus" worksheet is omitted.

6. TEST RESULTS

UF performed the 2002 tests at SR20 with the primary goal of measuring the shaft side shear in the overburden above the mid-level O-cell. This chapter summarizes and compares the O-cell tests from 1996 with the 2002 tests.

6.1 Test Stages

The 2002 test stages were planned with careful consideration of the 1996 tests, including anticipated failure loads and cumulative cell expansion (limited to 6 in). On this basis, stage 3 loading from the mid-level O-cell appeared to provide the most definitive test method from which to determine the side shear change. (See description of test staging in **Section 4.4.**) This limited the investigation to the overburden soils, but this zone was also expected to exhibit the greatest side shear setup. Since the overburden side shear capacity could have increased significantly from the 1996 tests, the bottom O-cell was closed during the 2002 tests to obtain the maximum reaction capacity below the mid-level O-cell, using both the end bearing and side shear from the rock socket. **Table 6.1** summarizes the maximum sustained O-cell load and total O-cell expansion for each test stage from both 1996 and 2002.

Three of the five 1996 tests included multi-stage shaft loading from both the mid-level and bottom O-cells. Two of these tests included a stage 3 simultaneous loading of both O-cells, intended to provide compression data from which to estimate the shaft modulus between the O-cells. This effort was unsuccessful because of the very low strain induced in these large diameter shafts. Perhaps for this reason, Sharp (1998) did not report the shaft movement or the O-cell expansion for these additional stages, which were subsequently estimated from LTI field notes.

The following sections provide test details for each shaft along with the pertinent O-cell test curves. Test load increments ceased during each stage after reaching a failure, as indicated by continuing displacement at constant load. The 1996 and 2002 test curves shown below are generally for different test stages and will therefore show O-cell loads that cannot be compared directly, i.e. the side shear developed during each stage

should be compared, not the overall applied load. **Appendices C-L** provide the detailed measurements for each test, including additional plots used to check and verify the test results. **Chapter 7** reports the maximum measured side shear for each shaft segment, and discusses the changes observed between the 1996 and 2002 tests.

Table 6.1 SR20 Test Summary

Test Shaft	Year - Stage	Maximum Load		Mid-level O-cell				Bottom O-cell			
		Mid O-cell tons	Bottom O-cell tons	Plate Movement		O-cell Expansion		Plate Movement		O-cell Expansion	
				Top in	Bottom in	Stage in	Total in	Top in	Bottom in	Stage in	Total in
11	1996 - 1	0.0	1801.9	0.720	0.720	0.000	0.000	0.766	-5.776	6.542	6.542
11	2002 - 3	1317.7	0.0	1.166	-1.144	2.310	2.309	-1.117	0.037	-1.154	5.388
2	1996 - 1	0.0	1990.9	2.131	2.150	-0.018	-0.018	2.142	-1.679	3.821	3.821
2	2002 - 3	1147.6	1004.3	1.523	-1.427	2.951	2.932	-1.455	-0.046	-1.409	2.412
10	1996 - 1	0.0	2263.0	0.366	0.352	0.015	0.015	0.369	-1.513	1.882	1.882
10	1996 - 2	1869.3	0.0	1.570	-0.587	2.157	2.172	-0.594	-0.048	-0.546	1.335
10	2002 - 1	0.0	147.6	-0.001	0.007	-0.008	2.164	0.007	-0.032	0.038	1.374
10	2002 - 3	2031.9	1.9	2.537	-0.098	2.636	4.799	-0.106	-0.040	-0.066	1.308
5	1996 - 1	0.0	1110.9	1.826	1.833	-0.008	-0.008	1.838	-2.674	4.512	4.512
5	1996 - 2	187.3	0.0	-0.065	-1.336	1.271	1.263	-1.344	-0.048	-1.296	3.216
5	1996 - 3	754.9	754.4	1.041	1.041	0.000	1.263	1.041	-0.537	1.578	4.794
5	2002 - 3	762.7	621.4	0.874	-0.230	1.104	2.367	-0.307	-0.032	-0.275	4.519
7	1996 - 1	0.0	810.6	0.041	0.041	0.000	0.000	0.049	-4.377	4.427	4.427
7	1996 - 2	789.4	0.0	0.135	-2.806	2.942	2.941	-2.870	-0.031	-2.839	1.588
7	1996 - 3	1032.1	0.0	2.753	-0.250	3.003	5.944	0.046	-0.148	0.194	1.782
7	1996 - 3A	751.5	754.4	0.063	0.063	0.000	5.944	0.063	0.058	0.005	1.787
7	2002 - 1	0.0	255.7	0.019	3.626	-3.607	2.337	3.134	0.020	3.115	4.902
7	2002 - 3	912.2	780.5	1.853	-1.266	3.120	5.456	-0.808	-0.199	-0.610	4.292

6.2 Shaft 11 Test Results

The overburden profile surrounding Shaft 11 has a 15 ft thick clay layer at the surface with about 5 ft of silt directly beneath it. Sand layers dominate the remainder of the overburden profile down to the rock surface at elevation -13 ft. **Appendices C and D** provide details of the 1996 and 2002 tests respectively. As shown in **Figure 6.1**, the 1996 test clearly failed in bearing and mobilized most of the side shear during stage 1 testing from the bottom O-cell. The stroke limit was exceeded during the final load of 1802 tons, and the O-cell hydraulic pressure dropped quickly to zero. Although the

shaft moved 0.72 in upward, the shear-movement (τ -z) curves (see **Appendix C**) at elevations from +16 ft to -27 ft did not fully attain their maximum shear. However, failure was imminent and a mathematical curve fit to extrapolate to 2 in of movement provided correlation coefficients exceeding 0.99. The 1996 testing stopped with the completion of the stage 1 test.

Figure 6.2 shows the 2002 test performed using the mid-level O-cell with the lower O-cell closed to develop end bearing (stage 3). At the maximum load of 1318 tons, the shaft had moved upwards 1.5 in and the overburden side shear had failed. Although closed at the surface, the lower O-cell did not record any internal pressure as its expansion was reduced during the test, as expected because of the blown seal. The rock socket side shear failed at about 460 tons after about 0.5 in movement. The remaining reaction was apparently achieved in bearing and side shear at the bottom of the shaft, arching around the non-load bearing lower O-cell.

The 2002 test of Shaft 11 was performed on a cool, rainy night. Although the shaft top instrumentation was covered, the high humidity prevented adequate drying of the EDI-multiplexer connectors, and the EDI data acquisition system did not function reliably. Therefore, the EDI's were read manually. One of the top movement indicators, DG13, was splashed by rain during the test and ceased to function altogether. Subsequent displacement at this location was carefully estimated using a tape measure. Despite the relatively crude tape measurement for DG13, the average top movement from the three indicators compared well with the survey level measurements. The top of shaft movement also does not significantly affect the results of the test, which depend more on the O-cell load and strain measurements. Two of the strain gages, 10602 and 10604 at elevations +10 ft and +0 ft respectively, no longer functioned, and the remaining gage at each level provided the only strain measurement. The strain difference (due to unequal shaft or side loading) between gages above and below these levels was not extreme, and the shaft strain and load distributions appear reasonable. However, the resulting shear stress estimates at +16 ft, +5 ft, and -4 ft may be somewhat affected.

Bottom Cell Movement vs Load - Stage 1 - Shaft 11 - 1996

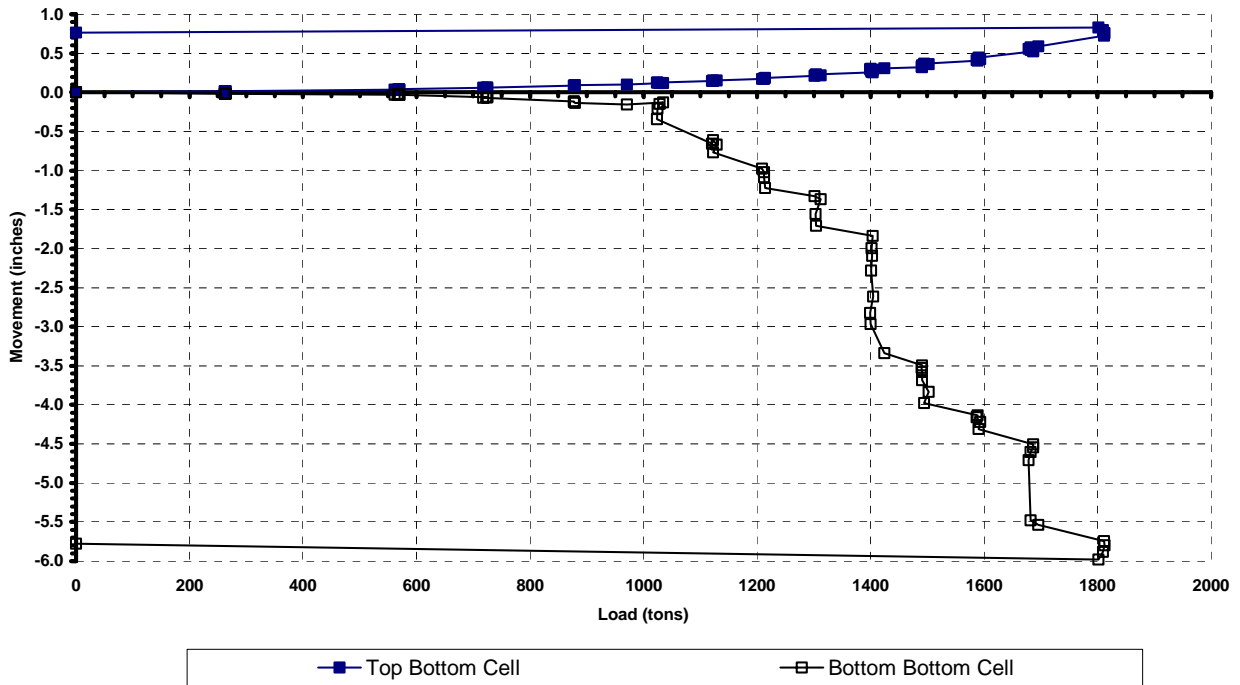


Figure 6.1 Load vs. Movement (Shaft 11 – 1996)

Mid Cell Movement, Stage 3 - Shaft 11 - 2002

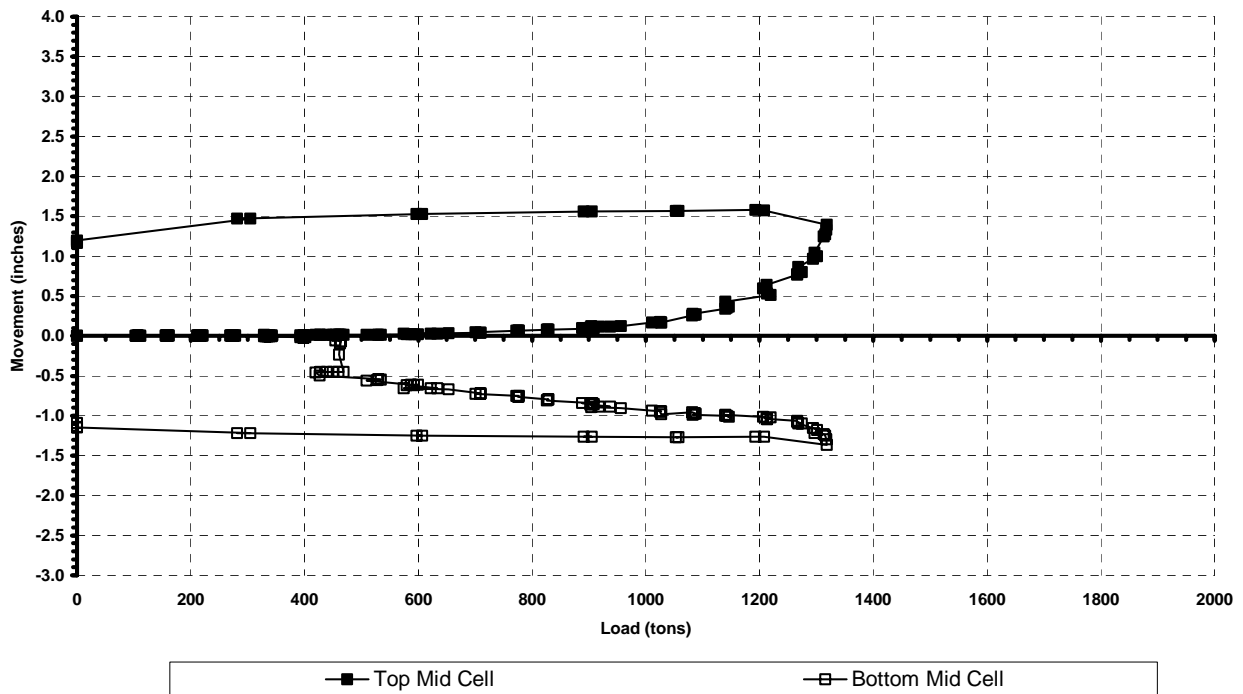


Figure 6.2 Load vs. Movement (Shaft 11 – 2002)

6.3 Shaft 2 Test Results

The overburden profile surrounding Shaft 2 has a 7 ft thick clay layer at the surface with about 11 ft of clayey sand directly beneath it. Sand layers dominate the remainder of the overburden profile down to the rock surface at elevation -16 ft. As **Figure 6.3** shows the 1996 test, performed using only the lower O-cell (stage 1), failed in both bearing and side shear at a maximum load of 1991 tons. The shaft had moved upwards 2.3 in and downwards 2.0 in at the failure load. The indicators for the bottom plate of the mid-level O-cell exceeded their maximum stroke just below the failure load, and they were not reset. Although not used for the shear stress analysis, since the mid-level O-cell was not expanded during this test, the remaining movement of its bottom plate was estimated to be the same as measured for its top plate.

Since the 1996 test failed in both bearing and side shear almost simultaneously, and no bearing increase was expected to compensate for any side shear setup, the 2002 test focused on the overburden side shear. A stage 3 test from the mid-level O-cell was performed with lower O-cell closed, using the combined rock socket side shear and end bearing for reaction. The 2002 test, shown in **Figure 6.4**, failed in overburden side shear at 1148 tons and 1.8 in top of shaft movement. The early portion of the strain gage and O-cell pressure transducer data was inadvertently lost because of a memory overload in the CR10 datalogger. However, the impact on the test analysis was minimal. The missing strain readings occur during the early, elastic phase of the test, and the manual O-cell gage pressure readings provided backup for the pressure transducers. Several indicators exceeded their maximum travel, but they were immediately reset during the test. The mid-level O-cell broke its shipping welds at about 160 tons, which causes a clear, but inconsequential, discontinuity in the test curve shown in **Figure 6.4**. Although the lower O-cell maintained reasonably good pressure, a leaky hose fitting allowed the O-cell to close during the test. **Appendices E and F** provide additional details of the Shaft 2 tests.

Final Report Contract #BC354 RPWO #32

Bottom Cell Movement - Stage 1 - Shaft 2 - 1996

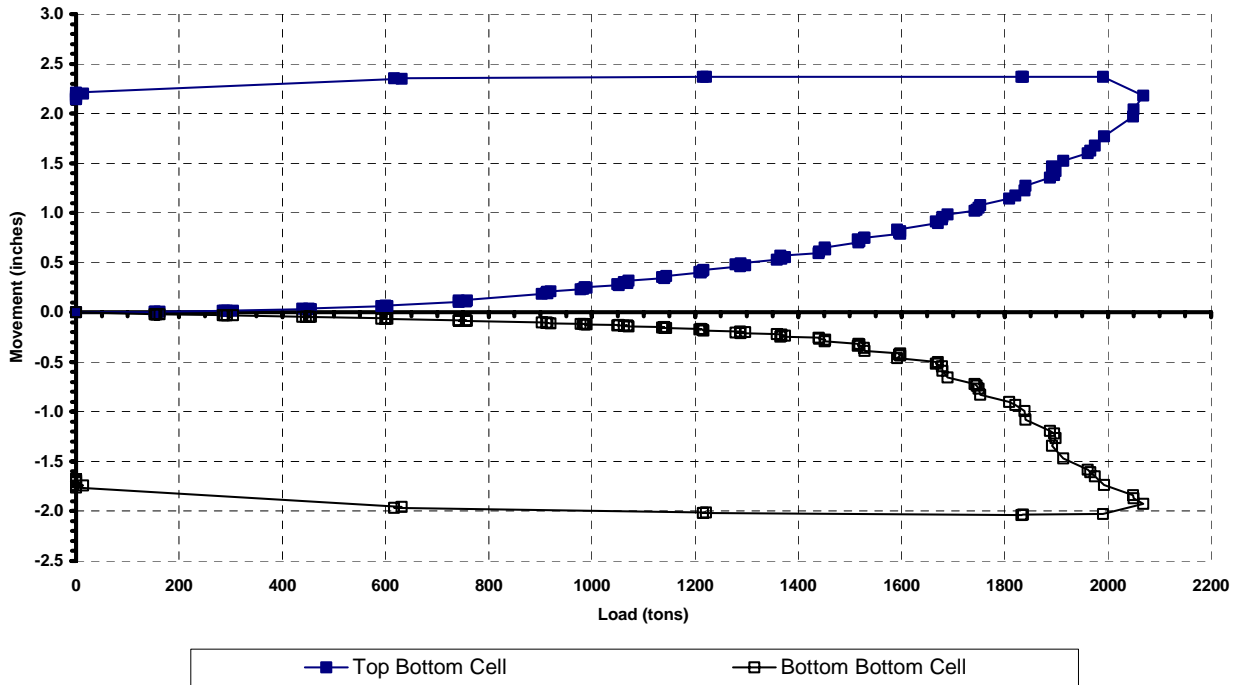


Figure 6.3 Load vs. Movement (Shaft 2 – 1996)

Mid Cell Movement - Stage 3 - Shaft 2 - 2002

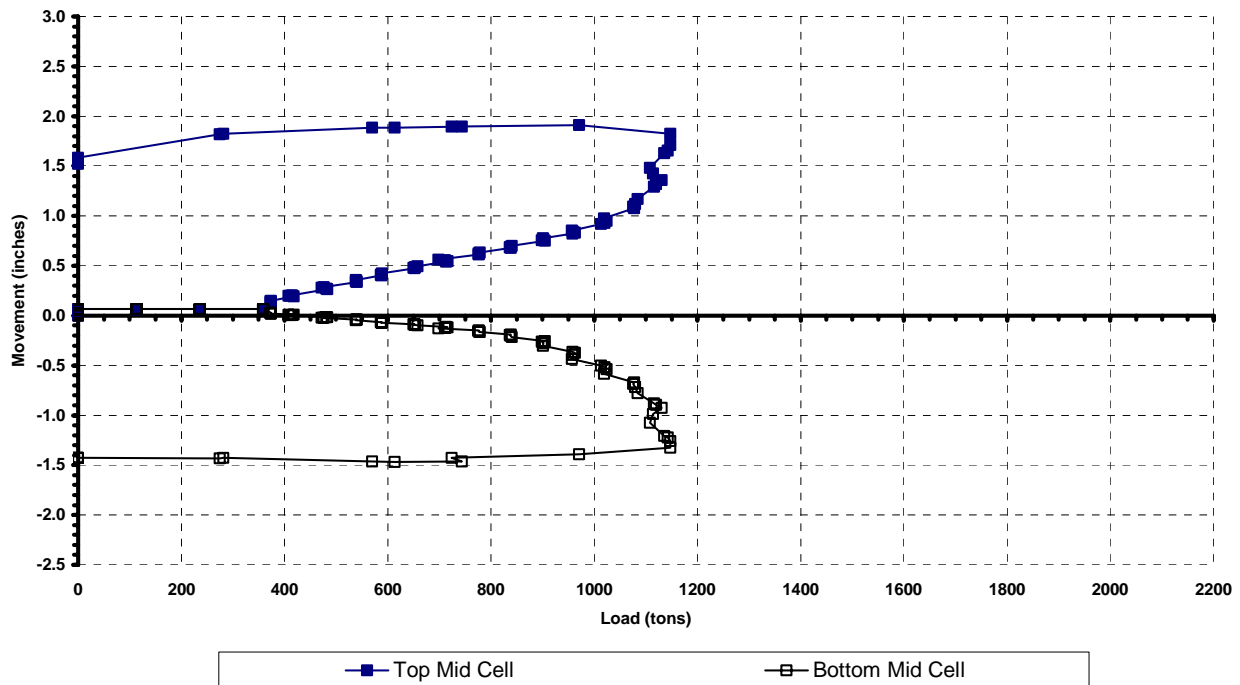


Figure 6.4 Load vs. Movement (Shaft 2 – 2002)

6.4 Shaft 10 Test Results

Shaft 10 was located near the West bank of the river and surrounded by limestone riprap placed 3-4 ft deep after the 1996 test. However, the surface elevation, and the overburden stress, has not changed significantly since the 1996 tests. Shaft 10 is the only test shaft with permanent casing, from the ground surface to just below the rock surface at elevation -20.9 ft. The near-surface soil consists of 24 ft of silty and clayey sand. The remaining overburden above the rock is mostly loose sand. LTI set the mid-level O-cell at this site into the rock socket, with 17 ft of rock above it.

LTI performed the 1996 test in two stages, achieving a stage 1 end bearing failure at 2263 tons, with in upward movement. As shown in **Figure 6.5**, the stage 2 test from the mid-level O-cell fully mobilized the side shear above it, with a movement of 1.7 in at the maximum load of 1869 tons. Although the lower O-cell was open to drain during stage 2 testing, the lower plate movement of the mid-level O-cell resembled a bearing curve. LTI believed that end bearing and side shear were mobilized together in the rock socket. This may have resulted from a discontinuity in the shaft sidewall or from load transferred around the lower O-cell as it compressed.

Only stage 2 and 3 loads were performed in 2002, since the lower O-cell would only fail the end bearing. However, the O-cell hoses had no identifying marks, and the lower O-cell was initially pressurized by mistake. Concurrent stage 2 and 3 loading did not fail the rock socket or develop pressure in the lower O-cell. However, it did fail the overburden side shear at 2032 tons with 2.7 in top of shaft movement, as shown in **Figure 6.6**. Two of the strain gages in the rock socket (10635 and 10645) did not function during the 2002 tests and shaft load was based on the two remaining gages at each level. The strain data indicate very little side shear mobilized in the cased portion of the shaft, probably due to the construction method. Therefore, the weight of the shaft may have partially closed the mid-level O-cell after the 1996 test, which might explain the movement required to reengage the rock side shear as seen in **Figure 6.6**. Loading stopped when the mid-level O-cell pressure dropped suddenly at about 6600 psi, probably because of a blown seal. **Appendices G and H** provide test details.

Mid Cell Movement - Stage 2 - Shaft 10 - 1996

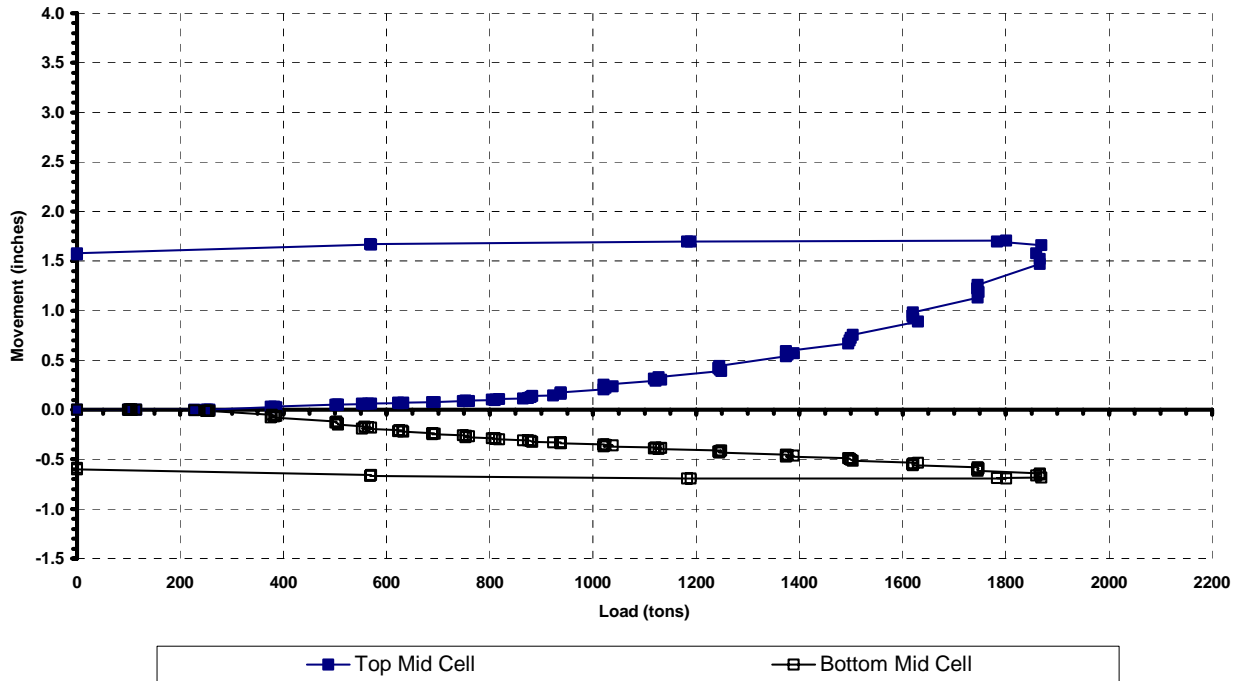


Figure 6.5 Load vs. Movement (Shaft 10 – 1996)

Mid Cell Movement - Stage 3 - Shaft 10 - 2002

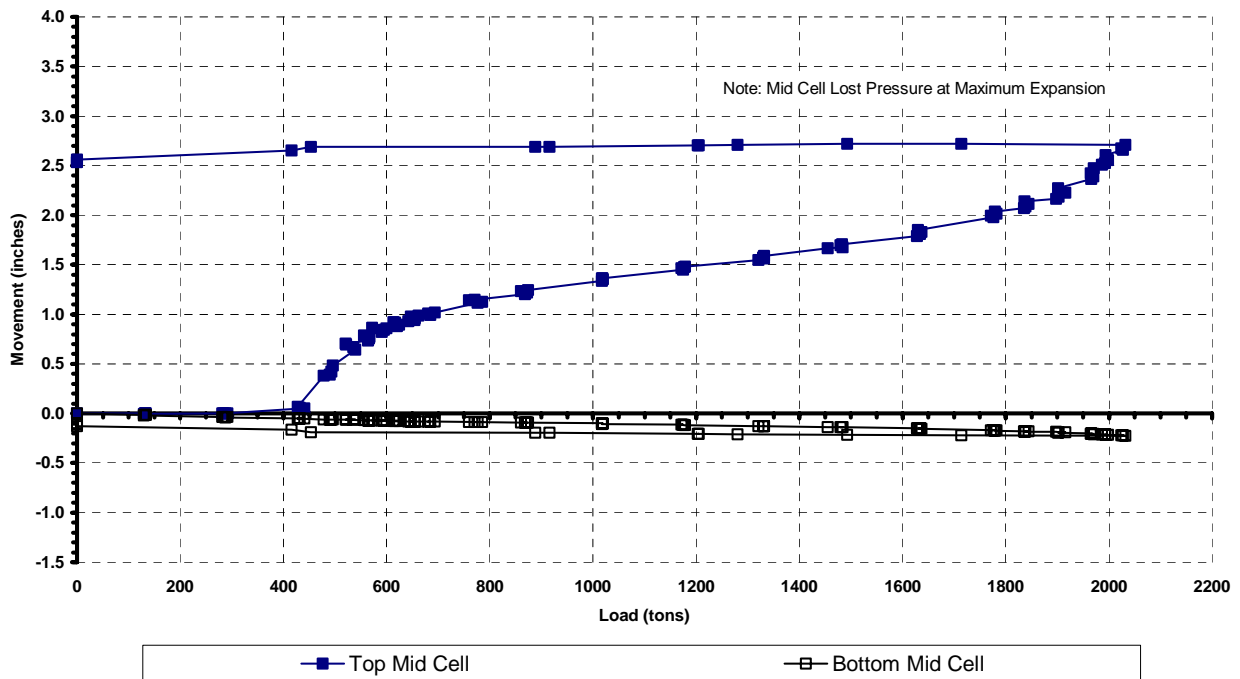


Figure 6.6 Load vs. Movement (Shaft 10 – 2002)

6.5 Shaft 5 Test Results

Shaft 5 was located near the East bank of the river and, like Shaft 7, has more fine-grained and distinctly weaker soil in the overburden than the shafts on the Western side of the river. The surface layer of clayey sand is about 8 ft thick and has 35-40 ft of clay under it. A thin 5-10-ft thick layer of sand below this grades back into a clayey sand above the limestone found at elevation -24 ft. As shown in **Figure 6.7**, the 1996 LTI test failed in both bearing and side shear during stage 1, with a top of shaft movement of 1.9 in at the maximum sustained load of 1111 tons. Stage 2 and stage 3 loading resulted in a total of 1.3 and 4.8 in of expansion in the mid-level and lower O-cells respectively, but added little useful information. Stages 2 and 3 from 1996 were not included in the D&M report (Sharp, 1998). Stage 2 was initially identified from computer files supplied by LTI, but stage 3 was not discovered until field records were obtained from LTI, after the 2002 Shaft 5 test.

Based on the 1996 stage 2 results, it appeared that adequate expansion capability remained in the lower O-cell to perform a 2002 stage 1 test with the mid-level O-cell closed, and progress to stages 2 and 3 if needed. Due to a burst O-cell hose, the initial 2002 test (not included in this report) was aborted at about 450 tons and 0.08 in top of shaft movement. A second attempt two weeks later resulted in a side shear failure load of 763 tons at 1.0 in top of shaft movement (see **Figure 6.8**).

After review of the 2002 tests, the O-cell hoses were apparently reversed, mistakenly pressurizing the mid-level O-cell during both attempts. To help avoid future mistakes, UF requested, and LTI subsequently provided, a copy of their field records, which proved very useful during the remainder of the 2002 test program. Adjacent strain gage measurements were carefully checked during the remaining tests to verify the correct O-cell loading. However, the Shaft 5 mistake proved to be serendipitous. The remaining stroke in the lower O-cell was actually 1.6 in less than calculated due to the unreported 1996 stage 3 loading. Therefore, the lower O-cell would likely have overextended, blowing the seal prior to obtaining a failure. Details of the 1996 and 2002 tests are included in **Appendices I and J**.

Final Report Contract #BC354 RPWO #32

Bottom Cell Movement - Stage 1 - Shaft 5 - 1996

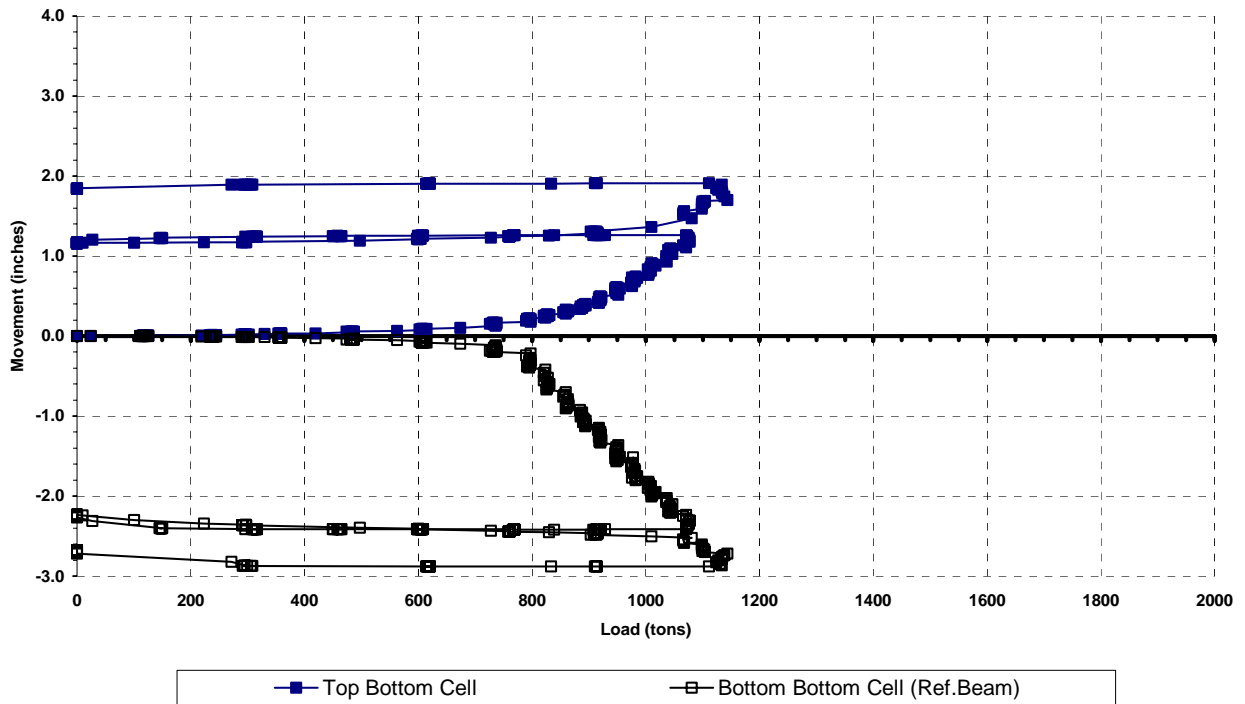


Figure 6.7 Load vs. Movement (Shaft 5 – 1996)

Mid Cell Movement - Stage 3 - Shaft 5 - 2002

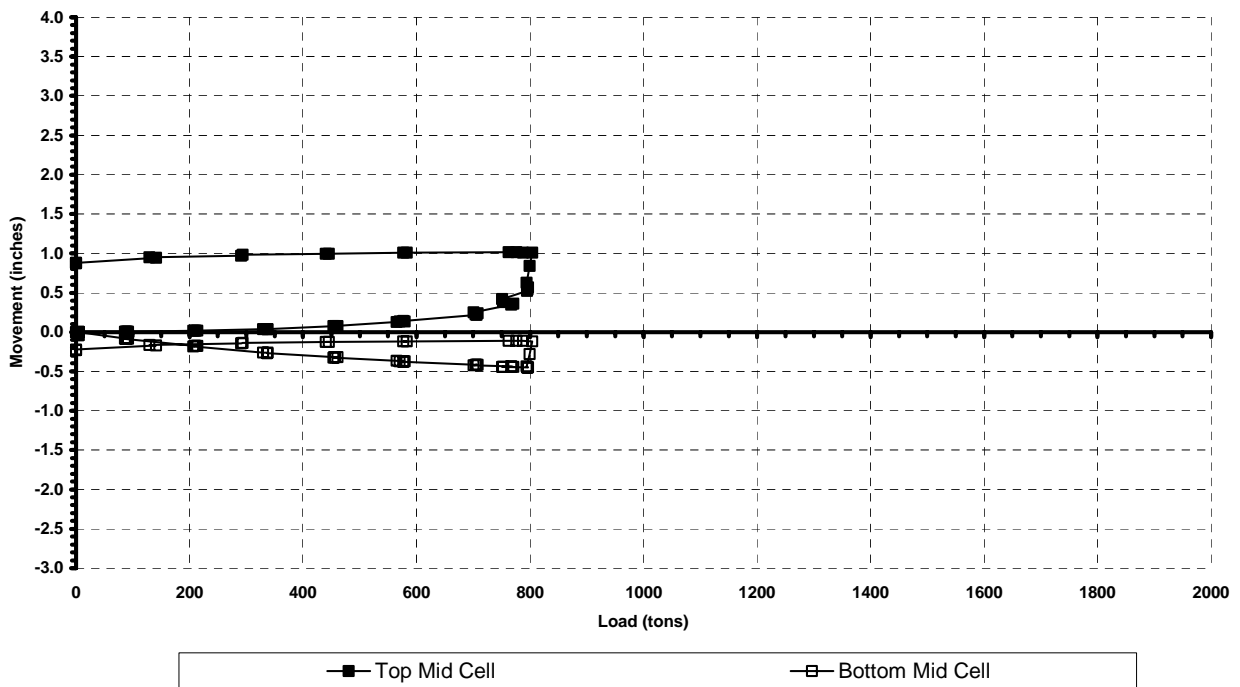


Figure 6.8 Load vs. Movement (Shaft 5 – 2002)

6.6 Shaft 7 Test Results

The overburden soil at Test Shaft 7 is approximately 71 ft thick and consists mostly of weak, cohesive soils except for a 9 ft thick sand layer at about elevation -5 ft. The rock surface starts at about -26 ft. The 1996 tests included 3 stages, using all of the 6 in stroke in the mid-level O-cell and 1.8 in of the lower O-cell stroke. The overburden section of the shaft failed during a stage 3 test at 1032 tons and 1.7 in top of shaft movement. The results of both 1996 and 2002 stage 3 tests are shown in **Figures 6.9 and 6.10** respectively. **Appendices K and L** present the test details.

Because the 1996 tests used up the mid-level O-cell stroke, the 2002 tests had to start with the lower O-cell. However, the lower O-cell lacked adequate bearing reaction to fail the entire shaft. Therefore, the first 2002 test was a stage 1 test with the mid-level O-cell open to drain and compress, allowing a subsequent stage 3 test to fail the overburden section of the shaft. During the 2002 stage 1 test, the rock socket shear direction was reversed from the 1996 tests, and no usable information was obtained. Pump problems interfered with the stage 1 progress, but the mid-level O-cell was closed to an expansion of 2.3 in. The stage 3 test, with the lower O-cell closed, failed the overburden side shear at a maximum load of 912 tons and a top of shaft movement of 2.0 in.

Multiplexer communication with one of the top of shaft movement indicators (DG13) failed at the start of the 2002 stage 1 test and manual readings were used in the test analysis. Water also flowed from one of the lower O-cell telltale pipes (TT4) during much of the 2002 testing, apparently displaced as the cell and its plates compressed. This reading did not affect the side shear analysis above the mid-level O-cell. The lower O-cell held pressure during both the stage 1 and 3 tests, but leaky hoses allowed it to compress slightly.

7. SIDE SHEAR SETUP RESULTS

This chapter compares the measured side shear for the 1996 and 2002 O-cell tests to quantify the amount of setup that occurred during the intervening period.

7.1 Calculation of Side Shear

Chapter 5 discusses the details of the side shear calculations, summarized below:

8. The average shaft strain was calculated at each strain gage elevation. The shaft strain at the O-cell was also calculated by dividing the O-cell load by the shaft stiffness (area and modulus).
9. The shaft load at each strain gage elevation was calculated by multiplying the average of the strain measurements at that elevation by the shaft stiffness.
10. Combining the shaft loads with the measured O-cell load, and the zero-load condition at the shaft top, both load and strain were plotted versus elevation for each O-cell load to check for unusual behavior and develop a graphical presentation of the load distribution.
11. The average side shear acting on each shaft segment between load elevations was estimated from a simple force summation, subtracting the shaft weight (mostly buoyant weight for SR20 site) from the load difference between the two elevations and dividing by the perimeter area.
12. Segment movement corresponding to each side shear estimate was found by subtracting the shaft compression below the segment from the movement of the top O-cell plate. Plots of shear versus movement (τ -z) for each segment showed the shear strength mobilized during each O-cell load.

The above analyses and plots were used to check the behavior of the soil adjacent to the test shaft, and are included in **Appendices C-L**. Several general factors affected the side shear analyses for the SR20 test shafts:

13. **Low Strain:** Although loads exceeding 2000 tons were applied to the SR20 test shafts, because of the 5-7 ft shaft diameter and relatively high shaft modulus, the measured shaft strain did not exceed 120 microstrain, and some were less than 10 microstrain. Because side shear depends on the strain difference between adjacent measurements, it may be significantly affected by measurement accuracy and shaft discontinuities affecting the strain distribution at a given cross-section.

14. **Shaft Modulus:** The 1996 tests were performed an average 9 days after concreting, the 2002 tests an average of 5.4 years later. Although less significant after about 7 days, fresh concrete typically gains both strength and stiffness for up to 28 days. The concrete modulus provided for the 1996 tests is probably low for the 2002 tests, but by an unknown amount. The shaft modulus can sometimes be back-calculated from the load test data near failure, but this method was not useful at SR20 because of the low strain values. Core tests of the shaft modulus were not feasible due to the shaft enclosures, and the lack of comparative core tests from the 1996 tests. By using the 1996 modulus values, the 2002 side shear and estimated setup should be conservatively low. If the concrete strength increased by 20% after the initial 1996 test, using the ACI formula ($E = 57,000 \sqrt{f'_c}$) the concrete modulus would increase by 9.5%, and the shaft modulus and side shear by 8-9%. A sensitivity analysis of the setup results presented herein indicated that this quantity would not significantly affect the conclusions of this study.
15. **Residual Stresses:** A zero load condition is required as a reference for the strain gage measurements. The beginning and end of the test are the most likely candidates for this. However, the beginning and ending strain readings for the SR20 tests disagree significantly, especially for the 1996 tests. Perez (2002) measured significant strain in fresh, drilled shaft concrete as it cured. Thermal increases, as much as 20°-60° C, followed by a similar decrease combined with shrinkage can induce significant shaft movement and mobilize side shear during the curing process. Because the end of the O-cell test should be reasonably close to a zero load condition for all tests, it was chosen as the most defensible reference. This results in initial shaft loads varying between 144 tons compression and 326 tons tension (see **Appendices C-L**). Because of this choice, the mobilized side shear strength for any particular segment and the overall side shear distribution at a given load are different from that reported by D&M (Sharp, 1998).
16. **Maximum Shear Strength:** For setup comparison between the 1996 and 2002 tests, the maximum segment side shear estimated during a test was reported as the side shear strength. Because the side shear for segments nearest the load usually mobilizes first and then reduces with continuing movement, the maximum mobilized side shear for the entire shaft is generally less than the sum of the maximum segment values times their respective side areas.
17. **Missing Data:** Several strain gages did not function during the 2002 tests, leaving a single gage to measure the strain. This causes an unknown error since all of the shafts exhibited some unequal side-to-side loading. (A minimum of four gages per elevation should have been used for shafts of this size.)

7.2 1996 vs. 2002 Side Shear Comparison

The following subsections summarize and compare the shear strength mobilized by each segment during the 1996 and 2002 tests. Comparisons are shown both in graphical and in tabular format organized by test shaft.

7.2.1 Shaft 11

Table 7.1 and **Figure 7.1** compare the shear strength measured during the 1996 and 2002 tests. Although the shaft moved upward 0.75 in, the 1996 test, during which the lower O-cell was over-expanded, the shaft did not fail in side shear above the lowest segment. However, the shear-movement curves were easily extrapolated to obtain the shear strength estimates shown in **Table 7.1**. The soil removed around the shaft enclosure during the 2002 test is reported as having zero strength compared to the 1996 test, but this segment is not included in later setup analyses. The lowest shaft segment above the mid-level O-cell is centered at -18.5 ft and is completely in the rock socket. The 8 ft long segment above it has 5 ft of soil over 3 ft of rock. Because the 1996 test did not include expansion of the mid-level O-cell, the side shear reported at -18.5 ft is an average between the strain elevations above and below it, and it may differ from the 2002 measurement for this reason.

The three segments between elevations +10 ft and -12 ft are also potentially affected by overreaming because the temporary casing was installed only to -2 ft and left the sandy soil between elevations -2 ft and -13 ft (top of rock) exposed to drill slurry for 4 days. The segment centered at + 5 ft has a rounded shear movement curve more indicative of an end bearing failure, which may explain the significant setup observed for this segment. In general, the side shear above the mid-level O-cell appears to increase following the 1996 test, but with several complications.

Table 7.1 Comparison of Maximum Shear Stress (Shaft 11)

Shaft 11			Max. Measured Side Shear		Change tsf	Loglinear Trend $\tau = a \log(t) + \tau_0$		Setup Factor A = (a / τ_0)	Segment Soil Type
			Test Date			a	τ_0 at t ₀ = 1day tsf		
Completion Date		8/19/96	8/26/96	3/2/02	7			2021	
Segment Elevations			Elapsed Time, Days						
Top ft	Bottom ft	Centerline ft	τ_{1996} , tsf	τ_{2002} , tsf					
45.00	40.47	42.74	0.046	0.000					Clay
40.47	22.00	31.24	0.046	0.179	0.133	0.054	0.000	110.919	Clay
22.00	10.00	16.00	0.550	0.550	0.000	0.000	0.550	0.000	Sand
10.00	0.00	5.00	0.740	1.062	0.322	0.131	0.629	0.208	Sand
0.00	-8.00	-4.00	1.100	0.739	-0.361	-0.147	1.224	-0.120	Sand
-8.00	-16.00	-12.00	0.980	1.477	0.497	0.202	0.809	0.249	Sand
-16.00	-21.00	-18.50	2.623	4.449	1.825	0.742	1.997	0.372	Limestone

1996 and 2002 Shear Stress Distributions - Shaft 11

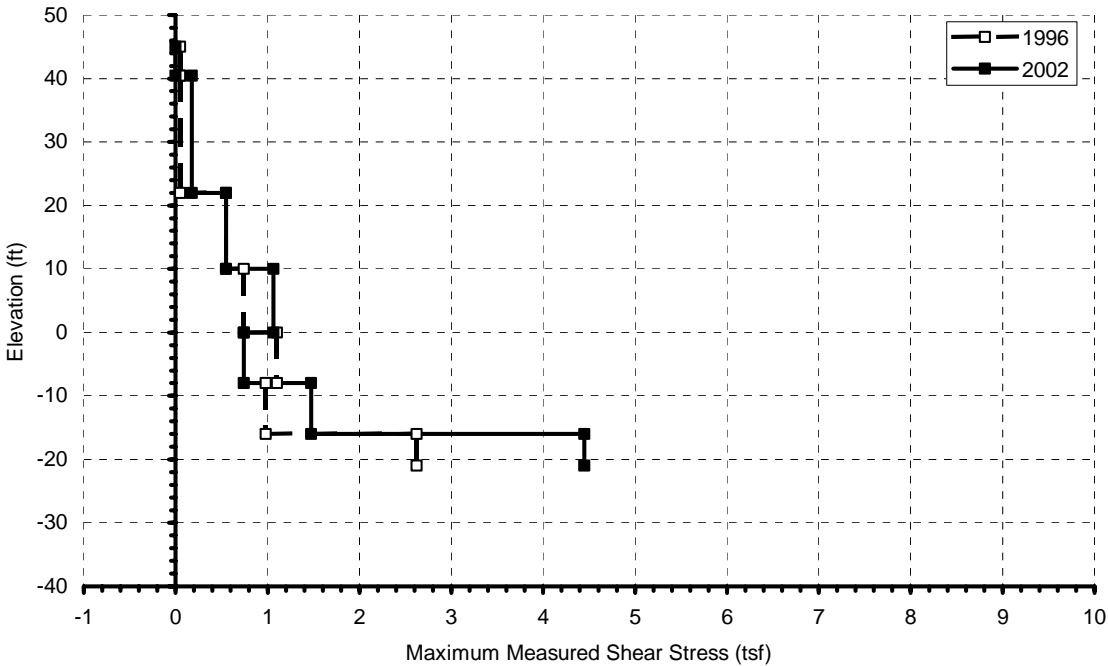


Figure 7.1 Distribution of Maximum Measured Shear Stress (Shaft 11)

7.2.2 Shaft 2

Table 7.2 and **Figure 7.2** compare the shear strength measured during the 1996 and 2002 tests. The soil removed around the shaft enclosure during the 2002 test is reported as having zero strength compared to the 1996 test, but this segment is not included in later setup analyses. The lowest shaft segment, centered at -19.6 ft, is the only segment in the rock socket above the mid-level O-cell. Because the 1996 test did not include expansion of the mid-level O-cell, the side shear reported in this segment is an average between the strain elevations above and below it, and it may differ from the 2002 measurement for this reason.

The segments between elevations +4.4 ft and -15.6 ft are potentially affected by overreaming because the temporary casing was installed only to +0.5 ft and left the sandy soil below it, down to the top of rock at elevation -16 ft, exposed to drill slurry for 7 days. For both the 1996 and 2002 tests, the strain gages at elevation -5.6 ft indicated an increase in shaft strain (and load) above the levels beneath it, a physical impossibility and an indication of an unknown shaft defect (poor concrete, reduced section, etc.). Strain measurements at this elevation were ignored by Sharp (1998). For the purpose of analysis, the strain at elevation -5.6 ft was replaced by interpolation between the adjacent strain levels. In general, the side shear above the mid-level O-cell appears to increase following the 1996 test, but with several complications.

Table 7.2 Comparison of Maximum Shear Stress (Shaft 2)

Shaft 2			Max. Measured Side Shear		Change tsf	Loglinear Trend $\tau = a \log(t) + \tau_0$		Setup Factor A = (a / τ_0)	Segment Soil Type
Completion Date 7/11/96			Test Date			a	τ_0 at $t_0 =$ 1day tsf		
Segment Elevations			Elapsed Time, Days		$\tau_{1996},$ tsf			$\tau_{2002},$ tsf	
Top ft	Bottom ft	Centerline ft	6	2064					
			$\tau_{1996},$ tsf	$\tau_{2002},$ tsf					
46.30	42.60	44.45	0.110	0.000					Clay
42.60	24.40	33.50	0.110	0.112	0.001	0.000	0.110	0.004	Clay-Sand
24.40	14.40	19.40	0.164	0.482	0.318	0.125	0.067	1.880	Sand
14.40	4.40	9.40	0.567	0.400	-0.167	-0.066	0.618	-0.107	Clay-Sand
4.40	-5.60	-0.60	0.599	0.817	0.218	0.086	0.532	0.162	Sand
-5.60	-15.60	-10.60	0.596	0.814	0.218	0.086	0.529	0.162	Sand
-15.60	-23.60	-19.60	2.405	3.682	1.277	0.503	2.013	0.250	Limestone

1996 and 2002 Shear Stress Distributions - Shaft 2

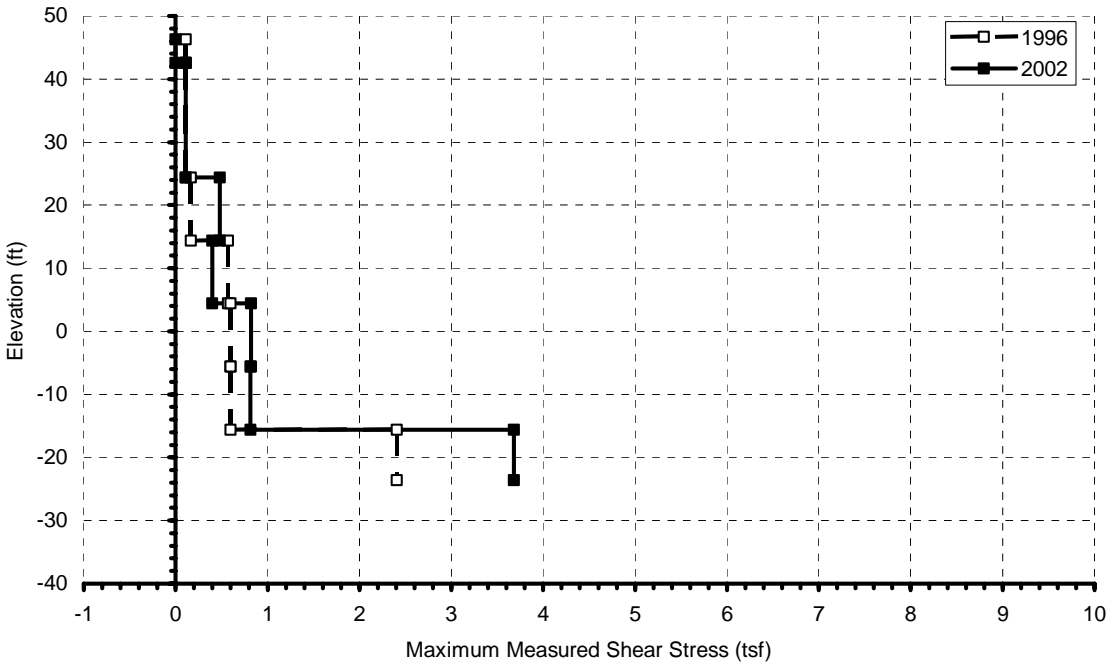


Figure 7.2 Distribution of Maximum Measured Shear Stress (Shaft 2)

7.2.3 Shaft 10

Table 7.3 and **Figure 7.3** compare the shear strength measured during the 1996 and 2002 tests. Shaft 10 has permanent casing installed to top of rock at -20.9 ft and has very low side shear strength through the cased portion of the shaft. This is expected since the Contractor using a vibratory hammer to install the casing after excavating the shaft to elevation -20.5 ft. The soil removed around the shaft enclosure during the 2002 test is reported as having zero strength compared to the 1996 test, but this segment is not included in later setup analyses.

The lowest three shaft segments, between elevations -20 ft and -37.5 ft, are all within the rock socket. The 2002 test indicated significant movement within the rock socket prior to mobilizing side shear. Since the O-cells were left open to drain between tests, and the cased portion of the shaft developed very little side shear, the cells may have partially closed under the weight of the shaft, allowing sand above the rock socket to drift down into the shaft-rock interface. The non-functioning strain gage at elevation -26 ft may also have affected the calculated load distribution within the rock socket during the 2002 test. The cased portion of the shaft shows a moderate increase in side shear between the tests, but the side shear within the rock socket shows both positive and negative change.

Table 7.3 Comparison of Maximum Side Shear (Shaft 10)

Shaft 10			Max. Measured Side Shear		Change tsf	Loglinear Trend $\tau = a \log(t) + \tau_0$		Setup Factor A = (a / τ_0)	Segment Soil Type
			Test Date			a	τ_0 at t ₀ = 1day tsf		
Completion Date		8/8/96	8/19/96	3/8/02	τ ₁₉₉₆ , tsf			τ ₂₀₀₂ , tsf	
Segment Elevations			Elapsed Time, Days						
Top ft	Bottom ft	Centerline ft	11	2038					
47.50	43.92	45.71	-0.045	0.000					Clay-Sand
43.92	15.00	29.46	-0.045	0.053	0.099	0.044	-0.091	0.000	Sand
15.00	-20.00	-2.50	0.032	0.128	0.096	0.042	-0.012	0.000	Sand
-20.00	-26.00	-23.00	1.362	2.814	1.453	0.641	0.694	0.922	Limestone
-26.00	-32.00	-29.00	3.629	1.303	-2.326	-1.026	4.697	-0.218	Limestone
-32.00	-37.50	-34.75	8.021	9.255	1.234	0.544	7.454	0.073	Limestone

1996 and 2002 Shear Stress Distributions - Shaft 10

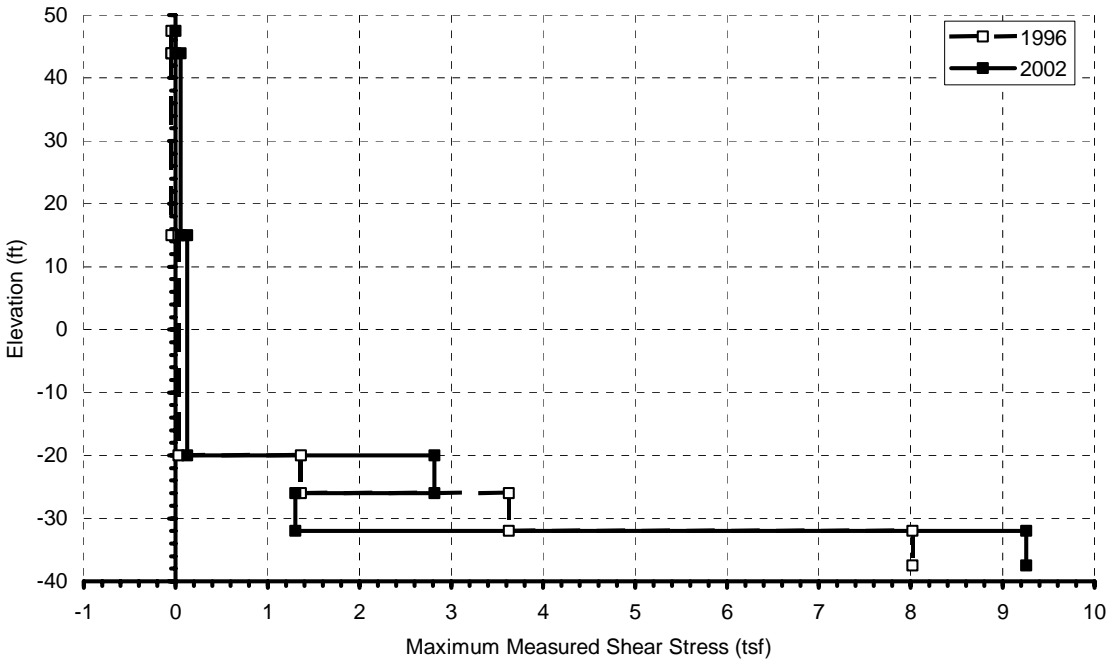


Figure 7.3 Distribution of Maximum Measured Shear Stress (Shaft 10)

7.2.4 Shaft 5

Table 7.4 and **Figure 7.4** compare the shear strength measured during the 1996 and 2002 tests. The soil removed around the shaft enclosure during the 2002 test is reported as having zero strength compared to the 1996 test, but this segment is not included in later setup analyses. Although LTI performed a three-stage test in 1996, the shaft failed in side shear during the first stage. The lowest shaft segment, centered at –21.9 ft, is the only segment in the rock socket above the mid-level O-cell. Because stage 1 of the 1996 test did not include expansion of the mid-level O-cell, the side shear reported in this segment is an average between the strain elevations above and below it, and it may differ from the 2002 measurement for this reason. In general, the side shear above the mid-level O-cell appears to increase following the 1996 test.

7.2.5 Shaft 7

Table 7.5 and **Figure 7.5** compare the shear strength measured during the 1996 and 2002 tests. The soil removed around the shaft enclosure during the 2002 test is reported as having zero strength compared to the 1996 test, but this segment is not included in later setup analyses. Both the 1996 and 2002 tests of the overburden were performed from the mid-level O-cell (stage 3). The lowest shaft segment, centered at –26.65 ft, is the only segment in the rock socket above the mid-level O-cell. In general, the side shear above the mid-level O-cell appears to decrease following the 1996 test.

Table 7.4 Comparison of Maximum Shear Stress (Shaft 5)

Shaft 5			Max. Measured Side Shear		Change tsf	Loglinear Trend $\tau = a \log(t) + \tau_0$		Setup Factor A = (a / τ_0)	Segment Soil Type
Completion Date 11/27/96			Test Date			a	τ_0 at $t_0 =$ 1day tsf		
Segment Elevations			Elapsed Time, Days						
Top ft	Bottom ft	Centerline ft	9 τ_{1996} , tsf	1900 τ_{2002} , tsf					
47.00	43.80	45.40	0.071	0.000					Clay-Sand
43.80	30.10	36.95	0.071	0.062	-0.009	-0.004	0.075	-0.050	Clay
30.10	17.10	23.60	0.054	0.106	0.052	0.022	0.033	0.676	Clay
17.10	5.10	11.10	0.036	0.078	0.042	0.018	0.019	0.935	Clay
5.10	-4.90	0.10	0.210	0.215	0.005	0.002	0.208	0.010	Clay
-4.90	-13.90	-9.40	0.480	0.528	0.048	0.020	0.461	0.044	Sand
-13.90	-18.90	-16.40	2.083	3.081	0.997	0.429	1.674	0.256	Clay-Sand
-18.90	-24.90	-21.90	1.673	2.206	0.533	0.229	1.454	0.158	Clay-Sand

1996 and 2002 Shear Stress Distributions - Shaft 5

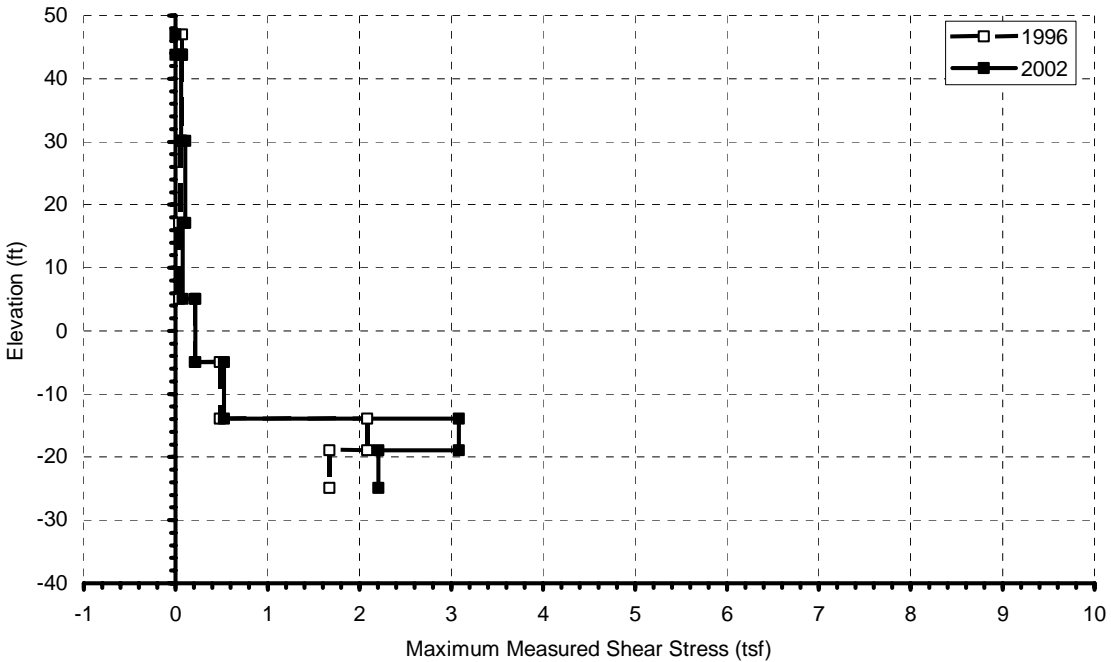


Figure 7.4 Distribution of Maximum Measured Shear Stress (Shaft 5)

Table 7.5 Comparison of Maximum Shear Stress (Shaft 7)

Shaft 7			Max. Measured Side Shear		Change tsf	Loglinear Trend $\tau = a \log(t) + \tau_0$		Setup Factor A = (a / τ_0)	Segment Soil Type
			Test Date			a	τ_0 at t ₀ = 1day tsf		
Completion Date 11/23/96			12/4/96	2/23/02					
Segment Elevations			Elapsed Time, Days						
Top ft	Bottom ft	Centerline ft	11 τ_{1996} , tsf	1918 τ_{2002} , tsf					
47.00	43.65	45.33	0.049	0.000					Clay-Sand
43.65	25.10	34.38	0.049	0.016	-0.033	-0.015	0.064	-0.229	Clay-Sand
25.10	15.10	20.10	0.163	0.152	-0.010	-0.005	0.168	-0.028	Clay
15.10	5.10	10.10	0.139	0.099	-0.041	-0.018	0.158	-0.115	Clay
5.10	-4.90	0.10	0.262	0.269	0.007	0.003	0.259	0.013	Sand
-4.90	-14.90	-9.90	0.574	0.378	-0.196	-0.087	0.665	-0.131	Sand
-14.90	-24.90	-19.90	1.566	1.198	-0.369	-0.164	1.738	-0.095	Clay-Sand
-24.90	-28.40	-26.65	9.550	9.063	-0.486	-0.217	9.776	-0.022	Limestone

1996 and 2002 Shear Stress Distributions - Shaft 7

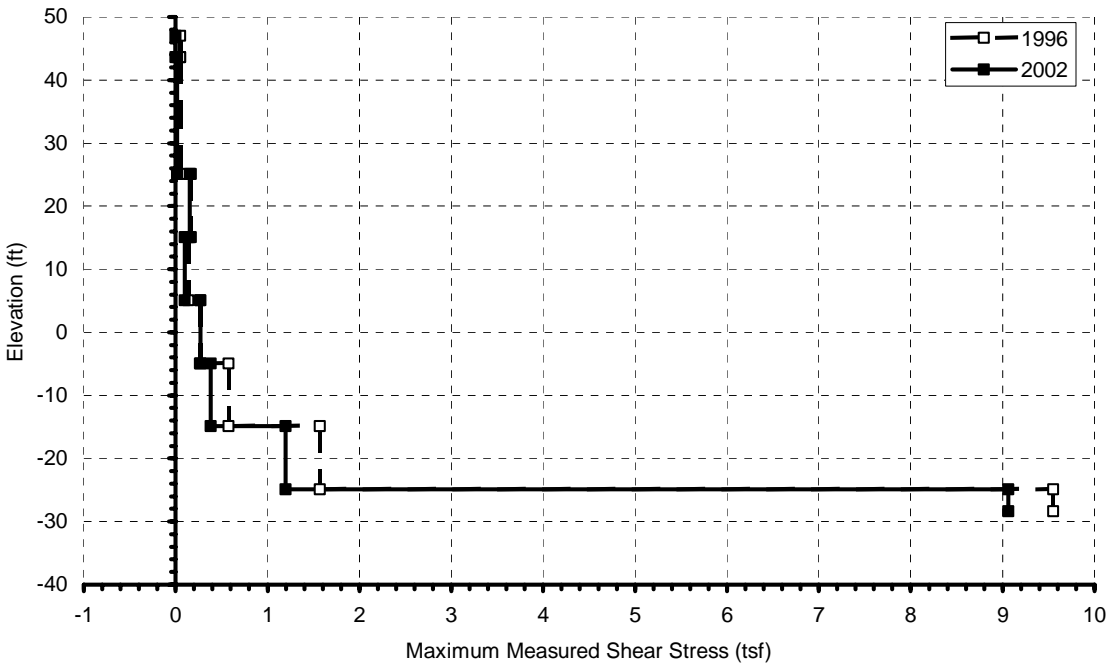


Figure 7.5 Distribution of Maximum Measured Shear Stress (Shaft 7)

7.3 Time Effects on Side Shear

The unitless setup factor A, proposed by Skov and Denver (1988), describes a linear trend between side shear and the logarithm of elapsed time relative to an initial capacity. The initial unit side shear capacity, τ_0 , and the magnitude of the setup factor depend partially on the choice of the initial time, t_0 , which Skov and Denver (1988) as the lower limit for a predictable increase in capacity. For drilled shafts, this initial time is difficult to determine, affected by both soil and concrete behavior. The final set of the concrete should stabilize the lateral pressure on the sidewalls, but thermal expansion and contraction occurring as the concrete sets may cause significant vertical shaft movement. Shaft diameter and length, soil type, concrete characteristics, casing, and construction procedures may all affect the setup behavior of drilled shafts. To simplify the analysis herein, the reference time was chosen as $t_0 = 1$ day, after the initial concrete set but still early in the setup process. This choice is also mathematically simple, with the advantage that $(t/t_0) = t$ when both t and t_0 are expressed in days. Using a semilog-linear trend to describe the segment side shear as a function of time:

$$\tau = a \log_{10}(t) + b \quad \text{and} \quad \tau_0 = a \log_{10}(t_0) + b$$

where:

a	=	Slope of semilog-linear side shear trend (stress)
b	=	Intercept of semilog-linear side shear trend (stress)
τ, τ_0	=	Unit side shear capacity (stress) at time t or t_0
t	=	Time elapsed since installation, days
t_0	=	Reference time, elapsed since installation, = 1 day

Then with the definition from Section 2.4, the setup factor, A, may be calculated as:

$$A = \frac{\tau/\tau_0 - 1}{\log_{10}(t/t_0)} = \frac{\tau - \tau_0}{\tau_0 \log_{10}(t/t_0)} = \frac{a \log_{10}(t) + b - (a \log_{10}(t_0) + b)}{\tau_0 \log_{10}(t/t_0)} = \left(\frac{a}{\tau_0} \right)$$

Figures 7.6-7.10 show the maximum measured unit side shear vs. the logarithm of time for each shaft segment, including an indication of the approximate soil type. Since each segment has only two tests, the slope and intercept for a straight line connecting the capacities in these figures is easily calculated, as is the corresponding setup factor.

Tables 7.1-7.5 include these values for each test shaft, along with the soil type.

Changes in Side Shear with Time - Shaft 11

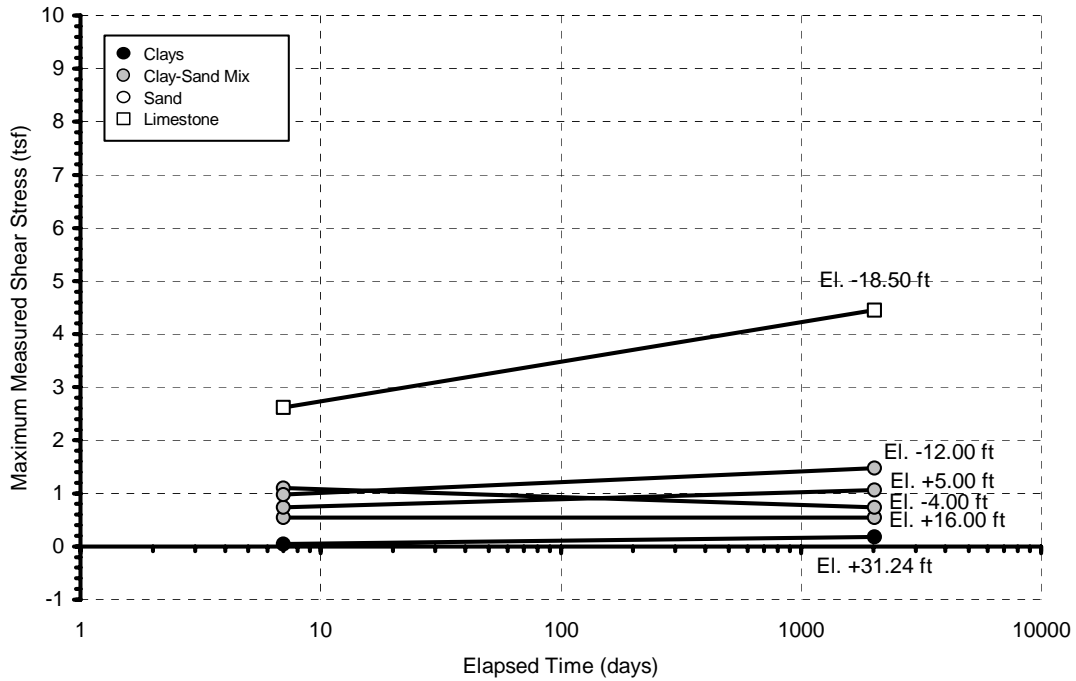


Figure 7.6 Shear Capacity vs. Time (Shaft 11)

Changes in Side Shear with Time - Shaft 2

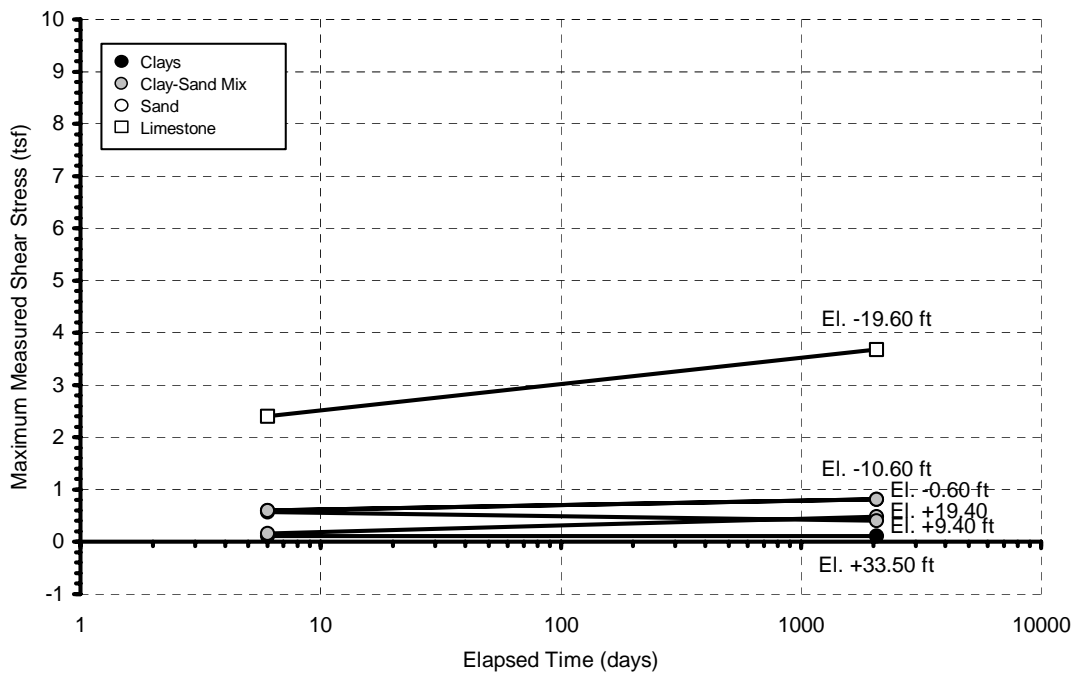


Figure 7.7 Shear Capacity vs. Time (Shaft 2)

Changes in Side Shear with Time - Shaft 10

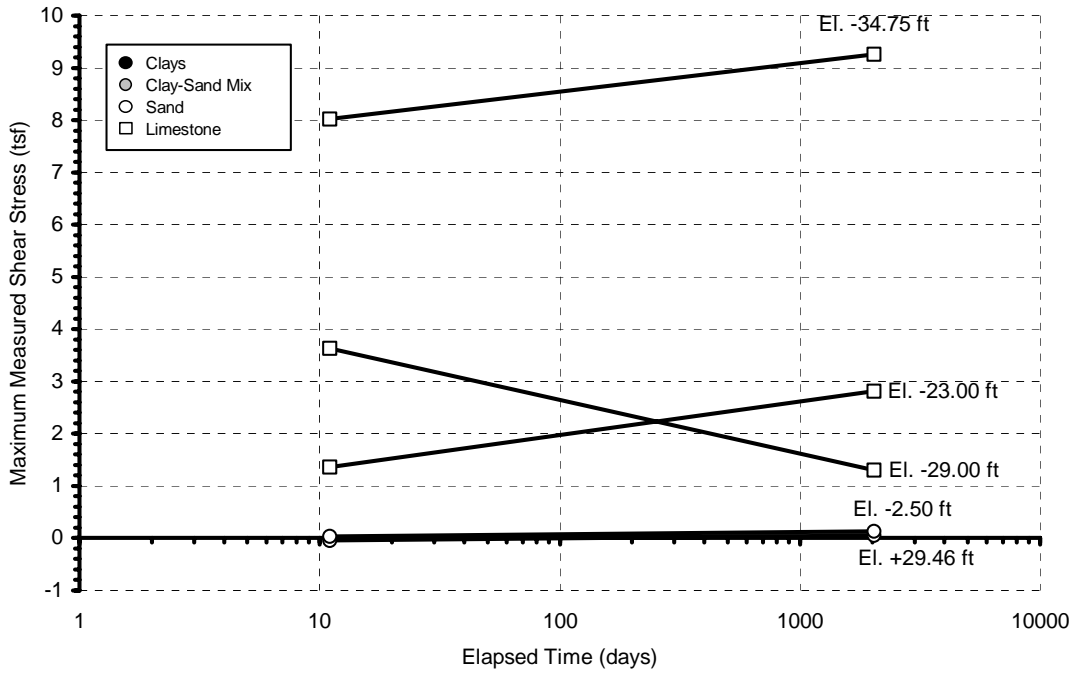


Figure 7.8 Shear Capacity vs. Time (Shaft 10)

Changes in Side Shear with Time - Shaft 5

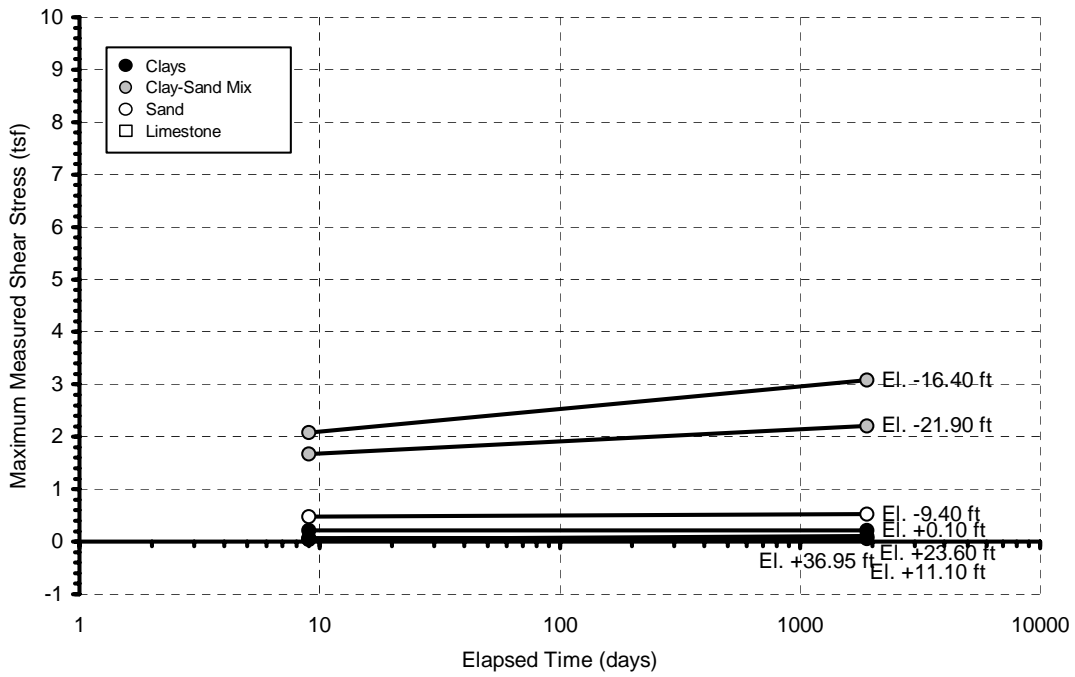


Figure 7.9 Shear Capacity vs. Time (Shaft 5)

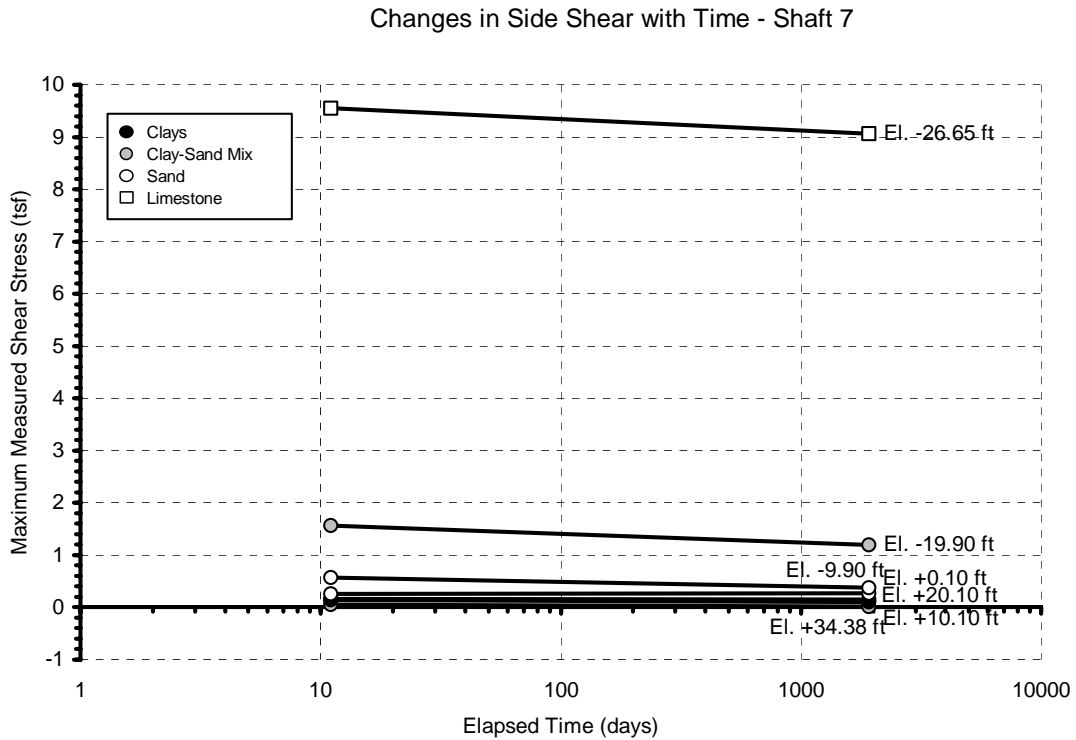


Figure 7.10 Shear Capacity vs. Time (Shaft 7)

7.4 Summary of SR20 Setup

Table 7.6 summarizes the setup factors from the shaft tests at SR20 and provides a statistical analysis by soil type. The average setup factor for all segments was $A = 0.18$, but the variability was high with a coefficient of variation of 247%. Although the average setup factor varied by material type, the variability was high for all types. More importantly, many segments exhibited a negative change and the median setup factor for all segments was only $A = 0.01$. **Figure 7.11** shows the measured setup factors plotted versus depth, and indicates no clear trend with depth or soil type.

For comparison with the shaft tests at SR20, the side shear setup measurements from Bullock (1999) for five 18 in square, prestressed concrete piles driven in Florida are presented in **Table 7.7** and **Figure 7.12**. The average setup factor was 0.51 with a coefficient of variation of 80%. The only pile segment exhibiting negative setup was believed affected by O-cell disturbance, and the median setup factor was $A = 0.38$.

Table 7.6 Summary of Setup Factors for SR20 Test Shafts

Soil Type	Shaft	Elevation ft	Depth ft	τ_0 at $t_0 = 1$ day, tsf		Setup Factor A		
Clay	5	36.95	8.95	0.075		-0.050		
Clay	5	23.60	22.30	0.033	Samples 6	0.676	Samples 6	
Clay	5	11.10	34.80	0.019	Average 0.110	0.935	Average 0.238	
Clay	5	0.10	45.80	0.208	Std. Dev. 0.078	0.010	Std. Dev. 0.449	
Clay	7	20.10	25.20	0.168	COV 71.2%	-0.028	COV 188.5%	
Clay	7	10.10	35.20	0.158		-0.115		
Clay-Sand	2	33.50	12.90	0.110		0.004		
Clay-Sand	2	9.40	37.00	0.618	Samples 6	-0.107	Samples 6	
Clay-Sand	5	-16.40	62.30	1.674	Average 0.943	0.256	Average -0.002	
Clay-Sand	5	-21.90	67.80	1.454	Std. Dev. 0.774	0.158	Std. Dev. 0.181	
Clay-Sand	7	34.38	10.93	0.064	COV 82.1%	-0.229	COV -8996.2%	
Clay-Sand	7	-19.90	65.20	1.738		-0.095		
Sand	11	16.00	29.00	0.550		0.000		
Sand	11	5.00	40.00	0.629		0.208		
Sand	11	-4.00	49.00	1.224		-0.120		
Sand	11	-12.00	57.00	0.809	Samples 12	0.249	Samples 12	
Sand	2	19.40	27.00	0.067	Average 0.469	1.880	Average 0.206	
Sand	2	-0.60	47.00	0.532	Std. Dev. 0.371	0.162	Std. Dev. 0.541	
Sand	2	-10.60	57.00	0.529	COV 79.2%	0.162	COV 263.1%	
Sand	10	29.46	18.04	-0.091		0.000		
Sand	10	-2.50	50.00	-0.012		0.000		
Sand	5	-9.40	55.30	0.461		0.044		
Sand	7	0.10	45.20	0.259		0.013		
Sand	7	-9.90	55.20	0.665		-0.131		
Limestone	11	-18.50	63.50	1.997		0.372		
Limestone	2	-19.60	66.00	2.013	Samples 6	0.250	Samples 6	
Limestone	10	-23.00	70.50	0.694	Average 4.438	0.922	Average 0.229	
Limestone	10	-29.00	76.50	4.697	Std. Dev. 3.564	-0.218	Std. Dev. 0.397	
Limestone	10	-34.75	82.25	7.454	COV 80.3%	0.073	COV 173.2%	
Limestone	7	-26.65	71.95	9.776		-0.022		
				All Samples	30		All Samples	30
				Average	1.286		Average	0.175
				Std. Dev.	2.234		Std. Dev.	0.432
				COV	173.7%		COV	246.6%
				Median	0.541		Median	0.012

Table 7.7 Summary of Setup Factors for Driven Florida Piles (Bullock, 1999)

Soil Type	Pile	Elevation ft	Depth ft	τ_0 at $t_0 = 1$ day, tsf		Setup Factor A		
Clay	Aucilla	39.24	13.98	0.213		0.36		
Clay	Aucilla	25.00	28.21	0.095	Samples 7	0.45	Samples 7	
Clay	Aucilla	16.76	36.45	0.328	Average 0.258	0.26	Average 0.487	
Clay	Vilano W.	-40.32	44.88	0.135	Std. Dev. 0.170	0.38	Std. Dev. 0.259	
Clay	Vilano W.	-48.82	53.38	0.162	COV 65.6%	0.99	COV 53.1%	
Clay	Seabreeze	-52.13	58.43	0.281		0.67		
Clay	Seabreeze	-63.12	69.42	0.596		0.30		
Clay-Sand	Aucilla	48.23	4.99	0.082		0.04		
Clay-Sand	Aucilla	31.76	21.46	0.171	Samples 7	0.38	Samples 7	
Clay-Sand	Aucilla	7.25	45.96	0.122	Average 0.208	1.60	Average 0.500	
Clay-Sand	Aucilla	-4.27	57.48	0.807	Std. Dev. 0.273	0.17	Std. Dev. 0.523	
Clay-Sand	Vilano E.	0.56	3.02	0.012	COV 131.4%	0.58	COV 104.6%	
Clay-Sand	Vilano W.	-19.82	24.38	0.048		0.53		
Clay-Sand	Vilano W.	-31.82	36.38	0.211		0.20		
Sand	Buckman	11.19	3.02	0.058		0.33		
Sand	Buckman	5.18	9.02	0.051		1.03		
Sand	Buckman	-0.82	15.03	0.010		1.48		
Sand	Buckman	-6.33	20.54	0.012		0.97		
Sand	Buckman	-11.58	25.79	0.044	Samples 14	0.85	Samples 14	
Sand	Aucilla	1.25	51.97	0.082	Average 0.391	0.79	Average 0.529	
Sand	Vilano E.	-4.72	8.30	0.094	Std. Dev. 0.644	0.36	Std. Dev. 0.431	
Sand	Vilano E.	-9.97	13.55	0.108	COV 165.0%	0.28	COV 81.5%	
Sand	Vilano E.	-16.21	19.78	0.360		0.38		
Sand	Vilano E.	-24.70	28.28	1.306		0.25		
Sand	Vilano W.	-53.58	58.14	1.062		0.08		
Sand	Seabreeze	-25.39	31.69	0.015		0.47		
Sand	Seabreeze	-41.37	47.67	0.140		0.21		
Sand	Seabreeze	-71.13	77.43	2.125		-0.07		
						Samples 28	Samples 28	
						Average 0.312	Average 0.511	
						Std. Dev. 0.479	Std. Dev. 0.407	
						COV 153.7%	COV 79.6%	
						Median 0.128	Median 0.380	

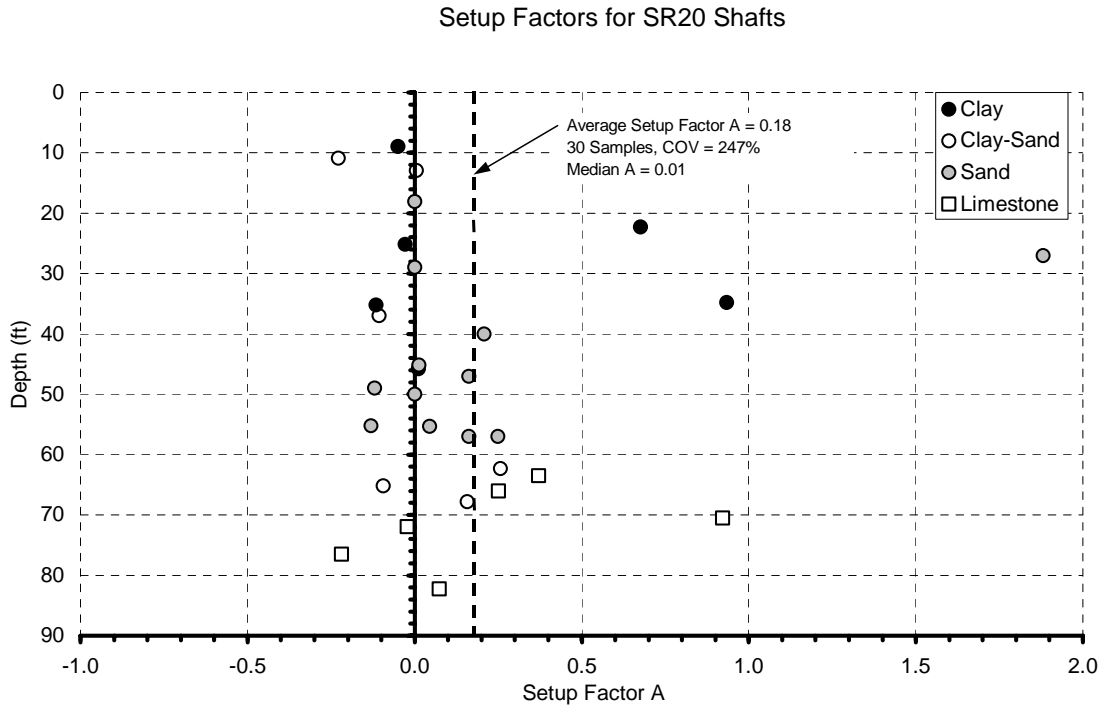


Figure 7.11 Setup Factor Depth Profile for SR20 Test Shafts

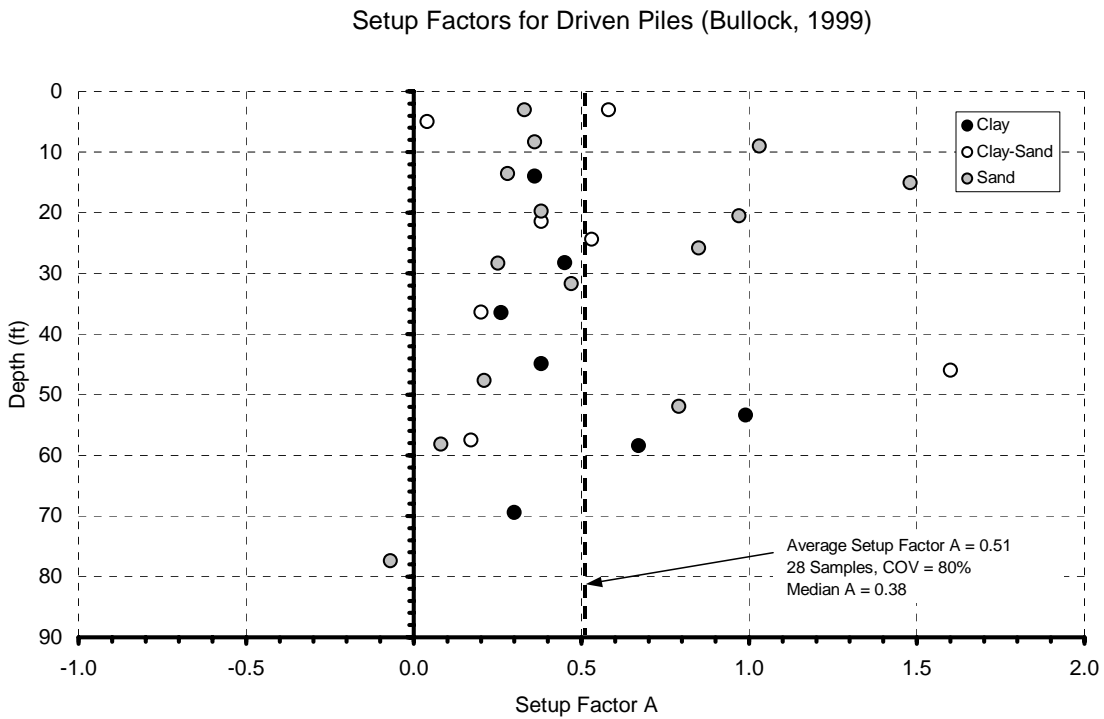


Figure 7.12 Setup Factor Depth Profile for Driven Florida Piles (Bullock, 1999)

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The following conclusions are based on SR20 load test results from this research:

1. Although positive side shear setup was measured for the test shafts at SR20, on average it was only about 35% of that measured by Bullock (1999) for driven piles. The data provided no clear trend with soil type or depth. In addition, negative setup was measured for many shaft segments and the median setup factor for shafts was approximately zero.
2. The O-cells and VW strain gages performed well over a period of 5 years, despite less than optimal storage conditions at the shaft top.
3. Significant residual stresses, previously ignored, were identified in the test shafts following construction. The cause of these stresses is thought to be thermal expansion and subsequent contraction of the setting concrete.
4. Several unquantified factors may have affected both the overall shaft capacity and the measured setup for the SR20 test shafts including large shaft size, substandard construction methods, residual stresses, and shaft settlement between tests due to the O-cells being left open to drain. For this reason, shaft setup should not be ruled out at this time.
5. Lightweight reference beams built from fiberglass structural members provided a stable and portable reference system.

8.2 Recommendations

Recommendations based on the above conclusions:

6. Although some setup was measured at the SR20 site, it was not consistent. Based on this study, shaft setup does not appear reliable for design use at present.
7. Side shear setup was measured for some of the shaft segments at the SR20 site. Research under more carefully controlled conditions, especially construction methods and storage, may identify trends that are more consistent.
8. Additional research on the formation of residual stresses in drilled shafts commonly used by the FDOT seems warranted. Residual loads existing prior to the structural loads could lead to unplanned settlement of the structure and impair the performance of the constructed foundation.

9. REFERENCES

- Bartolomey, A.A., and Yushkov, B.S. (1985). "Variation in time of capacity of pile foundations in clays", Proceedings of the 11th International Conference on Soil Mechanics and Foundation Engineering, Balkema, Brookfield, VT, 3, 1517-1520.
- Bullock, P.J. (1999). "Pile Friction Freeze: A Field and Laboratory Study, Doctoral Dissertation", University of Florida, Gainesville, FL.
- Finno, R.J., Cosmao, T., and Gitskin, B. (1989). "Results of Foundation Engineering Congress Pile Load Test", Predicted and Observed Axial Behavior of Piles, ASCE, New York, NY, GSP23, 338-355
- Karlsrud, K. and Haugen, T. (1985). "Axial static capacity of steel model piles in overconsolidated clays", Proceedings of the 11th International Conference in Soil Mechanics and Foundation Engineering, Balkema, Brookfield, VT, 3, 1401-1406.
- LOADTEST, Inc. (1998). "Telltale from LOADTEST", LOADTEST, Inc., Gainesville, FL
- Lukas, R.G. and Bushnell, T.D. (1989). "Contribution of pile freeze to pile capacity", Foundation Engineering: Current Principles and Practices, Kulhaway, F.H., editor, ASCE, Reston, VA, Vol.2, 991-1001.
- Lutenegger, A.J. and Miller, G.A. (1993). "Evaluation of Dilatometer method to determine axial capacity of driven model pipe piles in clay", Design and Performance of Deep Foundations: Piles and Piers in Soil and Soft Rock, Nelson, P.P., Smith, T.D., and Clukey, E.C. editors, ASCE, Reston, VA, GSP38, 41-63.
- Marchetti, S., Totani, G., Campanella, R. G., Robertson, P. K., and Taddei, B. (1986). "The DMT- σ_{hc} method for piles driven in clay", In Situ '86, Clemence, S.P., editor, ASCE, Reston, VA, GSP6, 765-779.
- O'Neill, M.W. (2001). "Side Resistance in Piles and Drilled Shafts", Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Reston, VA, 127(1), 3-16.
- Osterberg, J.O. (2001). "The Osterberg Load Cell as a Research Tool", XVth International Conference on Soil Mechanics and Geotechnical Engineering, Istanbul, Turkey.
- Osterberg, J. O. (1999). "What Has Been Learned About Drilled Shafts From the Osterberg Load Test", Annual Members Conference, Deep Foundations Institute, Englewood Cliffs, NJ.
- Paikowsky, S.G., LaBelle, V.A., and Hourani, N.M. (1996). "Dynamic analyses and time dependent pile capacity." Stresswave '96 Fifth International Conference on the Application of Stress-Wave Theory to Piles. Townsend, F. C., Hussein, M., and McVay, M.C. editors, Department of Civil Engineering, University of Florida, Gainesville, FL.

Reese, L.C. (1978). "Design and construction of drilled shafts", *Journal of Geotechnical Engineering*, ASCE, 104(1), 91-116.

Sharp, M.R. (1998). "Final Geotechnical Report, SR20 over Apalachicola River Blountstown Bridge", Dames & Moore, Inc., Tampa, FL.

Skov, R., and Denver, H. (1988). "Time-dependence of bearing capacity of piles." *Proceedings of the Third International Conference on the Application of Stress-Wave Theory to Piles*, Fellenius, B.G., editor, BiTech Publishers, Vancouver, BC, 879-888.

Soderberg, L.O. (1962). "Consolidation theory applied to foundation pile time effects." *Geotechnique*, The Institution of Civil Engineers, London, England, 12(3), 217-225.

York, D.L., Brusey, W.G., Clemente, F.M., and Law, S.K. (1994). "Set-up and Relaxation in Glacial Sand", *Journal of Geotechnical Engineering*, ASCE, 120(9), 1498-1513.

Vesic, A.S. (1977). "Design of pile foundations." *NCHRP Synthesis of Highway Practice 42*. Transportation Research Board, National Academy of Sciences, Washington, D.C.

**APPENDIX A
SPT BORING LOGS**

Final Report Contract #BC354 RPWO #32

TH-46A
 9/14/94
 APPROX. STA. 124+30
 12' R SURVEY BASELINE
 ELEVATION 45.3'

TH-46B
 9/27/94
 APPROX. STA. 124+31
 43' R SURVEY BASELINE
 ELEVATION 44.8'

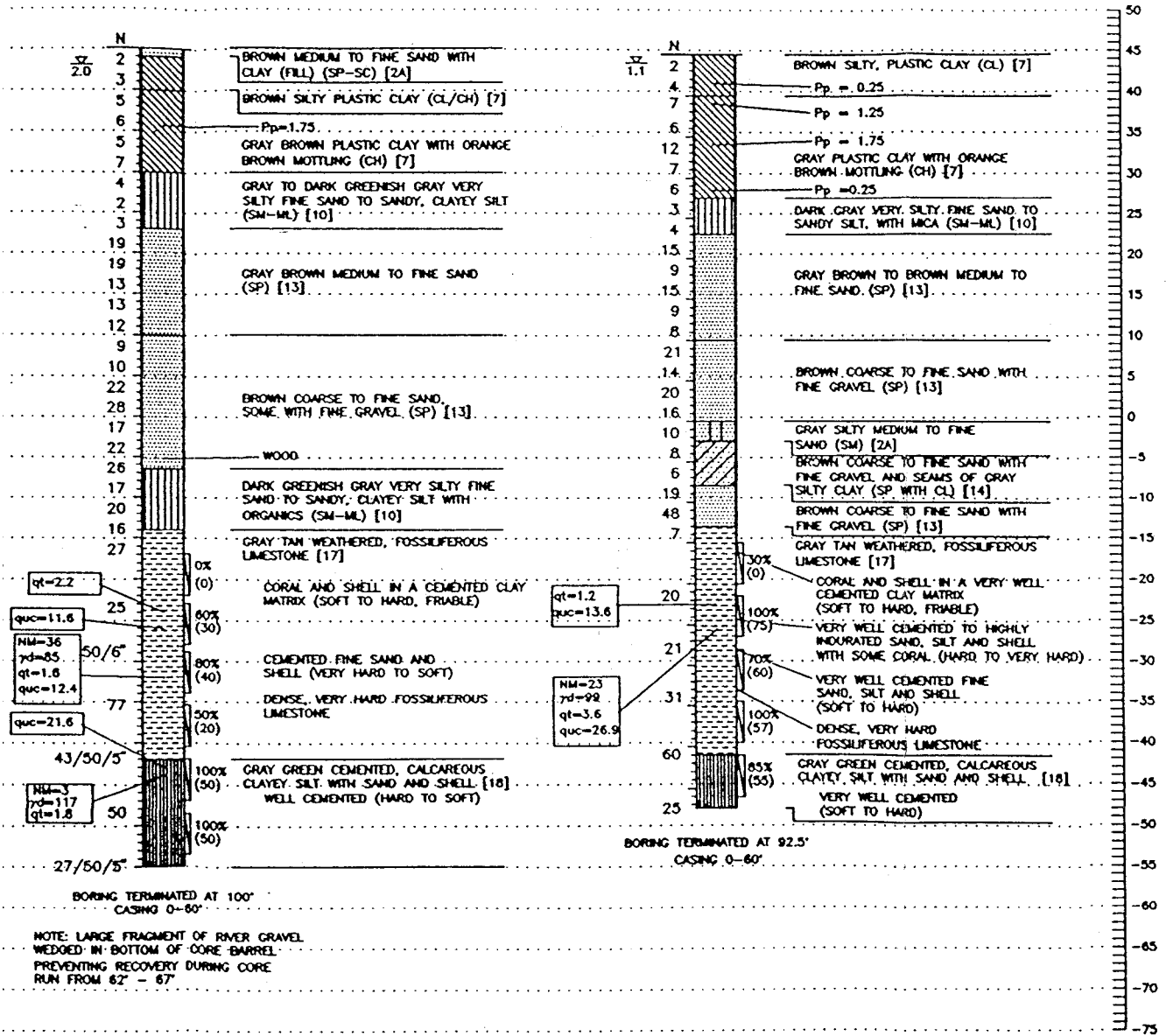


Figure A.1 Shaft 11 Boring Logs (TH-46A and TH-46B)

Final Report Contract #BC354 RPWO #32

TH-62A
 9/29/94
 APPROX. STA. 145+96
 16' R. SURVEY BASELINE
 ELEVATION 47.5'

TH-62B
 8/22/94
 APPROX. STA. 145+96
 53' R. SURVEY BASELINE
 ELEVATION 47.3'

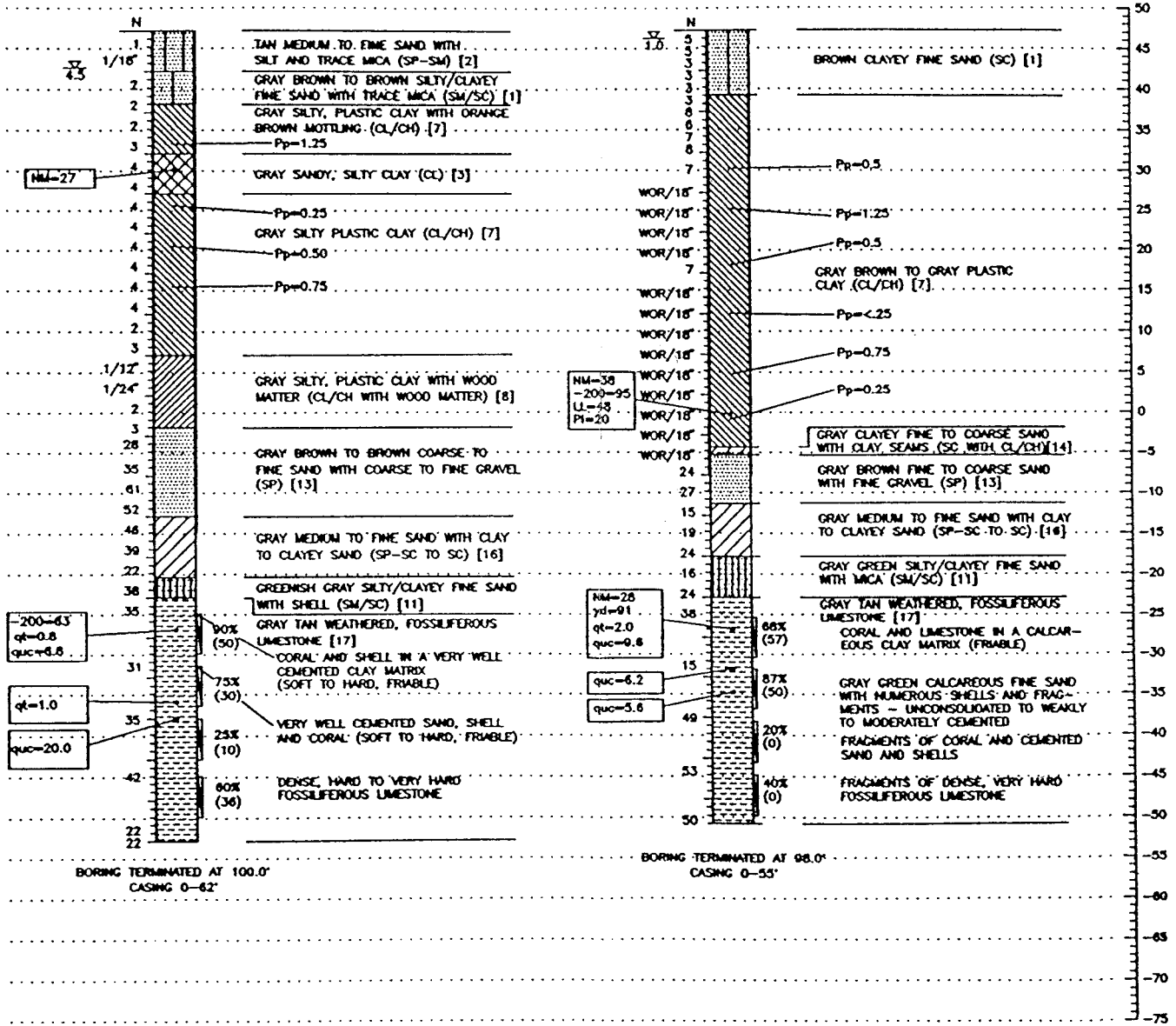


Figure A.4 Shaft 5 Boring Logs (TH-62A and TH-62B)

Final Report Contract #BC354 RPWO #32

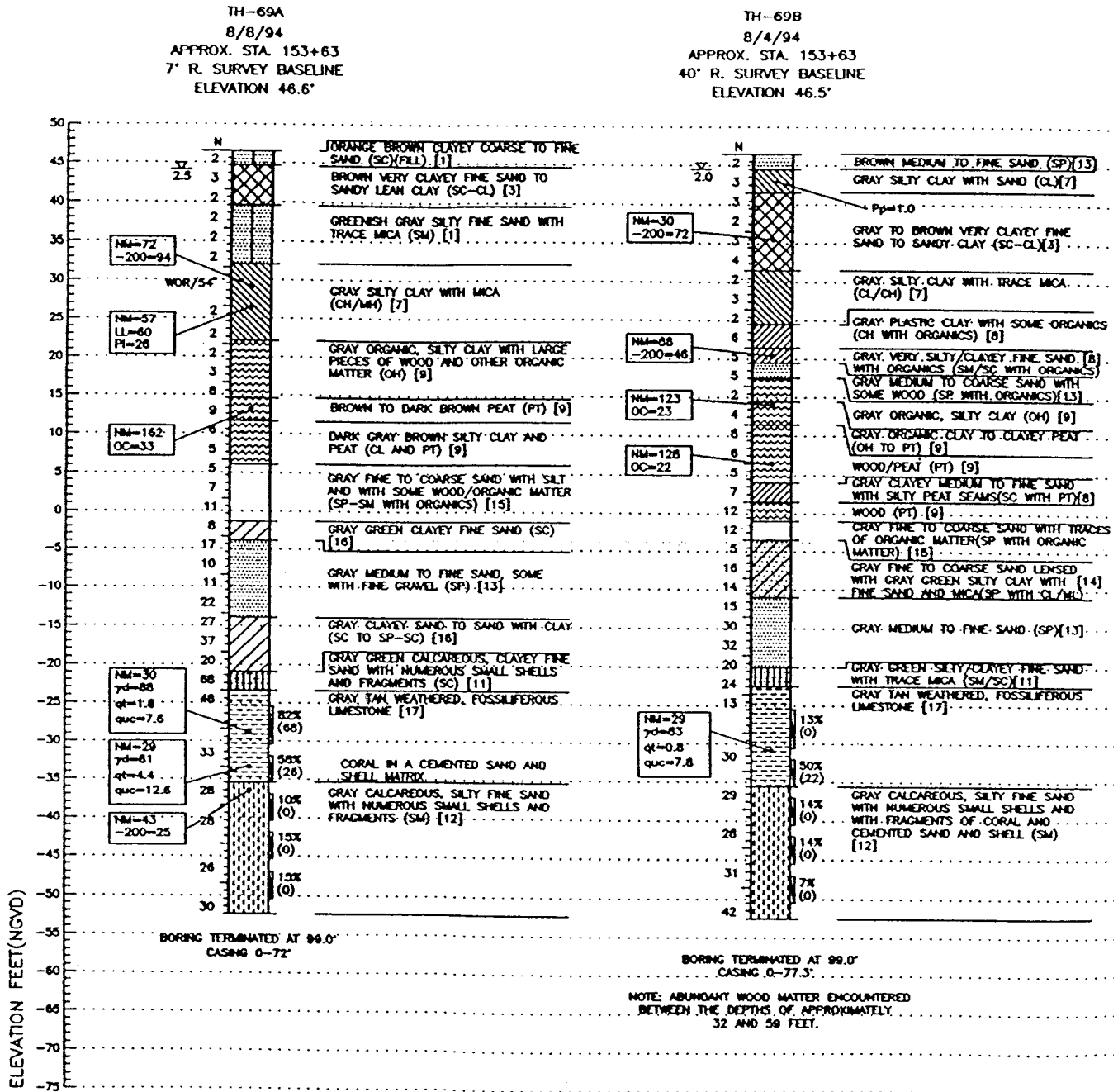


Figure A.5 Shaft 7 Boring Logs (TH-69A and TH-69B)

LEGEND INFORMATION

- TH STANDARD PENETRATION TEST (SPT) BORING LOCATION
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
- 50/5 50 BLOWS FOR 3-INCH PENETRATION INTO SOIL
- 13/50/5 13 BLOWS FOR 6-INCH, 50 BLOWS FOR 5-INCH PENETRATION INTO SOIL
- $\frac{US-1}{(100\%)}$ UNDISTURBED SAMPLE
% RECOVERY
- 5% \blacksquare ESTIMATED % WATER LOSS
- ∇ GROUNDWATER LEVEL MEASURED ON DATE DRILLED
- NM NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
- 200 PERCENT PASSING No. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
- γ_d DRY UNIT WEIGHT, POUNDS PER CUBIC FOOT
- quc CORRECTED UNCONFINED COMPRESSIVE STRENGTH (ksf)
- qt SPLITTING TENSILE STRENGTH (ksf)
- Pp UNCONFINED COMPRESSIVE STRENGTH (tsf) USING POCKET PENETROMETER
- LL LIQUID LIMIT (ASTM D-424)
- PI PLASTICITY INDEX (ASTM D-424)
- SP,SP-SM UNIFIED SOIL CLASSIFICATION SYSTEM
SM,SC,CH
- | | CASING

ROCK CORING DATA



% RECOVERY (ROD)

CORE SIZE - HWD4 AND HW-WIRE LINE

STANDARD PENETRATION TEST DATA:

SPOON I.D. = 1.5" HAMMER DROP = 30"
SPOON O.D. = 2.0" HAMMER WEIGHT = 140 lbs.

DRILL RIG: CME 45, CME 55(2)
AND CME 75

DRILLERS: F. SMITH, K. McDOUGAL, G. SHIELDS, P. BONEY
AND G. LEDBETTER (TALLAHASSEE)
R. PRATHER AND T. BUCHAN (ORLANDO)
S. PARKER AND J. BOSWELL (BARTOW)

- NOTES:
- 1) UPON COMPLETION OF EACH BORING, THE BOREHOLE WAS GROUTED WITH A CEMENT-BENTONITE SLURRY.
 - 2) SOIL LEGEND AND SOIL SYMBOLS DEVELOPED FROM ARDAMAN & ASSOCIATES, INC. PHASE I PRELIMINARY GEOTECHNICAL REPORT FOR THE PROPOSED ALIGNMENT C- ADDITION TO THE CALHOUN BRIDGE OVER THE APALACHICOLA RIVER BASIN ALONG STATE ROAD 20 IN LIBERTY AND CALHOUN COUNTIES, FLORIDA DATED DECEMBER 17, 1992.
SUBSURFACE INFORMATION IS ALSO PRESENTED IN THE ABOVE REFERENCED REPORT.
 - 3) NUMBER IN BRACKETS ([7]) FOLLOWING SOIL/ROCK DESCRIPTIONS ON THE FOLLOWING SHEETS REFERENCES THE SOIL/ROCK STRATA NUMBERS SHOWN WITH THE SOIL LEGEND ON THIS SHEET.

Figure A.6 Boring Log Legend

**APPENDIX B
CALIBRATIONS**



Vibrating Wire Pressure Transducer Calibration

Model Number:	<u>4500H-10,000</u>	Pressure Range:	<u>10,000 psi</u>
Serial Number:	<u>26478</u>	Mfg. Number:	<u>4-1207</u>
Customer:	<u>Schmertmann & Crapps</u>	Temp:	<u>22 °C</u>
Cust. I.D. Number:	<u>n/a</u>	Baro:	<u>999 mbar.</u>
Job No.:	<u>6383</u>	Date:	<u>3/17/94</u>
Test Gage:	<u>335</u>	By:	<u>SPE 94</u>

	Applied Pressure (psi)	Readings	Change
First Cycle	-0.2316	9131	
	2017.00	8452	679
	4011.60	7767	685
	6000.70	7077	690
	7996.60	6380	697
	10030.00	5667	713
Second Cycle	3.2085	9114	
	2041.80	8438	676
	4021.90	7759	679
	6002.00	7074	685
	8024.80	6370	704
	9996.00	5680	690

Calibration Factor (C): 2.8987 (PSI/Digit)
 Thermal Factor (K): 2.6088 (PSI//Deg.C.Rise)
 Calculated Pressure = C(R0-R1)+K(T1-T0)

GK-401 Reading at Shipment:	Date:	<u>3/24/94</u>
Position "B":* <u>9143</u>	Temperature:	<u>25.5</u> Deg.C.
or		
Position "F":* _____	Baro:	<u>1011</u> mbar**

* Users are advised to establish their own zero conditions.
 ** Barometric pressure is corrected for 580 ft. above sea level.

Wiring Code:

Red and Black: Gage White and Green: Thermistor

Figure B.1 Geokon Calibration, VW Pressure Transducer #26478

(S/N 26478, PERFORMED 15 AUG 95 AT WEEDON ENGINEERING)

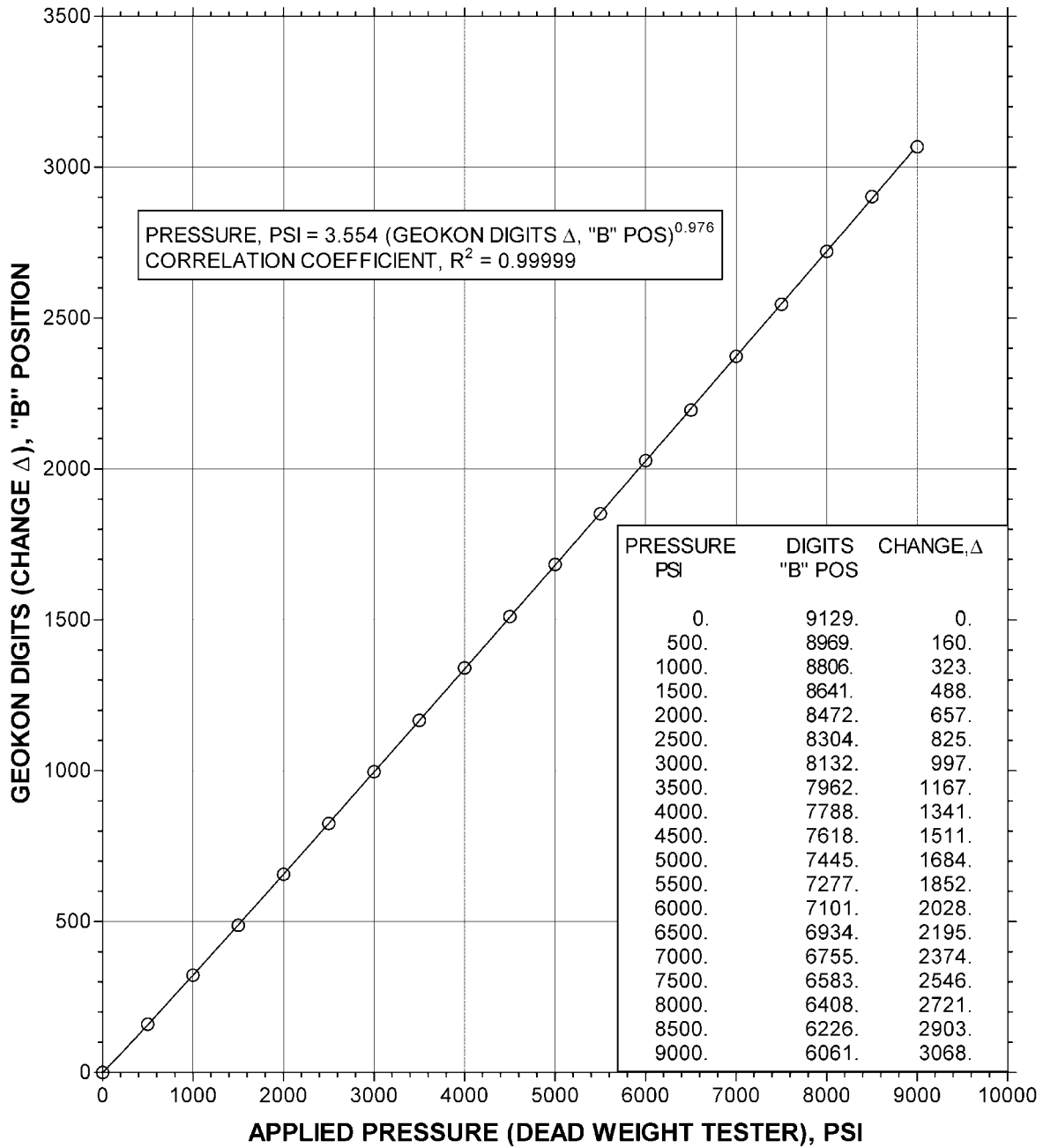


Figure B.2 Bench Calibration, VW Pressure Transducer #26478 (Bullock 1999)

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA	
Vibrating Wire Pressure Transducer Calibration Report	
Model Number: <u>4500HH-10000</u>	Pressure Range: <u>10,000 psi</u>
Serial Number: <u>64705</u>	Mfg. Number: <u>98-325</u>
Customer: <u>University of Florida</u>	Temperature: <u>23.0 °C</u>
Cust. I.D. #: <u>n/a</u>	†Barometric Pressure: <u>1006.7 mbar</u>
Job Number: <u>18214</u>	Date of Calibration: <u>January 22, 2002</u>
Cal. Std. Control #(s): <u>213, 438, 529, 524, 468, 403, 476</u>	Technician: <u>KOB</u>

Pressure (psi)	Reading 1st Cycle	Pressure (psi)	Reading 2nd Cycle	Average Pressure	Average Reading	Average Change	Linearity (%FS)	Polynomial Fit (%FS)
0	9046	0	9047	0	9047		-0.59	-0.12
2000	8211	2000	8212	2000	8212	835	0.29	0.19
4000	7404	4000	7406	4000	7405	807	0.46	0.09
6000	6615	6000	6616	6000	6616	790	0.20	-0.15
8000	5824	8000	5826	8000	5825	791	-0.04	-0.11
10000	5037	10000	5039	10000	5038	787	-0.36	0.10

Linear Gage Factor (G): <u>2.5005</u> (psi/digit)	Regression Zero: <u>9023</u>
Polynomial Gage Factors: A: <u>2.124E-05</u> B: <u>-2.7996</u> C:* <u>23575.56</u>	
Thermal Factor (K): <u>-1.3291</u> (psi/°C)	

Calculated Pressures:

Linear, $P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$**

**Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R₀): 9036 Temp(T₀): 25.0 °C †Baro(S₀): 999.4 mbar Date: January 22, 2002

† Barometric pressure is based upon Geokon factory elevation of 177m (580 ft.) above sea level.
(approximate correction for altitude = 0.5 psi / 1000 ft.)

*The user is advised to establish zero conditions in the field by recording the reading at a known temperature and barometric pressure.

Wiring Code: Red and Black: Gage White and Green: Thermistor Bare: Shield

The above instrument was found to be In Tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

This report shall not be reproduced except in full without written permission of Geokon Inc. 022201

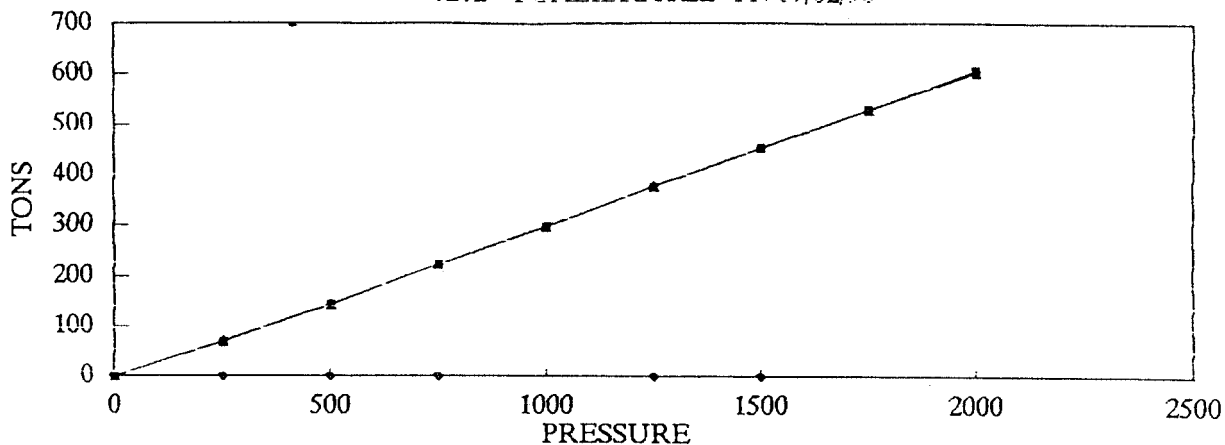
Figure B.3 Geokon Calibration, VW Pressure Transducer #64705

Table B.1 Osterberg Load Cell Calibration Summary

O-cell	S/N	Calibration Date	Calibration (@ 3" opening) Load, tons = a (Gage Pressure, psi) + b	
			a	b
Shaft 11 Mid	6262-1	07/02/96	0.306259	-6.89935
Shaft 11 Bottom	6262-3	07/16/96	0.309794	-13.1494
Shaft 2 Mid	6225-3	06/13/96	0.305051	-7.85985
Shaft 2 Bottom	6225-1	06/11/96	0.304843	-3.82846
Shaft 10 Mid	6262-2	07/03/96	0.308892	-12.7029
Shaft 10 Bottom	6225-2	06/12/96	0.305321	-3.6613
Shaft 5 Mid	6582-3	11/13/96	0.309632	-19.1694
Shaft 5 Bottom	6263-8	09/27/96	0.308442	-16.6937
Shaft 7 Mid	6263-7	09/27/96	0.308063	-15.7468
Shaft 7 Bottom	6263-6	09/25/96	0.307251	-12.8923

LOAD TEST GRAPH

6262-1 CALIBRATED ON 07/02/96



$TONS = X \text{ Coefficient} * (PRESSURE) + CONSTANT$
 34" OSTERBERG CELL, SERIAL # 6262-1

STROKR:	1 INCH	3 INCH	5 INCH
PRSSURR	TONS	TONS	TONS
0	0.00	0.00	0.00
250	69.32	70.45	69.32
500	145.08	144.70	143.94
750	223.48	223.11	222.73
1000	298.11	297.73	296.21
1250	376.89	377.65	376.89
1500	454.55	454.17	453.03
1750	529.55	529.17	528.03
2000	607.20	604.17	603.41

Regression Output: 1 INCH

Constant	-8.02219
Std Err of Y Rst	0.964101
R Squared	0.999978
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.307594
Std Err of Coef.	0.000595

Regression Output: 3 INCH

Constant	-6.89935
Std Err of Y Rst	1.508467
R Squared	0.999945
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.306259
Std Err of Coef.	0.000931

Regression Output: 5 INCH

Constant	-7.80574
Std Err of Y Rst	1.595059
R Squared	0.999938
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.306223
Std Err of Coef.	0.000984

CALIBRATION STANDARDS:

All data presented is derived from NIST certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

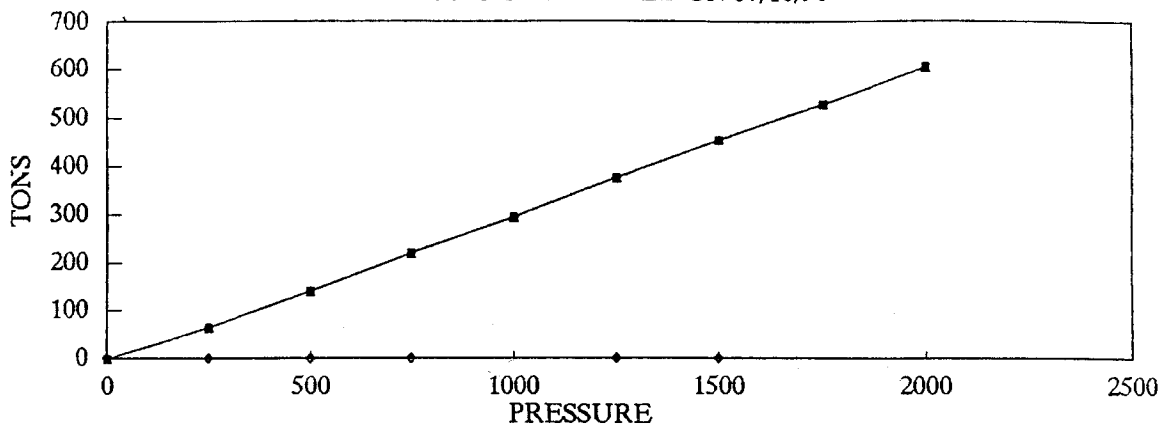
 * CUSTOMER P.O.#: LT-8241
 * DATE: 06/27/96
 * JOB LOCATION: HOUNTSTOWN, PL
 * CONTRACTOR: ODRBRECHT CONT.

Service Engineer _____ Date 7/2/96

Figure B.4 Shaft 11, Mid O-cell Calibration Sheet

LOAD TEST GRAPH

6262-3 CALIBRATED ON 07/16/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
 34" OSTERBERG CELL, SERIAL # 6262-3

PRESSURE	TONS	TONS	TONS
0	0.00	0.00	0.00
250	66.29	64.77	64.39
500	141.29	140.91	139.39
750	220.83	218.94	219.70
1000	296.97	295.45	295.45
1250	377.65	375.76	376.14
1500	453.79	453.03	454.17
1750	531.06	528.79	529.17
2000	607.95	605.30	606.82

Regression Output: 1 INCH
 Constant -12.3106
 Std Err of Y Est 1.242741
 R Squared 0.999963
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.31048
 Std Err of Coef. 0.000767

Regression Output: 3 INCH
 Constant -13.1494
 Std Err of Y Est 1.206004
 R Squared 0.999965
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.309794
 Std Err of Coef. 0.000744

Regression Output: 5 INCH
 Constant -14.164
 Std Err of Y Est 1.544277
 R Squared 0.999944
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.310949
 Std Err of Coef. 0.000953

CALIBRATION STANDARDS:

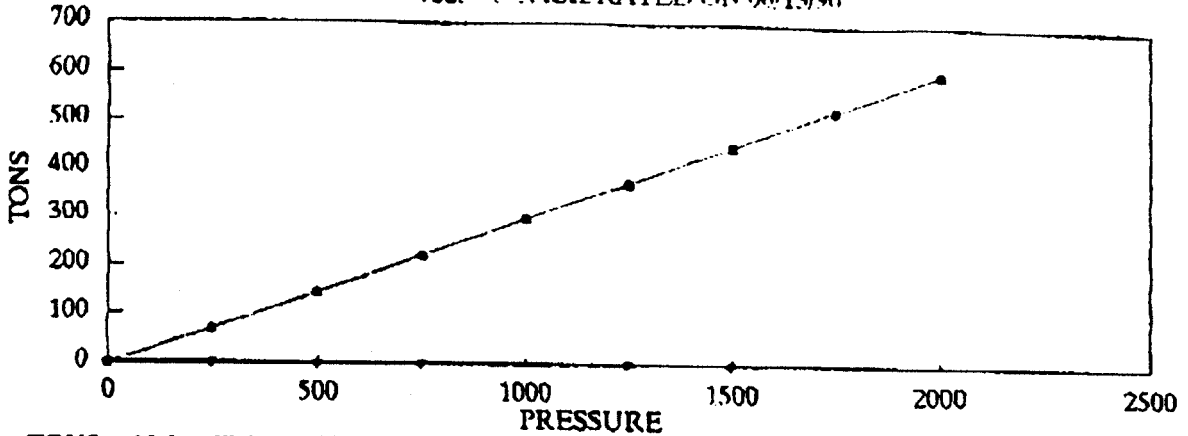
All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No Specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

* CUSTOMER P.O.#: LT-8241
 * DATED: 07/15/96
 * JOB LOCATION: BLOUNTSTOWN, FL
 * CONTRACTER: ODBRTECHT CONTA

Service Engineer Date
[Signature] 7/16/96

Figure B.5 Shaft 11, Bottom O-cell Calibration Sheet

LOAD TEST GRAPH
6225-3 CALIBRATED ON 06/13/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
34" OSTERBERG CELL, SERIAL # 6225-3

STANDER:	1 INCH	3 INCH	5 INCH
PRESSURE	TONS	TONS	TONS
0	0.00	0.00	0.00
250	68.56	88.94	71.59
500	143.56	144.70	145.08
750	221.97	221.97	222.35
1000	296.97	296.21	296.97
1250	371.97	371.59	371.59
1500	448.48	449.24	448.86
1750	527.27	527.27	526.89
2000	602.27	602.65	603.41

Regression Output: 1 INCH
 Constant -8.21158
 Std Err of Y Est. 1.112821
 R Squared 0.99897
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.305195
 Std Err of Coef. 0.000687

Regression Output: 3 INCH
 Constant -7.85985
 Std Err of Y Est. 1.145098
 R Squared 0.999968
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.305051
 Std Err of Coef. 0.000707

Regression Output: 5 INCH
 Constant -6.26363
 Std Err of Y Est. 1.539846
 R Squared 0.999941
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.304055
 Std Err of Coef. 0.00095

CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications A40.1.

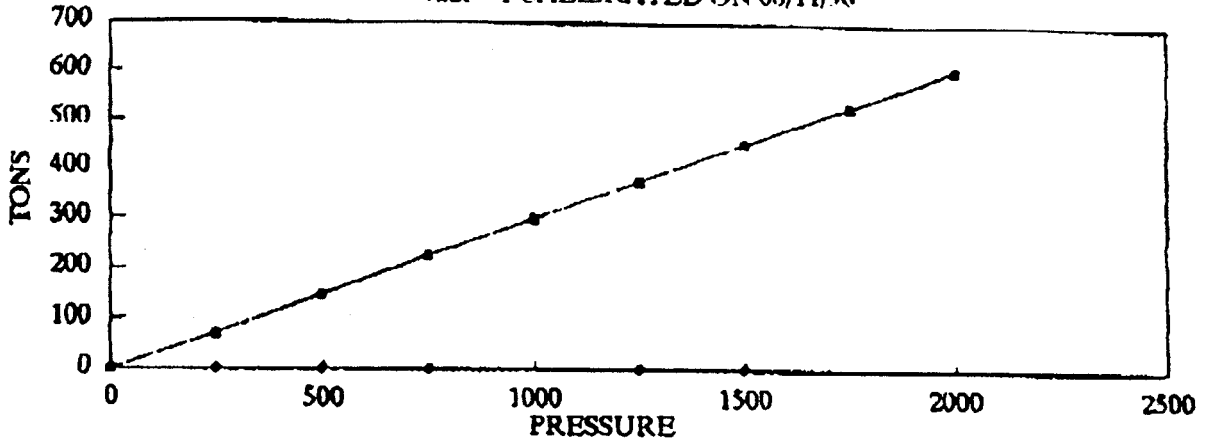
CUSTOMER P.O.#: 47-8241
 DAY: 06/07/96
 JOB LOCATION: MOUNTSTOWN, PA.
 CONTRACTOR: PARKER DUTTING

Service Engineer: *Bill Paul* Date: *6/13/96*

Figure B.6 Shaft 2, Mid O-cell Calibration Sheet

LOAD TEST GRAPH

6225-1 CALIBRATED ON 06/11/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
34" OSTERBERG CELL, SERIAL # 6225-1

STROKES: 1 INCH 3 INCH 5 INCH

PRESSURE	1 INCH	3 INCH	5 INCH
0	0.00	0.00	0.00
250	71.21	71.21	71.59
500	140.86	140.84	140.80
750	227.27	226.14	227.85
1000	301.14	301.52	301.14
1250	375.78	375.16	376.14
1500	453.03	453.03	453.78
1750	532.58	530.30	531.44
2000	607.20	605.68	606.06

Regression Output: 1 INCH

Constant	-4.4237
Std Err of Y Est.	1.615514
R Squared	0.999936
No. of Observations	8
Degrees of Freedom	6

X Coefficient(s) 0.305826
 Std Err of Coef. 0.000996

Regression Output: 3 INCH

Constant	-3.22846
Std Err of Y Est.	1.048545
R Squared	0.999993
No. of Observations	8
Degrees of Freedom	6

X Coefficient(s) 0.304834
 Std Err of Coef. 0.000647

Regression Output: 5 INCH

Constant	-3.23323
Std Err of Y Est.	1.435358
R Squared	0.999949
No. of Observations	8
Degrees of Freedom	6

X Coefficient(s) 0.306852
 Std Err of Coef. 0.000886

CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauge directly to the National Institute of Standards and Technology. No specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications H40.1.

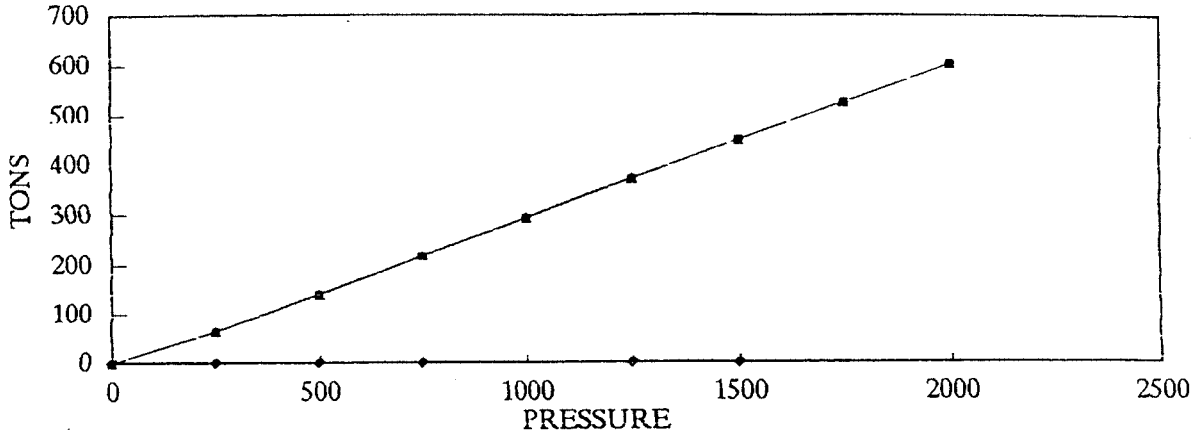
 * CUSTOMER P.O.#: 17-R241
 * DATE: 06/27/96
 * JOB LOCATION: HIGHTSTOWN, FL
 * CONTRACTOR: PARKER DRILLING

Service Engineer Date
[Signature] 6/11/96

Figure B.7 Shaft 2, Bottom O-cell Calibration Sheet

LOAD TEST GRAPH

6262-2 CALIBRATED ON 07/03/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
 34" OSTERBERG CELL, SERIAL # 6262-2

STROKE: 1 INCH	3 INCH	5 INCH
PRESSURE	TONS	TONS
0	0.00	0.00
250	63.26	64.77
500	139.39	140.91
750	218.18	219.70
1000	293.18	293.94
1250	373.48	373.11
1500	451.52	451.14
1750	526.89	527.27
2000	604.17	604.92

Regression Output: 1 INCH
 Constant -14.678
 Std Err of Y Est. 1.213534
 R Squared 0.999965
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.309722
 Std Err of Coef. 0.000749

Regression Output: 3 INCH
 Constant -12.7029
 Std Err of Y Est. 0.876886
 R Squared 0.999982
 No. of Observations 8
 Degrees of Freedom 6
 X Coefficient(s) 0.308892
 Std Err of Coef. 0.000541

Regression Output: 5 INCH
 Constant -13.447
 Std Err of Y Est. 0.957434
 R Squared 0.999978
 No. of Observations 4
 Degrees of Freedom 3
 X Coefficient(s) 0.308838
 Std Err of Coef. 0.000591

CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANST specifications R40.1.

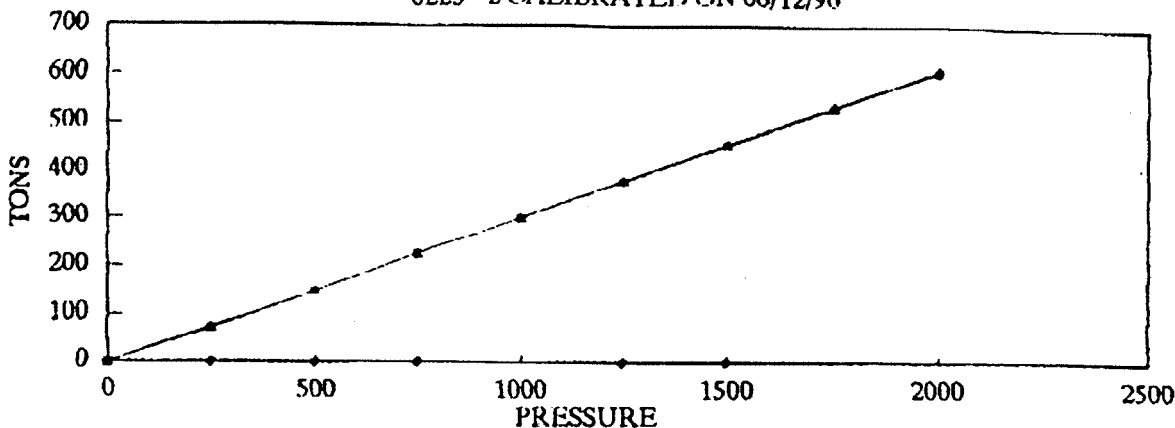
* CUSTOMER P.O.#: LT-8241
 * DATE: 06/27/96
 * JOB LOCATION: BLOUNTSTOWN, FL
 * CONTRACTOR: OBERRECHT CONT.

Service Engineer *[Signature]* Date *7/3/96*

Figure B.8 Shaft 10, Mid O-cell Calibration Sheet

LOAD TEST GRAPH

6225-2 CALIBRATED ON 06/12/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
 34" OSTERBERG CELL, SERIAL # 6225-2

STROKE: 1 INCH 3 INCH 5 INCH

PRESSURE	TONS	TONS	TONS
0	0.00	0.00	0.00
250	71.59	71.97	73.86
500	149.24	149.62	149.62
750	226.89	227.27	227.27
1000	300.00	300.76	301.52
1250	376.14	376.62	378.03
1500	451.52	453.03	454.55
1750	530.68	532.58	534.09
2000	605.68	606.82	609.09

Regression Output: 1 INCH
 Constant -3.66613
 Std Err of Y Est. 1.416189
 R Squared 0.999951
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.304563
 Std Err of Coef. 0.000874

Regression Output: 3 INCH
 Constant -3.66613
 Std Err of Y Est. 1.474105
 R Squared 0.999947
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.305321
 Std Err of Coef. 0.00091

Regression Output: 5 INCH
 Constant -3.31439
 Std Err of Y Est. 1.25153
 R Squared 0.999962
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.306061
 Std Err of Coef. 0.000772

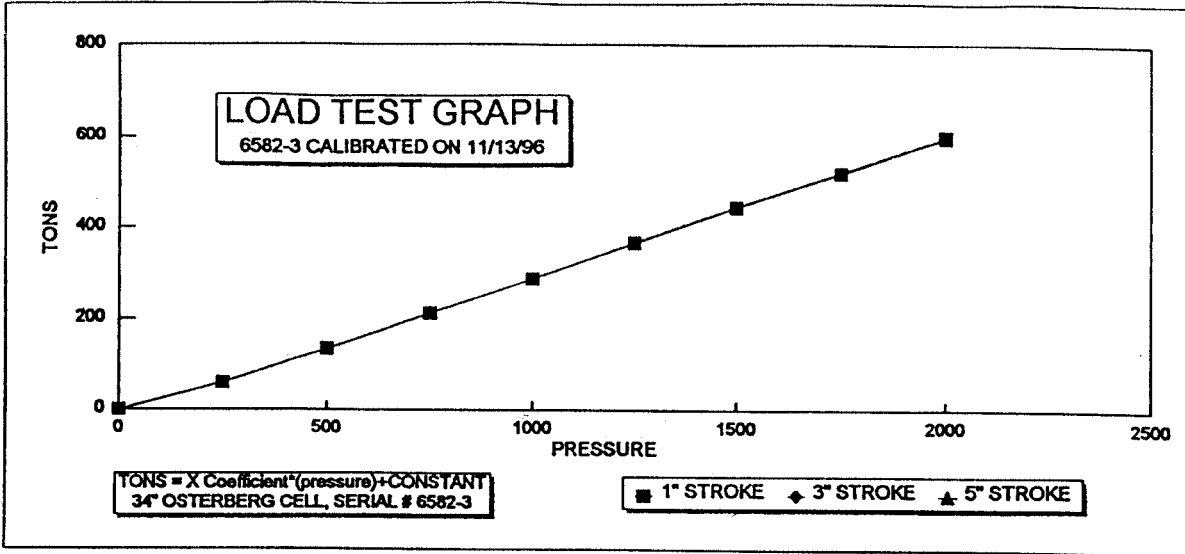
CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Mawler Deadweight Gauges directly to the National Institute of Standards and Technology. No specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications N0.1.

* CUSTOMER P.O.#: LT-8241
 * DATE: 06/07/96
 * JOB LOCATION: BLOOMSTOWN, FL
 * CONTRACTOR: PARNER DRILLING

Service Engineer *[Signature]* Date *6/12/96*

Figure B.9 Shaft 10, Bottom O-cell Calibration Sheet



STROKE:	1 INCH	3 INCH	5 INCH
PRESSURE	TONS	TONS	TONS
0	0	0	0
250	59.47	59.09	59.47
500	135.23	135.23	134.09
750	212.50	213.64	212.12
1000	288.26	287.88	287.88
1250	368.18	368.18	365.91
1500	445.83	446.97	443.56
1750	521.21	522.35	518.94
2000	599.24	600.00	595.83

Regression Output: 1 INCH
 Constant -18.8447
 Std Err of Y Est 1.121359
 R Squared 0.99997
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.308965
 Std Err of Coef. 0.000692

Regression Output: 3 INCH
 Constant -19.1694
 Std Err of Y Est 1.353806
 R Squared 0.999956
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.309632
 Std Err of Coef. 0.000836

Regression Output: 5 INCH
 Constant -18.3712
 Std Err of Y Est 0.891695
 R Squared 0.999981
 No. of Observations 8
 Degrees of Freedom 6

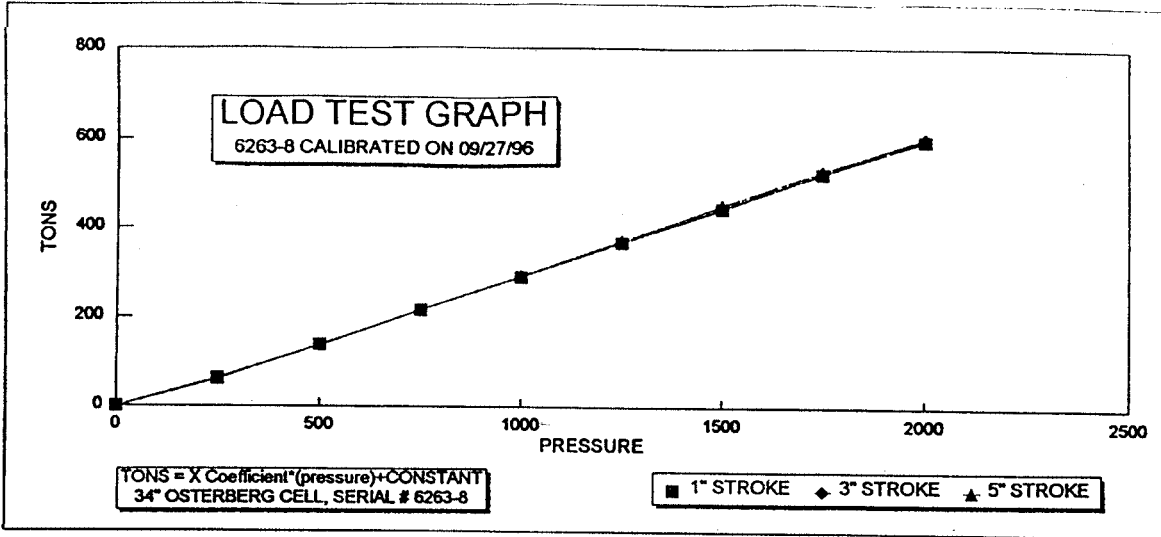
X Coefficient(s) 0.307197
 Std Err of Coef. 0.00055

CALIBRATION STANDARDS:
 All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No Specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

*AE & FC CUSTOMER:LOADTEST INC. *AE & FC JOB NO.:6745 *CUSTOMER P.O.NO.:LT-8241	*CONTRACTOR:ODEBRECHT CONTR. *JOB LOCATION: BLOUNTSTOWN, FL *DATED:11/22/96
---	---

SERVICE ENGINEER: [Signature] DATE: 11/22/96

Figure B.10 Shaft 5, Mid O-cell Calibration Sheet



STROKE:	1 INCH	3 INCH	5 INCH
PRESSURE	TONS	TONS	TONS
0	0	0	0
250	62.50	60.98	62.12
500	139.02	137.50	138.26
750	215.91	215.15	217.05
1000	289.02	290.15	292.05
1250	367.42	370.45	372.35
1500	442.80	443.94	450.00
1750	520.08	522.35	526.89
2000	596.21	601.89	602.65

Regression Output: 1 INCH
 Constant -13.7581
 Std Err of Y Est 1.012494
 R Squared 0.999975
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.30478
 Std Err of Coef. 0.000625

Regression Output: 3 INCH
 Constant -16.6937
 Std Err of Y Est 1.485551
 R Squared 0.999947
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.308442
 Std Err of Coef. 0.000917

Regression Output: 5 INCH
 Constant -15.8685
 Std Err of Y Est 1.197595
 R Squared 0.999966
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.309812
 Std Err of Coef. 0.000739

CALIBRATION STANDARDS:
 All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No Specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

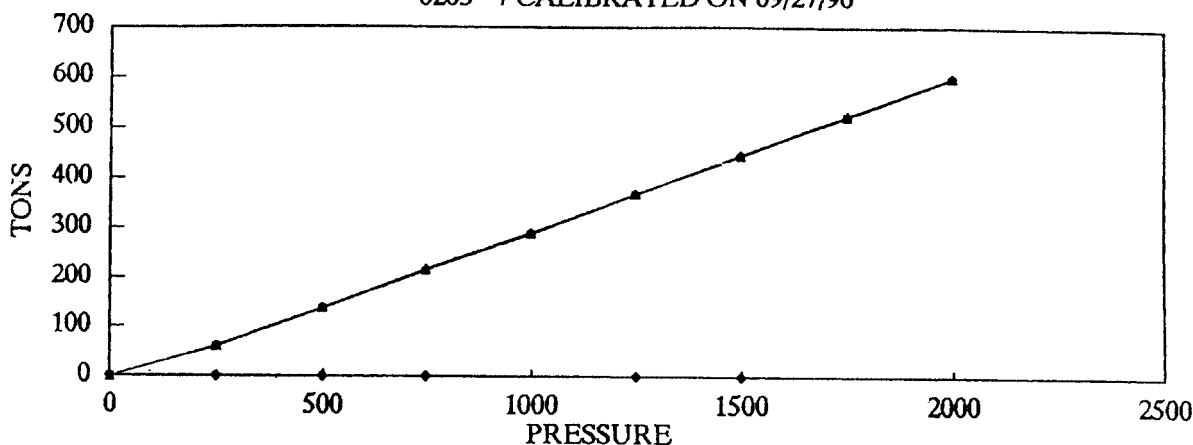
*AE & FC CUSTOMER:LOADTEST INC. *AE & FC JOB NO.:6546 *CUSTOMER P.O.NO.:LT-8241	*CONTRACTOR:ODEBRECHT *JOB LOCATION:BLOUNTSTOWN, FL *DATED:09/09/96
---	---

SERVICE ENGINEER: Ed Paul DATE: 9/27/96

Figure B.11 Shaft 5, Bottom O-cell Calibration Sheet

LOAD TEST GRAPH

6263-7 CALIBRATED ON 09/27/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
34" OSTERBERG CELL, SERIAL # 6263-7

STROKE:	1 INCH	3 INCH	5 INCH
PRESSURE	TONS	TONS	TONS
0	0.00	0.00	0.00
250	60.98	62.12	62.50
500	136.74	138.64	137.88
750	213.26	215.53	216.67
1000	287.88	289.39	291.67
1250	366.67	370.08	370.08
1500	443.56	446.59	446.21
1750	520.83	523.11	524.24
2000	599.24	601.14	601.14

Regression Output: 1 INCH
 Constant -17.316
 Std Err of Y Est 1.301376
 R Squared 0.999959
 No. of Observations 8
 Degrees of Freedom 6

 X Coefficient(s) 0.307522
 Std Err of Coef. 0.000803

Regression Output: 3 INCH
 Constant -15.7468
 Std Err of Y Est 1.335066
 R Squared 0.999957
 No. of Observations 8
 Degrees of Freedom 6

 X Coefficient(s) 0.308063
 Std Err of Coef. 0.000824

Regression Output: 5 INCH
 Constant -15.2733
 Std Err of Y Est 0.826066
 R Squared 0.999984
 No. of Observations 8
 Degrees of Freedom 6

X Coefficient(s) 0.308063
 Std Err of Coef. 0.00051

CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No Specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

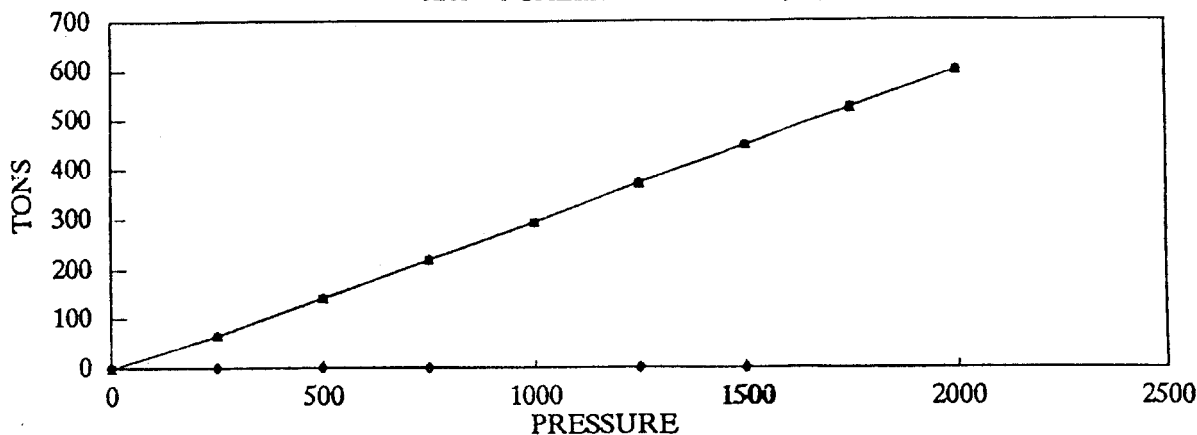
 * CUSTOMER P.O.#: LT-8241
 * DATED: 09/09/96
 * JOB LOCATION: BLOUNTSTOWN FL
 * CONTRACTER: ODEBRECHT

Service Engineer: Ed Ted Date: 9/27/96

Figure B.12 Shaft 7, Mid O-cell Calibration Sheet

LOAD TEST GRAPH

6263-6 CALIBRATED ON 09/25/96



TONS = X Coefficient*(PRESSURE)+CONSTANT
 34" OSTERBERG CELL, SERIAL # 6263-6

STROKE: 1 INCH	3 INCH	5 INCH	
PRESSURE	TONS	TONS	TONS
0	0.00	0.00	0.00
250	64.02	64.77	65.53
500	139.77	140.15	141.29
750	217.80	217.42	218.56
1000	292.05	292.05	292.80
1250	371.97	373.11	371.97
1500	447.35	448.86	448.11
1750	524.62	524.62	523.86
2000	600.38	601.14	600.00

Regression Output: 1 INCH

Constant	-13.1494
Std Err of Y Est	1.050579
R Squared	0.999973
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.307017
Std Err of Coef.	0.000648

Regression Output: 3 INCH

Constant	-12.8923
Std Err of Y Est	1.366364
R Squared	0.999955
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.307251
Std Err of Coef.	0.000843

Regression Output: 5 INCH

Constant	-11.2689
Std Err of Y Est	0.912679
R Squared	0.99998
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	0.305808
Std Err of Coef.	0.000563

CALIBRATION STANDARDS:

All data presented is derived from 6" dia. certified hydraulic pressure gauges and electronic load transducer, manufactured and calibrated by the University of Illinois at Champaign, Illinois. All calibrations and certifications are traceable through the Laboratory Master Deadweight Gauges directly to the National Institute of Standards and Technology. No Specific guidelines exist for calibration of load test jacks and equipment but procedures comply with similar guidelines for calibration of gauges, ANSI specifications B40.1.

* CUSTOMER P.O.#: LT-8241
 * DATED: 09/09/96
 * JOB LOCATION: BLOUNTSTOWN PL
 * CONTRACTER: ODEBRECHT

Service Engineer Date

Gil Ped 9/25/96

Figure B.13 Shaft 7, Bottom O-cell Calibration Sheet

**APPENDIX C
TEST SHAFT 11 – ANALYSIS OF 1996 TEST**

Table C.1 Adjusted Indicator Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement			Compression		
				DG A2 (inches)	DG B2 (inches)	Average (inches)	TT G (inches)	TT H (inches)	Avg. Rdg (inches)
L0	0:00:00	-	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	-	261.8	0.0059	0.0046	0.0053	0.0000	0.0000	0.0000
L1	0:01:00	-	263.8	0.0059	0.0046	0.0053	0.0000	0.0000	0.0000
L1	0:02:00	-	263.3	0.0059	0.0046	0.0053	0.0000	0.0000	0.0000
L1	0:04:00	-	261.8	0.0062	0.0050	0.0056	0.0000	0.0000	0.0000
L2	0:00:30	-	566.6	0.0158	0.0145	0.0152	0.0004	0.0000	0.0004
L2	0:01:00	-	570.6	0.0166	0.0152	0.0159	0.0005	0.0000	0.0005
L2	0:02:00	-	561.1	0.0170	0.0156	0.0163	0.0005	0.0000	0.0005
L2	0:04:00	-	569.1	0.0178	0.0161	0.0170	0.0005	0.0000	0.0005
L3	0:00:30	-	725.2	0.0291	0.0275	0.0283	0.0012	0.0000	0.0012
L3	0:01:00	-	723.2	0.0303	0.0287	0.0295	0.0012	0.0000	0.0012
L3	0:02:00	-	725.2	0.0316	0.0299	0.0308	0.0013	0.0000	0.0013
L3	0:03:30	-	717.2	0.0328	0.0310	0.0319	0.0013	0.0000	0.0013
L4	0:00:30	-	877.3	0.0492	0.0475	0.0484	0.0022	0.0000	0.0022
L4	0:01:00	-	877.3	0.0509	0.0492	0.0501	0.0023	0.0000	0.0023
L4	0:02:00	-	879.3	0.0526	0.0509	0.0518	0.0024	0.0000	0.0024
L4	0:04:00	-	970.5	0.0575	0.0561	0.0568	0.0028	0.0000	0.0028
L5	0:00:30	-	1034.4	0.0735	0.0721	0.0728	0.0033	0.0000	0.0033
L5	0:01:00	-	1027.9	0.0755	0.0742	0.0749	0.0034	0.0000	0.0034
L5	0:02:00	-	1024.9	0.0778	0.0765	0.0772	0.0034	0.0000	0.0034
L5	0:04:00	-	1023.9	0.0804	0.0793	0.0799	0.0034	0.0000	0.0034
L6	0:00:30	-	1120.7	0.0950	0.0946	0.0948	0.0039	0.0000	0.0039
L6	0:01:00	-	1122.2	0.0973	0.0970	0.0972	0.0039	0.0000	0.0039
L6	0:02:00	-	1128.7	0.0999	0.0998	0.0999	0.0040	0.0000	0.0040
L6	0:04:00	-	1122.7	0.1030	0.1028	0.1029	0.0041	0.0000	0.0041
L7	0:00:30	-	1209.0	0.1161	0.1163	0.1162	0.0044	0.0000	0.0044
L7	0:01:00	-	1212.0	0.1209	0.1208	0.1209	0.0045	0.0000	0.0045
L7	0:02:00	-	1212.5	0.1247	0.1251	0.1249	0.0045	0.0000	0.0045
L7	0:04:00	-	1213.9	0.1297	0.1301	0.1299	0.0045	0.0000	0.0045
L8	0:00:30	-	1301.2	0.1544	0.1551	0.1548	0.0051	0.0000	0.0051
L8	0:01:00	-	1312.2	0.1581	0.1588	0.1585	0.0051	0.0000	0.0051
L8	0:02:00	-	1303.3	0.1630	0.1639	0.1635	0.0051	0.0000	0.0051
L8	0:04:00	-	1303.8	0.1691	0.1698	0.1695	0.0052	0.0000	0.0052
L9	0:00:30	-	1403.5	0.1978	0.1991	0.1985	0.0058	0.0000	0.0058
L9	0:01:00	-	1401.5	0.2023	0.2035	0.2029	0.0058	0.0000	0.0058
L9	0:02:00	-	1402.5	0.2087	0.2098	0.2093	0.0058	0.0000	0.0058
L9	0:04:00	-	1401.0	0.2173	0.2175	0.2174	0.0059	0.0000	0.0059
L9	0:08:00	-	1404.5	0.2258	0.2263	0.2261	0.0060	0.0000	0.0060
L9	0:12:00	-	1399.0	0.2318	0.2345	0.2332	0.0060	0.0000	0.0060
L9	0:16:00	-	1400.4	0.2366	0.2369	0.2368	0.0061	0.0000	0.0061
L9	0:24:00	-	1424.3	0.2430	0.2423	0.2427	0.0061	0.0065	0.0061
L10	0:00:30	-	1491.2	0.2581	0.2579	0.2580	0.0065	0.0065	0.0065
L10	0:01:00	-	1489.7	0.2642	0.2639	0.2641	0.0066	0.0065	0.0066

Table C.1 Adjusted Indicator Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement			Compression		
				DG A2 (inches)	DG B2 (inches)	Average (inches)	TT G (inches)	TT H (inches)	Avg. Rdg (inches)
L10	0:02:00	-	1490.7	0.2725	0.2723	0.2724	0.0066	0.0065	0.0066
L10	0:04:00	-	1491.2	0.2829	0.2828	0.2829	0.0067	0.0065	0.0067
L10	0:08:00	-	1502.7	0.2943	0.2939	0.2941	0.0067	0.0065	0.0067
L10	0:12:00	-	1494.2	0.3013	0.3009	0.3011	0.0067	0.0065	0.0067
L11	0:00:30	-	1588.5	0.3391	0.3393	0.3392	0.0073	0.0065	0.0073
L11	0:01:00	-	1587.0	0.3467	0.3470	0.3469	0.0073	0.0065	0.0073
L11	0:02:00	-	1593.0	0.3586	0.3588	0.3587	0.0074	0.0065	0.0074
L11	0:04:00	-	1590.5	0.3722	0.3726	0.3724	0.0075	0.0065	0.0075
L12	0:00:30	-	1686.3	0.4510	0.4522	0.4516	0.0082	0.0065	0.0082
L12	0:01:00	-	1686.3	0.4586	0.4599	0.4593	0.0083	0.0065	0.0083
L12	0:02:00	-	1681.8	0.4704	0.4716	0.4710	0.0083	0.0065	0.0083
L12	0:04:00	-	1678.3	0.4840	0.4854	0.4847	0.0083	0.0065	0.0083
L12	0:08:00	-	1681.8	0.5026	0.5024	0.5025	0.0086	0.0065	0.0086
L12	0:12:00	-	1695.3	0.5144	0.5143	0.5144	0.0088	0.0065	0.0088
L13	0:00:30	-	1811.4	0.6470	0.6497	0.6484	0.0098	0.0065	0.0098
L13	0:01:00	-	1811.9	0.6738	0.6787	0.6763	0.0100	0.0065	0.0100
L13	0:02:00	-	1809.9	0.7118	0.7186	0.7152	0.0104	0.0065	0.0104
L13	0:03:30	-	1801.9	0.7457	0.7539	0.7498	0.0106	0.0065	0.0106
U1	0:00:00	-	0.0	0.7093	0.7084	0.7089	0.0067	0.0026	0.0067

Table C.1 Adjusted Indicator Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		TT E (inches)	TT F (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT A1 (inches)	TT B1 (inches)	Mvmt. (inches)	TT C2 (inches)	TT D2 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT C1 (inches)	TT D1 (inches)	Mvmt. (inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0000	0.0000	0.0000	0.0053	0.0151	0.0052	0.0102	0.0199	0.0018	0.0109	0.0161	-0.0282	-0.0118	-0.0200
L1	0:01:00	0.0000	0.0000	0.0000	0.0053	0.0154	0.0053	0.0104	0.0201	0.0019	0.0110	0.0163	-0.0285	-0.0101	-0.0193
L1	0:02:00	0.0000	0.0000	0.0000	0.0053	0.0156	0.0056	0.0106	0.0203	0.0019	0.0111	0.0164	-0.0285	-0.0105	-0.0195
L1	0:04:00	0.0000	0.0000	0.0000	0.0056	0.0178	0.0076	0.0127	0.0213	0.0024	0.0119	0.0175	-0.0285	-0.0105	-0.0195
L2	0:00:30	0.0000	0.0002	0.0001	0.0153	0.0323	0.0187	0.0255	0.0313	0.0095	0.0204	0.0356	-0.0493	-0.0118	-0.0306
L2	0:01:00	0.0000	0.0002	0.0001	0.0160	0.0334	0.0196	0.0265	0.0319	0.0101	0.0210	0.0369	-0.0505	-0.0110	-0.0308
L2	0:02:00	0.0000	0.0002	0.0001	0.0164	0.0343	0.0203	0.0273	0.0323	0.0105	0.0214	0.0377	-0.0514	-0.0119	-0.0317
L2	0:04:00	0.0000	0.0003	0.0002	0.0171	0.0352	0.0211	0.0282	0.0328	0.0109	0.0219	0.0388	-0.0528	-0.0151	-0.0340
L3	0:00:30	0.0000	0.0009	0.0005	0.0288	0.0523	0.0357	0.0440	0.0410	0.0181	0.0296	0.0579	-0.0765	-0.0549	-0.0657
L3	0:01:00	0.0000	0.0010	0.0005	0.0300	0.0538	0.0371	0.0455	0.0417	0.0186	0.0302	0.0597	-0.0801	-0.0401	-0.0601
L3	0:02:00	0.0000	0.0010	0.0005	0.0313	0.0555	0.0387	0.0471	0.0424	0.0192	0.0308	0.0616	-0.0850	-0.0441	-0.0646
L3	0:03:30	0.0000	0.0012	0.0006	0.0325	0.0569	0.0400	0.0485	0.0429	0.0196	0.0313	0.0632	-0.0887	-0.0455	-0.0671
L4	0:00:30	0.0006	0.0020	0.0013	0.0497	0.0791	0.0609	0.0700	0.0512	0.0262	0.0387	0.0871	-0.1314	-0.1015	-0.1165
L4	0:01:00	0.0007	0.0021	0.0014	0.0515	0.0811	0.0628	0.0720	0.0519	0.0266	0.0393	0.0893	-0.1399	-0.1105	-0.1252
L4	0:02:00	0.0008	0.0022	0.0015	0.0533	0.0831	0.0649	0.0740	0.0525	0.0269	0.0397	0.0915	-0.1515	-0.1198	-0.1357
L4	0:04:00	0.0012	0.0027	0.0020	0.0588	0.0922	0.0743	0.0833	0.0555	0.0294	0.0425	0.0993	-0.1751	-0.1404	-0.1578
L5	0:00:30	0.0019	0.0033	0.0026	0.0754	0.1089	0.0905	0.0997	0.0599	0.0327	0.0463	0.1191	-0.2582	-0.0015	-0.1299
L5	0:01:00	0.0019	0.0034	0.0027	0.0775	0.1111	0.0928	0.1020	0.0604	0.0329	0.0467	0.1215	-0.2932	-0.0055	-0.1494
L5	0:02:00	0.0019	0.0034	0.0027	0.0798	0.1137	0.0953	0.1045	0.0611	0.0330	0.0471	0.1242	-0.3611	-0.0559	-0.2085
L5	0:04:00	0.0020	0.0035	0.0028	0.0826	0.1169	0.0981	0.1075	0.0618	0.0331	0.0475	0.1273	-0.5086	-0.1850	-0.3468
L6	0:00:30	0.0027	0.0039	0.0033	0.0981	0.1342	0.1152	0.1247	0.0656	0.0353	0.0505	0.1453	-0.7606	-0.5555	-0.6581
L6	0:01:00	0.0028	0.0040	0.0034	0.1006	0.1366	0.1174	0.1270	0.0659	0.0354	0.0507	0.1478	-0.8093	-0.4108	-0.6101
L6	0:02:00	0.0029	0.0040	0.0035	0.1033	0.1394	0.1203	0.1299	0.0662	0.0354	0.0508	0.1507	-0.8840	-0.4519	-0.6680
L6	0:04:00	0.0030	0.0041	0.0036	0.1065	0.1426	0.1237	0.1332	0.0667	0.0357	0.0512	0.1541	-0.9891	-0.5408	-0.7650
L7	0:00:30	0.0037	0.0045	0.0041	0.1203	0.1580	0.1389	0.1485	0.0692	0.0375	0.0534	0.1696	-1.0993	-0.8549	-0.9771
L7	0:01:00	0.0038	0.0046	0.0042	0.1251	0.1622	0.1433	0.1528	0.0696	0.0378	0.0537	0.1746	-1.1482	-0.8998	-1.0240
L7	0:02:00	0.0039	0.0046	0.0043	0.1292	0.1664	0.1476	0.1570	0.0696	0.0379	0.0538	0.1787	-1.2272	-0.9519	-1.0896
L7	0:04:00	0.0040	0.0046	0.0043	0.1342	0.1714	0.1526	0.1620	0.0699	0.0381	0.0540	0.1839	-1.3586	-1.0944	-1.2265
L8	0:00:30	0.0049	0.0052	0.0051	0.1598	0.1982	0.1798	0.1890	0.0731	0.0407	0.0569	0.2117	-1.5709	-1.0891	-1.3300
L8	0:01:00	0.0050	0.0052	0.0051	0.1636	0.2018	0.1835	0.1927	0.0734	0.0408	0.0571	0.2156	-1.6227	-1.1141	-1.3684
L8	0:02:00	0.0050	0.0053	0.0052	0.1686	0.2066	0.1886	0.1976	0.0736	0.0409	0.0573	0.2207	-1.7158	-1.4000	-1.5579
L8	0:04:00	0.0052	0.0054	0.0053	0.1748	0.2128	0.1945	0.2037	0.0741	0.0411	0.0576	0.2271	-1.8746	-1.5448	-1.7097
L9	0:00:30	0.0062	0.0060	0.0061	0.2046	0.2446	0.2259	0.2353	0.0774	0.0435	0.0605	0.2589	-2.1149	-1.5591	-1.8370
L9	0:01:00	0.0062	0.0060	0.0061	0.2090	0.2489	0.2303	0.2396	0.0775	0.0435	0.0605	0.2634	-2.1739	-1.8104	-1.9922
L9	0:02:00	0.0063	0.0061	0.0062	0.2155	0.2553	0.2364	0.2459	0.0779	0.0436	0.0608	0.2700	-2.2825	-1.9041	-2.0933
L9	0:04:00	0.0065	0.0062	0.0064	0.2238	0.2633	0.2443	0.2538	0.0784	0.0438	0.0611	0.2785	-2.4749	-2.0902	-2.2826
L9	0:08:00	0.0066	0.0063	0.0065	0.2325	0.2720	0.2537	0.2629	0.0792	0.0440	0.0616	0.2877	-2.8068	-2.4221	-2.6145
L9	0:12:00	0.0069	0.0064	0.0067	0.2398	0.2798	0.2623	0.2711	0.0803	0.0442	0.0623	0.2954	-3.0169	-2.6322	-2.8246
L9	0:16:00	0.0069	0.0065	0.0067	0.2435	0.2835	0.2647	0.2741	0.0805	0.0442	0.0624	0.2991	-3.1608	-2.7761	-2.9685
L9	0:24:00	0.0071	0.0066	0.0069	0.2495	0.2890	0.2746	0.2818	0.0817	0.0444	0.0631	0.3057	-3.5446	-3.1341	-3.3394
L10	0:00:30	0.0080	0.0067	0.0074	0.2654	0.3056	0.3005	0.3031	0.0840	0.0444	0.0642	0.3222	-3.7114	-3.2752	-3.4933
L10	0:01:00	0.0081	0.0067	0.0074	0.2715	0.3114	0.3064	0.3089	0.0845	0.0444	0.0645	0.3285	-3.7455	-3.3038	-3.5247

Table C.1 Adjusted Indicator Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		TT E	TT F	Avg. Rdg	Mvmt.	TT A1	TT B1	Mvmt.	TT C2	TT D2	Avg. Rdg	Mvmt.	TT C1	TT D1	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L10	0:02:00	0.0083	0.0069	0.0076	0.2800	0.3195	0.3145	0.3170	0.0851	0.0445	0.0648	0.3372	-3.8081	-3.3563	-3.5822
L10	0:04:00	0.0084	0.0069	0.0077	0.2905	0.3301	0.3250	0.3276	0.0859	0.0446	0.0653	0.3481	-3.9214	-3.4525	-3.6870
L10	0:08:00	0.0085	0.0070	0.0078	0.3019	0.3416	0.3360	0.3388	0.0867	0.0466	0.0667	0.3608	-4.1066	-3.5631	-3.8349
L10	0:12:00	0.0086	0.0070	0.0078	0.3089	0.3486	0.3431	0.3459	0.0872	0.0466	0.0669	0.3680	-4.2599	-3.6935	-3.9767
L11	0:00:30	0.0101	0.0074	0.0088	0.3480	0.3891	0.3834	0.3863	0.0911	0.0466	0.0689	0.4081	-4.4294	-3.8336	-4.1315
L11	0:01:00	0.0101	0.0074	0.0088	0.3556	0.3966	0.3909	0.3938	0.0915	0.0466	0.0691	0.4159	-4.4618	-3.8594	-4.1606
L11	0:02:00	0.0104	0.0075	0.0090	0.3677	0.4085	0.4027	0.4056	0.0925	0.0466	0.0696	0.4283	-4.5222	-3.9104	-4.2163
L11	0:04:00	0.0106	0.0076	0.0091	0.3815	0.4219	0.4161	0.4190	0.0931	0.0466	0.0699	0.4423	-4.6235	-3.9978	-4.3107
L12	0:00:30	0.0126	0.0083	0.0105	0.4621	0.5051	0.4975	0.5013	0.0983	0.0480	0.0732	0.5248	-4.8415	-4.1744	-4.5080
L12	0:01:00	0.0127	0.0084	0.0106	0.4698	0.5130	0.5050	0.5090	0.0987	0.0480	0.0734	0.5326	-4.8781	-4.2059	-4.5420
L12	0:02:00	0.0129	0.0084	0.0107	0.4817	0.5245	0.5162	0.5204	0.0991	0.0480	0.0736	0.5446	-4.9446	-4.2621	-4.6034
L12	0:04:00	0.0130	0.0084	0.0107	0.4954	0.5383	0.5299	0.5341	0.0996	0.0480	0.0738	0.5585	-5.0551	-4.3566	-4.7059
L12	0:08:00	0.0134	0.0085	0.0110	0.5135	0.5576	0.5474	0.5525	0.1012	0.0482	0.0747	0.5772	-6.4545	-4.5055	-5.4800
L12	0:12:00	0.0136	0.0086	0.0111	0.5255	0.5717	0.5597	0.5657	0.1018	0.0482	0.0750	0.5894	-6.4568	-4.6221	-5.5395
L13	0:00:30	0.0168	0.0098	0.0133	0.6617	0.7108	0.7000	0.7054	0.1075	0.0522	0.0799	0.7282	-6.7041	-4.7888	-5.7465
L13	0:01:00	0.0173	0.0100	0.0137	0.6899	0.7239	0.7308	0.7274	0.1079	0.0532	0.0806	0.7568	-6.7761	-4.8203	-5.7982
L13	0:02:00	0.0179	0.0101	0.0140	0.7292	0.7240	0.7703	0.7472	0.1082	0.0548	0.0815	0.7967	-6.8948	-4.8761	-5.8855
L13	0:03:30	0.0185	0.0102	0.0144	0.7642	0.7240	0.8058	0.7649	0.1087	0.0561	0.0824	0.8322	-7.0171	-4.9379	-5.9775
U1	0:00:00	0.0151	0.0066	0.0109	0.7197	0.6791	0.7609	0.7200	0.0702	0.0441	0.0572	0.7660	-6.7636	-4.7873	-5.7755

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L0	0:00:00		-1.18	-8.08	-5.13	-17.60	-16.39	-26.15	-25.19	-38.24	-26.66	-46.24	16.67	-60.17	32.85	-51.60
L1	0:00:00		-0.18	-7.09	-3.41	-15.78	-13.54	-23.38	-20.03	-34.31	-18.09	-41.65	32.39	-48.15	46.51	-24.17
L1	0:00:00		-0.04	-6.95	-3.16	-15.42	-12.82	-22.94	-18.99	-33.92	-17.11	-40.83	33.82	-46.70	48.48	-21.60
L1	0:00:30		0.04	-6.95	-3.05	-15.31	-12.89	-22.87	-18.92	-33.63	-16.93	-40.55	34.00	-46.16	48.88	-21.24
L1	0:01:00		-0.14	-6.91	-2.94	-15.35	-12.21	-22.66	-19.17	-33.92	-16.86	-40.37	34.30	-46.02	48.98	-20.99
L1	0:01:30		0.04	-6.91	-2.98	-15.35	-12.82	-22.87	-18.95	-33.52	-16.82	-40.22	34.22	-46.02	49.23	-21.06
L1	0:02:00		-0.04	-6.84	-3.01	-15.31	-12.57	-22.55	-18.49	-33.59	-16.64	-40.26	34.26	-45.87	49.09	-21.13
L1	0:02:30		0.04	-6.91	-2.98	-15.42	-12.86	-22.76	-18.31	-33.45	-16.64	-40.22	34.30	-45.84	49.16	-21.10
L1	0:03:00		0.04	-6.91	-2.98	-15.27	-12.49	-22.62	-18.74	-33.66	-16.82	-40.12	34.33	-45.80	49.38	-21.06
L1	0:03:30		-0.18	-6.91	-2.98	-15.27	-12.75	-22.76	-18.74	-33.63	-16.60	-40.12	34.48	-45.65	49.38	-21.06
L1	0:04:00		1.29	-5.78	-0.72	-13.02	-8.70	-19.52	-14.26	-28.86	-10.75	-34.57	42.08	-35.69	57.03	-3.91
L2	0:00:00		2.22	-5.28	0.07	-11.75	-8.02	-17.79	-11.61	-26.70	-7.96	-30.67	45.26	-29.00	61.29	6.33
L2	0:00:30		2.00	-5.17	0.39	-11.42	-6.46	-17.50	-10.79	-26.52	-7.23	-29.74	45.74	-28.03	61.86	6.73
L2	0:01:00		1.90	-5.17	0.50	-11.71	-6.25	-17.29	-10.86	-26.19	-6.90	-29.38	46.29	-27.38	62.29	7.85
L2	0:01:30		1.90	-5.21	0.43	-11.49	-6.32	-17.18	-10.75	-26.05	-6.39	-29.20	46.51	-27.41	62.22	7.82
L2	0:02:00		1.90	-5.21	0.61	-11.49	-6.36	-17.18	-10.43	-26.05	-6.83	-29.20	46.40	-27.31	62.11	7.31
L2	0:02:30		2.11	-5.10	0.57	-11.46	-6.28	-17.18	-10.36	-25.65	-6.61	-29.13	46.65	-27.02	62.51	8.25
L2	0:03:00		2.36	-5.10	0.65	-11.53	-6.28	-17.11	-10.64	-25.73	-6.76	-29.13	46.47	-26.94	62.40	8.11
L2	0:03:30		2.40	-5.17	0.47	-11.09	-6.07	-17.25	-10.32	-25.83	-6.83	-28.95	46.65	-26.94	62.51	8.43
L2	0:04:00		2.04	-5.07	0.47	-11.38	-6.97	-17.07	-10.36	-25.76	-6.68	-28.95	46.80	-26.66	62.65	8.76
L2	0:04:30		2.15	-5.17	0.68	-11.57	-7.04	-17.00	-9.85	-25.76	-6.61	-28.92	46.69	-26.69	62.51	8.29
L2	0:05:00		2.79	-4.11	2.48	-9.35	-4.22	-14.52	-6.99	-22.23	-1.96	-24.37	51.59	-19.25	66.98	20.55
L3	0:00:00		2.83	-3.72	3.12	-8.58	-2.82	-13.36	-4.69	-20.20	0.51	-21.90	53.46	-15.31	68.73	26.63
L3	0:00:30		3.51	-3.61	3.19	-8.33	-2.42	-12.93	-3.76	-19.63	1.09	-20.72	53.82	-13.98	68.70	28.04
L3	0:01:00		3.22	-3.47	3.30	-8.22	-2.49	-12.82	-3.58	-19.52	1.49	-20.43	54.08	-13.33	68.77	29.46
L3	0:01:30		3.83	-3.51	3.62	-7.89	-2.06	-12.68	-3.30	-19.27	1.67	-20.00	54.37	-12.93	69.06	30.29
L3	0:02:00		3.29	-2.98	3.48	-8.00	-2.53	-12.61	-3.19	-19.12	1.82	-19.86	54.41	-12.24	69.31	30.36
L3	0:02:30		3.83	-3.40	3.62	-8.00	-1.88	-12.43	-3.05	-18.76	1.96	-19.61	54.88	-11.92	69.06	31.08
L3	0:03:00		3.29	-3.44	3.62	-8.04	-2.38	-12.46	-2.94	-18.91	2.03	-19.65	54.66	-11.85	69.16	30.72
L3	0:03:30		3.86	-3.44	3.55	-8.00	-1.84	-12.50	-2.94	-18.73	2.03	-20.18	54.55	-11.85	69.09	30.69
L4	0:00:00		4.79	-2.06	5.56	-5.67	1.12	-9.54	0.97	-14.68	7.41	-14.21	59.89	-3.25	73.42	43.57
L4	0:00:00		4.90	-2.02	6.17	-4.98	2.24	-8.39	2.62	-12.66	9.52	-11.59	61.50	2.20	74.82	51.09
L4	0:00:30		5.19	-1.91	6.42	-4.55	1.77	-8.00	3.44	-12.01	10.21	-10.63	61.90	4.12	74.60	53.63
L4	0:01:00		5.29	-1.59	6.53	-4.40	2.60	-7.82	3.55	-11.73	10.39	-10.02	61.90	5.17	74.39	21.82
L4	0:01:30		4.69	-1.56	6.46	-4.58	2.46	-7.82	3.55	-11.76	10.43	-9.77	61.75	5.49	73.64	55.83
L4	0:02:00		5.08	-1.56	6.50	-4.51	2.85	-7.67	3.55	-11.69	10.61	-9.38	62.05	6.47	73.78	55.98
L4	0:02:30		5.47	-1.52	6.60	-4.47	3.07	-7.64	3.87	-11.51	10.83	-8.66	62.16	6.86	74.21	57.50
L4	0:03:00		4.76	-1.52	6.75	-4.44	2.92	-7.60	3.73	-11.44	10.79	-8.52	62.12	7.12	73.96	57.57
L4	0:03:30		5.08	-1.74	6.57	-4.44	3.14	-7.53	3.83	-11.26	10.86	-8.77	62.38	7.37	73.78	57.57
L4	0:04:00		6.12	-0.82	8.43	-2.65	5.16	-5.26	7.35	-8.05	15.04	-3.76	67.71	16.15	79.04	62.89
L5	0:00:00		6.44	-0.53	8.86	-2.07	5.02	-4.39	8.28	-6.42	16.49	-1.29	69.58	21.09	81.08	75.41
L5	0:00:30		6.15	-0.43	8.54	-2.04	6.28	-4.25	8.89	-6.28	16.57	-0.54	69.87	22.68	80.72	75.05
L5	0:01:00		6.19	-0.43	9.08	-1.82	5.81	-4.25	8.38	-6.06	16.57	-0.07	69.69	23.73	79.83	79.43

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L5	0:01:30		6.22	-0.21	9.11	-2.00	6.07	-4.07	8.60	-5.99	16.53	-0.04	69.65	24.38	79.68	79.28
L5	0:02:00		6.26	-0.11	8.86	-1.89	5.42	-4.14	8.89	-5.88	16.53	0.18	69.65	24.78	80.18	80.91
L5	0:02:30		6.26	-0.46	9.15	-1.89	6.25	-4.14	8.67	-5.77	16.42	0.64	69.76	24.96	80.04	80.77
L5	0:03:00		6.30	-0.32	9.15	-1.67	5.96	-4.07	8.74	-5.70	16.57	0.89	69.91	25.39	79.90	81.42
L5	0:03:30		6.22	-0.21	8.72	-1.85	6.36	-4.11	8.78	-5.70	16.49	0.97	69.95	25.36	79.93	81.35
L5	0:04:00		6.26	-0.43	9.22	-1.89	6.03	-4.03	8.71	-5.59	16.60	1.18	69.98	25.93	80.25	82.29
L5	0:04:30		6.30	0.11	9.26	-1.85	6.54	-3.85	9.10	-5.45	16.71	1.40	70.05	26.04	80.40	82.61
L5	0:05:00		6.47	0.00	9.22	-1.75	6.72	-3.89	9.17	-5.38	16.71	1.47	69.98	26.11	80.43	82.32
L6	0:00:00		6.76	0.25	9.65	-0.55	8.31	-2.52	10.89	-3.50	18.89	4.33	73.09	31.82	83.26	89.92
L6	0:00:00		6.98	0.50	9.98	-0.62	7.76	-2.27	11.47	-2.85	18.96	5.26	73.31	33.16	84.30	92.02
L6	0:00:30		7.23	0.43	10.23	-0.47	8.81	-2.13	11.61	-2.56	18.96	5.83	73.31	34.49	83.90	93.43
L6	0:01:00		7.23	0.39	10.23	-0.36	8.02	-2.13	11.22	-2.56	18.85	6.30	73.27	35.25	83.47	93.79
L6	0:01:30		6.80	0.71	10.23	-0.51	8.77	-2.16	11.50	-2.49	18.78	6.19	73.31	35.69	83.40	94.01
L6	0:02:00		6.76	0.35	10.23	-0.51	8.77	-2.13	11.22	-2.42	18.78	6.33	73.16	35.29	83.44	94.84
L6	0:02:30		7.19	0.25	9.90	-0.51	8.81	-2.13	11.54	-2.02	18.71	6.69	73.20	35.97	83.87	96.36
L6	0:03:00		6.90	0.21	10.01	-0.40	8.88	-2.13	11.50	-2.38	18.67	6.76	73.27	35.40	83.76	60.39
L6	0:03:30		6.87	0.32	10.01	-0.62	8.12	-2.09	11.54	-2.35	18.67	6.73	73.53	35.76	83.83	94.73
L6	0:04:00		6.98	0.53	10.55	-0.11	8.81	-1.55	12.33	-1.66	19.73	8.30	75.21	37.53	86.09	97.96
L7	0:00:00		7.51	0.99	10.98	0.69	10.11	-0.58	13.51	0.04	21.07	10.09	76.75	41.43	87.23	103.06
L7	0:00:30		7.26	0.99	11.02	0.73	10.29	-0.36	13.79	0.58	21.29	11.06	77.15	42.76	88.66	102.44
L7	0:01:00		7.23	0.85	10.77	0.73	10.04	-0.29	13.87	0.54	21.14	11.45	77.55	43.16	89.45	103.64
L7	0:01:30		7.19	0.96	10.66	0.40	10.40	-0.29	13.65	0.61	21.11	10.81	77.70	44.17	89.38	103.35
L7	0:02:00		7.40	0.85	10.77	0.62	10.15	-0.22	13.87	1.05	21.18	11.45	77.99	43.81	90.24	103.85
L7	0:02:30		7.40	0.78	10.77	0.40	10.22	-0.14	13.90	1.15	21.32	11.42	78.28	43.74	90.24	104.40
L7	0:03:00		7.37	0.96	11.02	0.76	10.40	-0.14	13.76	0.94	21.14	12.20	78.39	44.39	90.59	102.77
L7	0:03:30		7.15	0.92	10.98	0.65	10.18	-0.14	13.94	1.23	21.11	12.24	78.65	43.85	91.17	103.78
L7	0:04:00		7.15	0.82	10.66	0.65	10.22	-0.11	13.97	1.30	21.21	11.95	78.79	43.92	91.74	103.64
L7	0:04:30		7.58	1.17	11.30	0.95	10.33	0.43	14.65	2.02	22.20	13.13	80.29	45.40	93.06	20.95
L8	0:00:00		7.94	1.42	11.77	2.00	11.77	1.58	15.94	3.57	23.94	16.07	82.38	51.18	95.50	110.84
L8	0:00:00		7.91	1.59	11.70	2.15	12.10	1.91	16.45	4.15	24.23	17.14	82.74	51.69	96.39	113.77
L8	0:00:30		7.83	1.42	11.63	2.15	12.06	1.94	16.48	4.83	24.12	17.57	82.85	52.19	96.39	113.30
L8	0:01:00		7.80	1.70	11.70	2.18	12.17	2.05	16.59	4.62	24.16	17.93	83.22	52.59	97.18	113.55
L8	0:01:30		7.91	1.42	11.70	1.82	12.28	2.16	16.63	5.23	24.16	18.54	83.14	53.17	97.36	114.09
L8	0:02:00		7.76	1.74	11.66	1.82	12.13	2.20	16.63	5.34	24.05	18.64	83.29	53.13	97.75	114.35
L8	0:02:30		7.51	1.63	11.63	2.25	12.10	2.23	16.59	5.41	24.01	18.61	83.62	53.96	97.72	115.43
L8	0:03:00		7.51	1.35	11.59	1.89	12.21	2.27	16.59	5.56	24.12	18.86	83.29	53.56	98.07	115.04
L8	0:03:30		7.73	1.67	11.81	2.36	12.21	2.34	16.66	5.23	24.27	19.04	83.47	54.86	97.75	116.48
L8	0:04:00		7.48	1.56	11.95	1.93	12.39	2.34	16.77	5.30	24.08	19.04	83.29	54.79	98.00	116.37
L8	0:04:30		7.83	1.84	12.09	2.11	12.64	2.63	16.95	5.63	24.45	19.47	84.46	55.51	98.86	117.35
L9	0:00:00		8.01	2.37	12.63	3.09	13.76	4.00	18.95	7.94	26.74	22.47	85.67	60.03	101.26	123.86
L9	0:00:00		7.94	2.45	12.67	4.04	13.69	4.50	19.13	8.73	27.17	24.08	86.36	62.77	101.47	126.90
L9	0:00:30		8.23	2.45	12.60	4.04	14.05	4.65	19.38	9.02	26.99	24.62	86.14	63.28	101.69	127.16
L9	0:01:00		7.80	2.37	12.49	4.00	14.05	4.61	19.35	9.16	26.92	24.94	86.25	62.88	101.94	127.63

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L9	0:01:30		8.01	2.41	12.56	3.64	14.01	4.79	19.49	9.38	26.88	25.23	86.47	63.21	102.80	128.13
L9	0:02:00		8.16	2.37	12.56	4.11	14.19	4.79	19.31	9.53	26.99	25.48	86.69	63.82	102.15	128.61
L9	0:02:30		7.76	2.45	12.56	3.89	14.23	4.90	19.60	9.74	26.99	25.77	86.65	63.79	102.40	128.79
L9	0:03:00		7.73	1.98	12.52	3.71	14.19	4.86	19.53	9.71	26.85	25.84	86.40	63.53	102.87	128.64
L9	0:03:30		7.98	2.41	12.49	3.64	13.90	4.97	19.64	9.85	26.95	26.16	87.24	64.73	102.83	129.47
L9	0:04:00		7.91	1.98	12.45	3.67	14.26	4.97	19.35	9.96	26.88	26.16	87.02	64.94	102.58	129.44
L9	0:04:30		7.98	2.37	12.63	3.78	14.23	5.15	19.38	9.96	26.92	26.30	86.87	65.09	102.08	129.69
L9	0:05:00		7.91	2.37	12.45	3.71	14.30	5.08	19.67	10.03	26.85	26.30	86.36	65.45	101.54	130.34
L9	0:05:30		7.66	1.91	12.49	4.26	14.01	5.15	19.74	10.10	26.92	26.66	86.54	65.63	101.94	130.85
L9	0:06:00		7.91	1.91	12.63	3.82	13.94	5.15	19.71	10.14	26.88	26.52	86.69	66.24	101.69	131.07
L9	0:06:30		7.66	2.34	12.56	4.26	14.26	5.15	19.74	10.28	26.88	26.62	86.54	66.53	101.72	131.86
L9	0:07:00		7.66	2.41	12.52	3.86	14.37	5.22	19.53	10.35	26.99	26.95	86.54	66.53	101.62	131.97
L9	0:07:30		8.01	1.98	12.56	4.33	14.37	5.26	19.60	10.35	27.06	27.05	86.58	67.00	101.40	132.40
L9	0:08:00		7.91	2.02	12.56	4.40	14.05	5.26	19.92	10.50	26.99	27.20	86.14	66.57	101.51	132.84
L9	0:08:30		7.66	2.45	12.52	4.51	14.55	5.33	19.74	10.64	27.06	27.30	86.76	67.18	101.51	133.38
L9	0:09:00		7.94	2.45	12.42	4.47	14.19	5.37	20.10	10.72	27.14	27.34	86.14	67.76	101.15	134.03
L9	0:09:30		7.69	2.45	12.67	3.89	14.66	5.51	20.32	10.82	27.21	27.56	86.14	67.76	101.19	134.58
L9	0:10:00		7.73	2.06	12.77	4.62	14.84	5.62	20.50	11.08	27.50	27.95	86.76	69.06	100.58	136.17
L9	0:10:30		7.94	2.06	12.74	4.11	14.73	5.62	20.39	11.11	27.28	27.98	85.48	68.84	99.86	135.52
L9	0:11:00		7.66	2.48	12.67	4.51	14.70	5.58	20.35	11.00	27.14	27.81	85.52	68.84	100.15	135.30
L9	0:11:30		7.91	2.45	12.60	4.51	14.59	5.55	20.32	10.97	27.03	27.84	85.78	69.10	99.68	135.99
L9	0:12:00		7.62	1.98	12.63	3.96	14.62	5.44	20.24	10.93	26.95	27.77	85.48	69.10	99.50	135.77
L9	0:12:30		7.87	2.41	12.60	3.86	14.59	5.47	20.03	10.93	26.88	27.81	85.16	69.42	99.29	136.02
L9	0:13:00		7.83	2.02	12.56	3.82	14.55	5.47	20.07	10.90	26.81	27.91	85.08	69.60	99.83	136.28
L9	0:13:30		7.91	2.62	12.56	3.82	14.12	5.40	20.07	10.90	26.81	27.88	85.08	69.60	99.33	136.78
L9	0:14:00		7.58	2.41	12.63	4.51	14.19	5.40	19.78	10.97	26.77	28.06	85.23	69.89	99.18	137.11
L9	0:14:30		7.58	2.41	12.34	3.96	14.19	5.44	20.07	11.00	26.77	28.16	85.05	70.32	98.97	137.51
L9	0:15:00		7.98	2.37	12.56	4.51	14.62	5.47	20.07	11.00	26.77	28.24	85.05	70.32	99.15	137.58
L9	0:15:30		7.83	2.34	12.56	4.47	14.52	5.44	20.10	11.00	26.81	28.27	84.79	70.54	99.11	138.34
L9	0:16:00		7.58	2.34	12.60	4.55	14.66	5.51	20.14	11.08	26.81	28.34	84.90	70.68	98.04	138.45
L9	0:16:30		7.98	2.37	12.52	3.86	14.70	5.55	20.14	11.11	26.74	28.38	84.57	70.97	98.32	138.74
L9	0:17:00		7.58	2.62	12.60	4.26	14.70	5.47	20.14	11.08	26.77	28.49	84.57	70.97	97.97	139.06
L9	0:17:30		7.91	1.98	12.60	4.58	14.73	5.47	20.17	11.15	26.77	28.49	84.50	70.90	97.18	139.35
L9	0:18:00		7.62	2.37	12.70	3.89	14.34	5.58	20.17	11.26	26.81	28.45	84.86	71.26	97.29	140.08
L9	0:18:30		7.87	2.41	12.63	3.93	14.30	5.55	20.24	11.22	26.81	28.56	84.83	71.62	97.43	140.11
L9	0:19:00		7.87	2.41	12.74	3.93	14.66	5.55	20.32	11.29	26.81	28.84	84.28	71.84	96.96	140.76
L9	0:19:30		7.87	2.41	12.67	4.04	14.81	5.65	20.32	11.33	26.85	28.92	84.17	72.02	96.71	140.91
L9	0:20:00		7.62	2.37	12.67	4.40	14.73	5.62	20.35	11.40	26.81	28.99	84.20	72.35	96.82	141.38
L9	0:20:30		7.66	2.37	12.63	4.00	14.41	5.69	20.42	11.40	26.85	29.09	84.28	73.39	96.50	141.70
L9	0:21:00		8.08	2.06	12.70	4.62	14.48	5.73	20.39	11.47	26.85	29.13	84.13	73.63	96.28	142.46
L9	0:21:30		7.91	2.45	12.70	4.04	14.44	5.73	20.50	11.51	26.95	29.34	83.99	73.86	96.07	142.32
L9	0:22:00		7.69	2.41	12.52	4.47	14.88	5.73	20.53	11.62	26.88	29.34	83.84	73.94	95.78	142.68
L9	0:22:30		7.66	1.98	12.74	4.66	14.88	5.87	20.57	11.62	26.92	29.49	83.91	73.50	95.89	143.33

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L9	0:23:00		7.91	2.59	12.77	4.66	14.52	5.76	20.60	11.73	26.92	29.56	83.77	73.79	95.82	143.51
L9	0:23:30		7.98	2.45	12.77	4.18	14.55	5.87	20.64	11.73	26.95	29.67	84.06	73.90	95.78	143.88
L9	0:24:00		7.94	2.45	12.74	4.80	15.06	5.87	20.67	11.83	27.03	29.85	83.73	74.15	96.28	144.42
L9	0:24:30		7.94	2.45	12.81	4.15	15.09	5.87	20.71	11.87	27.03	29.92	83.73	74.30	96.25	144.06
L9	0:25:00		7.98	2.48	12.81	4.62	14.62	6.05	20.75	11.94	26.99	30.02	83.80	74.44	95.68	144.49
L9	0:25:30		7.69	2.52	12.85	4.26	14.52	6.02	20.78	12.01	27.03	30.10	83.66	74.30	95.57	145.29
L9	0:26:00		8.01	2.34	13.38	4.80	15.82	6.63	21.57	13.06	28.30	31.63	85.01	77.44	96.93	148.43
L10	0:00:00		8.23	3.05	13.71	5.71	16.43	7.46	22.75	14.14	29.21	33.35	84.97	79.97	96.89	152.05
L10	0:00:30		8.44	3.08	13.78	5.60	16.29	7.78	23.04	14.97	29.46	34.14	84.94	79.93	96.78	154.33
L10	0:01:00		8.44	3.05	13.74	5.64	16.61	7.82	22.57	15.12	29.35	34.61	85.23	82.97	96.50	155.67
L10	0:01:30		8.12	3.08	13.74	5.67	16.86	8.00	23.15	15.37	29.28	35.03	84.72	83.69	96.39	156.58
L10	0:02:00		8.37	3.05	13.71	5.96	16.83	8.03	23.15	15.55	29.21	35.61	84.79	84.27	96.18	157.95
L10	0:02:30		8.08	3.19	13.71	6.00	16.57	8.18	23.04	15.73	29.17	35.93	84.53	85.06	95.75	159.33
L10	0:03:00		8.08	3.19	13.71	5.82	16.21	8.28	23.15	15.91	29.17	36.22	84.79	85.49	95.35	158.93
L10	0:03:30		8.33	3.15	13.74	5.86	17.04	8.54	23.29	16.13	29.17	36.50	84.83	86.22	95.68	160.38
L10	0:04:00		8.05	3.08	13.71	6.36	17.01	8.43	23.29	16.31	29.21	36.61	84.39	86.32	94.60	160.38
L10	0:04:30		8.01	3.08	13.67	5.89	16.65	8.32	23.25	16.42	29.03	36.79	84.42	86.58	94.92	161.17
L10	0:05:00		8.33	3.05	13.60	5.89	16.50	8.46	23.22	16.34	29.06	37.11	84.35	87.05	94.75	161.75
L10	0:05:30		8.01	2.59	13.67	5.89	17.01	8.39	22.72	16.45	29.03	37.29	84.35	87.23	94.28	162.08
L10	0:06:00		8.26	2.62	13.67	5.93	17.12	8.54	22.75	16.49	28.99	20.54	84.09	87.59	94.53	163.02
L10	0:06:30		7.98	3.05	13.74	5.96	16.68	8.54	23.33	16.56	29.03	37.50	84.24	88.13	94.35	163.45
L10	0:07:00		7.98	2.59	13.71	6.18	16.68	8.50	22.82	16.71	29.06	37.61	84.31	88.17	94.32	163.71
L10	0:07:30		7.98	2.59	13.71	6.00	17.12	8.54	23.36	16.78	29.03	37.81	84.02	88.49	93.89	164.03
L10	0:08:00		7.94	2.59	13.71	6.22	17.22	8.57	23.40	16.81	29.10	37.61	83.95	88.64	93.56	164.25
L10	0:08:30		7.94	2.59	13.71	6.04	17.22	8.61	23.40	16.85	29.06	37.61	83.91	88.89	93.82	164.94
L10	0:09:00		8.16	2.59	13.71	6.22	17.15	8.64	23.43	16.92	29.06	37.61	83.95	89.29	93.74	165.19
L10	0:09:30		7.94	2.59	13.71	6.07	17.30	8.68	23.47	16.99	29.03	37.81	83.88	89.39	93.78	165.73
L10	0:10:00		7.94	2.62	13.71	6.26	17.19	8.68	23.47	16.99	29.03	38.00	83.69	89.58	93.56	166.09
L10	0:10:30		7.94	2.59	13.71	6.26	17.19	8.72	23.47	17.07	29.03	38.20	83.66	89.83	93.28	166.53
L10	0:11:00		8.16	2.62	13.71	6.07	17.22	8.72	23.51	17.10	29.06	38.20	83.69	90.19	93.17	166.71
L10	0:11:30		8.16	3.05	13.46	6.07	17.15	8.79	23.43	17.14	29.03	38.40	83.29	90.33	92.81	166.71
L10	0:12:00		7.87	3.15	13.64	6.22	17.22	8.75	23.40	17.10	28.92	38.40	83.14	90.04	92.63	166.96
L10	0:12:30		8.08	3.01	13.64	6.04	17.12	8.75	23.40	17.32	28.81	38.43	83.33	90.30	92.35	167.14
L10	0:13:00		8.08	3.05	13.60	6.04	17.22	8.64	23.33	17.03	28.77	38.43	83.14	90.84	92.46	167.76
L10	0:13:30		8.51	3.01	14.35	6.95	18.45	9.80	24.76	18.58	30.66	40.62	85.37	93.04	94.71	172.46
L11	0:00:00		8.69	3.61	14.71	7.78	19.28	10.99	26.01	20.17	31.90	42.94	85.37	98.32	94.21	179.30
L11	0:00:30		8.62	3.72	14.68	7.78	18.96	11.53	26.44	21.03	32.11	44.30	85.05	100.84	94.64	183.06
L11	0:00:30		8.55	3.76	14.60	8.26	19.54	11.78	26.59	21.50	32.26	45.63	85.19	102.07	93.06	185.45
L11	0:01:00		8.51	3.37	14.60	8.33	19.36	11.74	26.59	21.97	32.26	45.63	85.48	103.41	93.46	186.54
L11	0:01:30		8.44	3.72	14.60	8.29	19.36	12.32	26.66	22.37	32.37	46.13	85.05	104.35	92.13	188.78
L11	0:02:00		8.55	3.37	14.68	8.40	19.46	12.10	26.80	22.73	32.33	46.63	85.05	105.32	91.99	189.94
L11	0:02:30		8.33	3.72	14.60	8.22	19.75	12.39	26.87	22.84	32.19	47.02	84.75	105.58	91.85	190.59
L11	0:03:00		8.30	3.72	14.60	8.26	19.79	12.35	26.84	22.91	32.15	47.02	85.01	107.60	91.63	191.03

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L11	0:03:30	8.30	3.79	14.53	8.33	19.86	12.64	26.94	23.09	32.26	47.31	85.16	106.59	91.60	191.68	
L11	0:04:00	8.01	3.33	14.57	8.33	19.64	12.46	26.91	23.13	32.19	47.24	84.79	108.86	91.13	192.22	
L11	0:04:30	8.26	4.04	15.00	8.84	20.51	13.22	27.73	23.96	33.02	48.56	86.36	108.97	92.46	195.19	
L11	0:05:00	8.55	4.29	15.39	10.22	20.44	14.91	29.67	26.77	35.71	52.21	86.76	115.87	93.10	204.34	
L12	0:00:00	8.73	4.36	15.29	10.51	20.76	15.85	30.17	28.07	36.18	54.22	87.02	119.77	92.74	209.44	
L12	0:00:00	8.51	4.18	15.32	10.73	21.96	16.14	30.28	28.65	36.18	55.61	86.33	121.65	93.14	212.12	
L12	0:00:30	8.37	4.36	15.21	10.51	21.96	16.32	30.31	28.97	36.36	55.97	86.14	122.52	91.95	213.39	
L12	0:01:00	8.33	4.18	15.11	10.91	22.10	16.57	30.42	29.87	36.84	53.43	86.73	123.74	91.70	214.91	
L12	0:01:30	7.98	4.18	15.04	10.76	22.10	16.75	30.42	29.69	36.00	55.38	86.33	124.47	91.53	215.31	
L12	0:02:00	8.19	4.15	15.11	10.95	22.06	16.78	30.42	29.84	36.62	54.02	86.11	124.76	91.35	215.99	
L12	0:02:30	8.12	4.57	15.11	11.16	22.14	16.86	30.42	30.74	35.82	56.95	85.67	125.26	91.13	216.54	
L12	0:03:00	7.87	4.18	15.18	11.13	22.06	17.07	30.56	31.03	35.96	58.12	85.96	126.52	91.06	217.48	
L12	0:03:30	8.08	4.15	15.18	10.91	21.23	17.07	30.53	31.17	35.78	58.01	85.56	126.85	91.02	217.80	
L12	0:04:00	8.19	4.78	15.00	10.91	22.14	17.11	30.46	30.49	36.47	58.19	85.45	127.39	91.10	218.20	
L12	0:04:30	7.80	4.15	15.14	11.24	22.21	17.29	30.56	30.88	35.85	58.51	85.89	127.36	90.88	218.78	
L12	0:05:00	7.83	4.39	15.11	11.31	21.77	17.65	30.67	30.92	35.89	58.55	85.92	127.86	90.74	219.36	
L12	0:05:30	8.12	4.22	15.21	11.38	22.24	17.50	30.78	31.35	35.96	59.15	85.89	128.19	91.06	220.01	
L12	0:06:00	7.73	4.18	15.11	11.35	22.24	17.50	30.78	31.35	35.89	59.12	85.37	128.73	89.92	219.65	
L12	0:06:30	7.73	4.15	15.04	11.31	21.34	17.47	30.64	31.21	36.44	59.12	85.26	128.58	90.20	220.16	
L12	0:07:00	7.69	4.15	15.04	11.35	21.31	17.61	30.67	31.25	35.60	59.26	85.01	128.76	90.42	220.59	
L12	0:07:30	7.69	4.15	15.11	11.35	22.24	17.54	30.67	32.29	35.64	59.30	85.23	128.94	89.81	220.95	
L12	0:08:00	7.91	4.15	15.04	11.20	21.34	17.72	30.67	31.61	35.71	59.51	85.34	129.38	89.92	221.24	
L12	0:08:30	7.94	4.36	15.14	11.16	21.67	18.05	30.67	31.75	36.51	60.30	85.56	129.67	90.42	221.64	
L12	0:09:00	7.98	4.18	15.07	11.49	22.32	18.15	30.71	32.58	35.85	59.98	85.41	129.81	89.92	221.71	
L12	0:09:30	7.91	4.39	15.07	11.53	22.35	17.79	30.85	31.97	35.89	60.01	85.30	129.88	90.02	222.25	
L12	0:10:00	7.91	4.18	15.14	11.57	22.42	18.01	30.81	32.04	36.65	60.76	85.45	130.21	89.99	222.40	
L12	0:10:30	7.91	4.54	15.07	11.60	22.39	17.94	30.81	32.22	35.85	59.98	85.16	130.43	89.84	222.54	
L12	0:11:00	7.91	4.61	15.07	11.64	22.61	18.41	30.92	32.26	36.04	60.51	85.26	131.26	90.42	223.09	
L12	0:11:30	7.87	4.39	15.14	11.64	21.23	18.05	30.99	32.98	36.11	60.66	85.52	130.90	90.31	223.41	
L12	0:12:00	7.91	4.22	15.11	11.71	21.31	18.12	30.99	32.58	36.18	60.87	85.34	132.05	90.34	223.63	
L12	0:12:30	7.87	4.22	15.18	11.53	22.28	18.19	30.99	32.51	37.13	60.98	85.37	131.36	90.38	223.88	
L12	0:13:00	7.62	4.32	15.18	11.82	22.57	18.26	31.10	33.23	36.91	61.34	85.45	131.55	90.27	224.35	
L12	0:13:30	7.94	4.57	15.14	11.60	21.41	18.37	31.24	33.30	36.40	61.48	85.74	131.73	90.67	224.53	
L13	0:00:00	8.23	5.17	16.18	13.38	24.84	21.14	34.58	36.59	40.29	65.56	89.43	138.70	93.89	233.62	
L13	0:00:00	8.51	5.53	15.93	14.33	24.74	22.98	35.58	39.00	41.81	69.07	89.65	144.84	94.96	241.22	
L13	0:00:00	8.23	5.46	15.79	15.09	25.31	24.56	36.19	41.38	43.05	71.07	93.09	146.32	99.68	242.27	
L13	0:00:30	8.19	5.85	15.68	15.38	25.60	25.32	36.80	42.97	44.97	72.36	97.77	145.74	106.48	240.17	
L13	0:01:00	7.62	5.92	15.79	16.33	26.18	25.90	37.48	43.98	45.95	73.29	101.61	144.55	112.89	237.49	
L13	0:01:30	7.55	5.99	15.65	16.62	25.67	26.80	37.80	44.38	46.79	73.65	105.63	143.14	117.86	234.88	
L13	0:02:00	7.55	6.20	15.72	17.02	26.40	27.23	38.48	45.71	47.73	74.40	107.17	142.81	121.12	234.30	
L13	0:02:30	7.48	6.38	15.50	16.77	26.25	27.45	38.41	45.64	48.06	73.40	108.41	142.09	123.15	233.07	
L13	0:03:00	7.15	6.17	15.57	16.91	26.18	29.10	38.73	46.62	48.90	75.79	110.42	142.27	125.77	232.71	
L13	0:03:30	7.08	6.20	15.61	17.35	26.40	28.53	39.09	46.87	49.44	74.43	111.74	142.13	127.56	232.39	

Table C.2 Calculated Strain, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
U1	0:00:00		0.21	0.32	0.90	0.95	1.73	2.20	3.12	4.73	1.53	8.91	-3.03	29.98	-13.10	38.61
U1	0:00:30		0.07	-0.18	0.36	0.51	0.97	1.04	1.79	2.49	1.27	3.90	-2.49	17.08	-8.23	19.69
U1	0:01:00		-0.04	-0.25	0.18	0.55	0.07	0.76	1.54	1.52	1.05	2.58	-1.39	12.39	-5.62	13.39
U1	0:01:30		0.00	-0.04	0.11	0.15	0.07	0.65	1.22	1.55	1.13	2.15	-0.95	10.11	-4.51	11.87
U1	0:02:00		-0.04	-0.07	0.18	0.33	0.47	0.50	1.22	1.08	0.91	2.22	-0.88	8.67	-3.83	10.49
U1	0:02:30		-0.04	-0.21	0.14	0.29	0.40	0.43	1.11	1.19	0.80	1.65	-0.69	7.48	-3.86	9.34
U1	0:03:00		-0.21	-0.04	0.07	0.29	-0.11	0.36	0.93	1.01	0.84	1.79	-0.33	6.39	-3.33	7.85
U1	0:03:30		-0.04	-0.14	0.00	0.25	-0.14	0.36	0.97	1.01	0.62	1.54	-0.33	5.71	-2.18	6.69
U1	0:04:00		0.04	-0.04	0.11	0.25	0.25	0.29	0.86	0.65	0.87	1.36	-0.22	5.02	-2.11	6.48
U1	0:04:30		-0.07	0.28	0.07	0.07	0.00	0.29	0.68	0.61	0.58	1.22	-0.26	4.41	-1.90	5.28
U1	0:05:00		0.04	-0.04	0.11	0.25	-0.40	0.25	0.72	0.54	0.47	1.25	-0.18	3.90	-1.75	5.65
U1	0:05:30		-0.04	-0.04	0.11	0.25	0.07	0.25	0.68	0.47	0.73	0.97	-0.07	3.36	-1.61	5.28
U1	0:06:00		-0.11	-0.04	-0.04	0.11	-0.25	0.22	0.64	0.51	0.58	0.89	-0.04	3.07	-1.72	5.36
U1	0:06:30		-0.04	-0.18	0.00	0.07	0.04	0.18	0.64	0.65	0.40	1.00	-0.07	2.78	-1.32	4.81
U1	0:07:00		-0.04	0.35	0.00	0.11	0.14	0.18	0.29	0.61	0.54	0.68	0.00	2.56	-1.32	4.34
U1	0:07:30		-0.11	-0.04	0.00	0.11	-0.32	0.14	0.47	0.32	0.40	0.61	0.18	2.31	-1.04	3.94
U1	0:08:00		0.04	-0.18	-0.04	0.22	0.14	0.11	0.29	0.54	0.25	0.57	0.04	2.17	-1.11	3.37
U1	0:08:30		-0.04	0.00	0.04	0.04	-0.51	0.11	0.50	0.25	0.36	0.50	0.04	2.02	-0.97	3.22
U1	0:09:00		0.07	0.00	0.04	0.04	-0.51	0.11	0.54	0.51	0.22	0.47	0.11	1.84	-0.75	3.11
U1	0:09:30		0.07	0.00	0.04	0.04	0.07	0.11	0.50	0.25	0.22	0.50	0.15	1.77	-0.68	3.00
U1	0:10:00		0.07	0.00	0.04	0.04	-0.54	0.11	0.50	0.47	0.18	0.39	0.07	1.52	-0.68	2.71
U1	0:10:30		0.07	0.00	0.04	0.04	-0.51	0.11	0.50	0.43	0.15	0.39	0.04	1.41	-0.64	2.57
U1	0:11:00		0.00	0.00	0.04	0.22	0.07	0.07	0.14	0.18	0.15	0.39	0.04	1.23	-0.50	2.32
U1	0:11:30		0.07	0.00	0.04	0.04	-0.54	0.07	0.11	0.14	0.11	0.29	0.04	1.08	-0.47	2.06
U1	0:12:00		0.07	0.00	0.04	0.00	0.04	0.07	0.43	0.36	0.11	0.25	0.00	0.94	-0.43	1.85
U1	0:12:30		-0.04	0.00	0.04	0.22	0.04	0.04	0.39	0.11	0.07	0.21	-0.04	0.83	-0.50	1.70
U1	0:13:00		0.00	0.00	0.04	0.00	0.04	0.04	0.39	0.32	0.07	0.18	0.00	0.72	-0.47	1.48
U1	0:13:30		-0.04	0.00	0.00	0.00	0.00	0.00	0.36	0.29	0.04	0.14	0.04	0.51	-0.29	0.83
U1	0:14:00		-0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.29	0.04	0.11	0.00	0.40	-0.32	0.65
U1	0:14:30		-0.04	0.00	0.00	0.00	-0.61	0.00	0.32	0.25	0.04	0.11	-0.04	0.33	-0.29	0.62
U1	0:15:00		0.00	0.00	0.00	0.00	-0.61	0.00	0.32	0.25	0.04	0.07	0.00	0.22	-0.18	0.47
U1	0:15:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table C.3 Calculated Strain, 4 Minute Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L0	0:00:00		-1.18	-8.08	-5.13	-17.60	-16.39	-26.15	-25.19	-38.24	-26.66	-46.24	16.67	-60.17	32.85	-51.60
L1	0:04:00		1.29	-5.78	-0.72	-13.02	-8.70	-19.52	-14.26	-28.86	-10.75	-34.57	42.08	-35.69	57.03	-3.91
L2	0:04:00		2.04	-5.07	0.47	-11.38	-6.97	-17.07	-10.36	-25.76	-6.68	-28.95	46.80	-26.66	62.65	8.76
L3	0:03:30		3.86	-3.44	3.55	-8.00	-1.84	-12.50	-2.94	-18.73	2.03	-20.18	54.55	-11.85	69.09	30.69
L4	0:04:00		6.12	-0.82	8.43	-2.65	5.16	-5.26	7.35	-8.05	15.04	-3.76	67.71	16.15	79.04	62.89
L5	0:04:00		6.26	-0.43	9.22	-1.89	6.03	-4.03	8.71	-5.59	16.60	1.18	69.98	25.93	80.25	82.29
L6	0:04:00		6.98	0.53	10.55	-0.11	8.81	-1.55	12.33	-1.66	19.73	8.30	75.21	37.53	86.09	97.96
L7	0:04:00		7.15	0.82	10.66	0.65	10.22	-0.11	13.97	1.30	21.21	11.95	78.79	43.92	91.74	103.64
L8	0:04:00		7.48	1.56	11.95	1.93	12.39	2.34	16.77	5.30	24.08	19.04	83.29	54.79	98.00	116.37
L9	0:04:00		7.91	1.98	12.45	3.67	14.26	4.97	19.35	9.96	26.88	26.16	87.02	64.94	102.58	129.44
L9	0:08:00		7.91	2.02	12.56	4.40	14.05	5.26	19.92	10.50	26.99	27.20	86.14	66.57	101.51	132.84
L9	0:16:00		7.58	2.34	12.60	4.55	14.66	5.51	20.14	11.08	26.81	28.34	84.90	70.68	98.04	138.45
L10	0:04:00		8.05	3.08	13.71	6.36	17.01	8.43	23.29	16.31	29.21	36.61	84.39	86.32	94.60	160.38
L10	0:08:00		7.94	2.59	13.71	6.22	17.22	8.57	23.40	16.81	29.10	37.61	83.95	88.64	93.56	164.25
L11	0:04:00		8.01	3.33	14.57	8.33	19.64	12.46	26.91	23.13	32.19	47.24	84.79	108.86	91.13	192.22
L12	0:04:00		8.19	4.78	15.00	10.91	22.14	17.11	30.46	30.49	36.47	58.19	85.45	127.39	91.10	218.20
L12	0:08:00		7.91	4.15	15.04	11.20	21.34	17.72	30.67	31.61	35.71	59.51	85.34	129.38	89.92	221.24
L13	0:03:30		7.08	6.20	15.61	17.35	26.40	28.53	39.09	46.87	49.44	74.43	111.74	142.13	127.56	232.39
U1	0:00:00		0.21	0.32	0.90	0.95	1.73	2.20	3.12	4.73	1.53	8.91	-3.03	29.98	-13.10	38.61
U1	0:04:00		0.04	-0.04	0.11	0.25	0.25	0.29	0.86	0.65	0.87	1.36	-0.22	5.02	-2.11	6.48
U1	0:08:00		0.04	-0.18	-0.04	0.22	0.14	0.11	0.29	0.54	0.25	0.57	0.04	2.17	-1.11	3.37
U1	0:15:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table C.4 Average Calculated Strain, 4 Minute Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+45.00	+22.00	+10.00	+0.00	-8.00	-16.00	-25.00	-29.00	-34.00
L0	0:00:00	0.00	-4.63	-11.37	-21.27	-31.72	-36.45	-21.75	-9.38	0.00
L1	0:04:00	0.00	-2.24	-6.87	-14.11	-21.56	-22.66	3.20	26.56	44.23
L2	0:04:00	0.00	-1.51	-5.46	-12.02	-18.06	-17.82	10.07	35.70	96.14
L3	0:03:30	0.00	0.21	-2.22	-7.17	-10.83	-9.07	21.35	49.89	121.16
L4	0:04:00	0.00	2.65	2.89	-0.05	-0.35	5.64	41.93	70.96	163.95
L5	0:04:00	0.00	2.92	3.67	1.00	1.56	8.89	47.96	81.27	172.97
L6	0:04:00	0.00	3.75	5.22	3.63	5.33	14.01	56.37	92.02	189.66
L7	0:04:00	0.00	3.98	5.66	5.06	7.64	16.58	61.36	97.69	205.07
L8	0:04:00	0.00	4.52	6.94	7.36	11.04	21.56	69.04	107.19	220.25
L9	0:04:00	0.00	4.95	8.06	9.62	14.65	26.52	75.98	116.01	236.68
L9	0:08:00	0.00	4.96	8.48	9.65	15.21	27.09	76.35	117.17	237.26
L9	0:16:00	0.00	4.96	8.57	10.09	15.61	27.58	77.79	118.24	236.57
L10	0:04:00	0.00	5.57	10.04	12.72	19.80	32.91	85.36	127.49	251.92
L10	0:08:00	0.00	5.26	9.96	12.90	20.11	33.35	86.29	128.91	253.85
L11	0:04:00	0.00	5.67	11.45	16.05	25.02	39.71	96.83	141.68	268.69
L12	0:04:00	0.00	6.49	12.95	19.62	30.47	47.33	106.42	154.65	283.52
L12	0:08:00	0.00	6.03	13.12	19.53	31.14	47.61	107.36	155.58	284.11
L13	0:03:30	0.00	6.64	16.48	27.46	42.98	61.94	126.93	179.97	304.40
U1	0:00:00	0.00	0.27	0.92	1.97	3.92	5.22	13.47	12.76	0.00
U1	0:04:00	0.00	0.00	0.18	0.27	0.75	1.12	2.40	2.18	0.00
U1	0:08:00	0.00	-0.07	0.09	0.13	0.41	0.41	1.10	1.13	0.00
U1	0:15:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ground
Surface

Top of
Bottom Cell

Table C.5 Shaft Load, 4 Minute Readings, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Shaft Load, tons								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+45.00	+22.00	+10.00	+0.00	-8.00	-16.00	-25.00	-29.00	-34.00
L0	0:00:00	0.00	-26.70	-65.55	-122.67	-182.63	-209.88	-128.75	-55.51	0.0
L1	0:04:00	0.00	-12.94	-39.61	-81.38	-124.16	-130.49	18.94	157.24	261.8
L2	0:04:00	0.00	-8.73	-31.48	-69.32	-103.98	-102.60	59.62	211.35	569.1
L3	0:03:30	0.00	1.23	-12.83	-41.35	-62.37	-52.25	126.40	295.32	717.2
L4	0:04:00	0.00	15.29	16.66	-0.27	-2.02	32.48	248.21	420.08	970.5
L5	0:04:00	0.00	16.82	21.14	5.76	8.97	51.20	283.89	481.09	1023.9
L6	0:04:00	0.00	21.65	30.10	20.94	30.71	80.69	333.68	544.72	1122.7
L7	0:04:00	0.00	22.98	32.62	29.15	43.97	95.49	363.21	578.27	1213.9
L8	0:04:00	0.00	26.05	40.01	42.46	63.55	124.15	408.70	634.50	1303.8
L9	0:04:00	0.00	28.52	46.49	55.46	84.38	152.71	449.77	686.72	1401.0
L9	0:08:00	0.00	28.62	48.90	55.66	87.59	156.01	451.99	693.61	1404.5
L9	0:16:00	0.00	28.61	49.42	58.16	89.87	158.79	460.49	699.94	1400.4
L10	0:04:00	0.00	32.10	57.87	73.34	114.01	189.49	505.27	754.68	1491.2
L10	0:08:00	0.00	30.36	57.45	74.38	115.77	192.06	510.81	763.07	1502.7
L11	0:04:00	0.00	32.71	66.02	92.57	144.06	228.67	573.17	838.66	1590.5
L12	0:04:00	0.00	37.41	74.71	113.15	175.46	272.53	629.96	915.45	1678.3
L12	0:08:00	0.00	34.75	75.65	112.63	179.30	274.15	635.51	920.95	1681.8
L13	0:03:30	0.00	38.30	95.03	158.36	247.48	356.65	751.38	1065.35	1801.9
U1	0:00:00	0.00	1.54	5.31	11.33	22.58	30.05	79.75	75.52	0.0
U1	0:04:00	0.00	0.00	1.04	1.56	4.35	6.43	14.21	12.92	0.0
U1	0:08:00	0.00	-0.41	0.53	0.73	2.38	2.38	6.52	6.68	0.0
U1	0:15:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Modulus, ksi		3820	3820	3820	3820	3815	3815	3798	3798	3798
Diameter, in		62.00	62.00	62.00	62.00	62.00	62.00	63.00	63.00	63.00

Top of
Shaft

Top of
Bottom cell

Table C.6 Average Segment Side Shear, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf								
		CL Elev., ft	+33.50	+16.00	+5.00	-4.00	-12.00	-20.50	-27.00	-31.50
		Length, ft	23.00	12.00	10.00	8.00	8.00	9.00	4.00	5.00
L0	0:00:00		-0.13	-0.26	-0.41	-0.52	-0.27	0.49	1.05	0.62
L1	0:04:00		-0.09	-0.19	-0.31	-0.39	-0.11	0.96	2.04	1.21
L2	0:04:00		-0.08	-0.17	-0.29	-0.32	-0.05	1.04	2.24	4.28
L3	0:03:30		-0.05	-0.13	-0.23	-0.22	0.02	1.16	2.50	5.06
L4	0:04:00		-0.02	-0.05	-0.16	-0.07	0.21	1.41	2.55	6.62
L5	0:04:00		-0.01	-0.03	-0.15	-0.03	0.27	1.52	2.93	6.52
L6	0:04:00		0.00	-0.01	-0.11	0.02	0.33	1.66	3.14	6.95
L7	0:04:00		0.00	-0.01	-0.08	0.06	0.34	1.76	3.20	7.65
L8	0:04:00		0.01	0.02	-0.04	0.11	0.41	1.88	3.37	8.06
L9	0:04:00		0.02	0.04	0.00	0.17	0.47	1.96	3.53	8.60
L9	0:08:00		0.02	0.05	-0.01	0.19	0.47	1.95	3.61	8.56
L9	0:16:00		0.02	0.05	0.00	0.19	0.47	1.99	3.57	8.44
L10	0:04:00		0.03	0.08	0.04	0.26	0.52	2.09	3.72	8.87
L10	0:08:00		0.02	0.08	0.05	0.26	0.53	2.11	3.77	8.91
L11	0:04:00		0.03	0.11	0.11	0.34	0.59	2.28	3.97	9.06
L12	0:04:00		0.04	0.13	0.18	0.42	0.69	2.37	4.27	9.19
L12	0:08:00		0.04	0.15	0.17	0.46	0.67	2.40	4.27	9.17
L13	0:03:30		0.05	0.23	0.33	0.63	0.78	2.62	4.70	8.87
U1	0:00:00		-0.05	-0.04	-0.02	0.03	0.00	0.28	-0.12	-0.97
U1	0:04:00		-0.06	-0.05	-0.05	-0.04	-0.04	0.00	-0.08	-0.21
U1	0:08:00		-0.06	-0.05	-0.06	-0.04	-0.06	-0.03	-0.06	-0.14
U1	0:15:30		-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
Segment Wt., tons			21.12	11.02	9.18	7.35	7.35	8.40	3.79	4.74
Maximum Shear, tsf			0.05	0.23	0.33	0.63	0.78	2.62	4.70	9.19

Table C.7 Average Segment Compression and Comparison with Teltale Measurement, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain									Shaft Compression				
		CL Elev., ft	+33.50	+16.00	+5.00	-4.00	-12.00	-20.50	-27.00	-31.50	Strain Gage		TT in	Error in	Error %
		Length, ft	23.00	12.00	10.00	8.00	8.00	9.00	4.00	5.00	Net, in	Change, in			
L0	0:00:00	-2.32	-8.00	-16.32	-26.49	-34.08	-29.10	-15.56	-4.69	-0.0137	0.0000	0.0000	0.0000		
L1	0:04:00	-1.12	-4.56	-10.49	-17.84	-22.11	-9.73	14.88	35.40	-0.0043	0.0095	0.0000	0.0095		
L2	0:04:00	-0.76	-3.49	-8.74	-15.04	-17.94	-3.87	22.89	65.92	-0.0003	0.0134	0.0002	0.0133	8863.9%	
L3	0:03:30	0.11	-1.01	-4.70	-9.00	-9.95	6.14	35.62	85.52	0.0050	0.0187	0.0006	0.0181	3023.5%	
L4	0:04:00	1.33	2.77	1.42	-0.20	2.65	23.79	56.45	117.46	0.0135	0.0272	0.0020	0.0253	1296.5%	
L5	0:04:00	1.46	3.29	2.33	1.28	5.22	28.42	64.61	127.12	0.0156	0.0293	0.0028	0.0266	966.0%	
L6	0:04:00	1.88	4.49	4.43	4.48	9.67	35.19	74.19	140.84	0.0189	0.0326	0.0036	0.0291	818.4%	
L7	0:04:00	1.99	4.82	5.36	6.35	12.11	38.97	79.52	151.38	0.0208	0.0345	0.0043	0.0302	702.4%	
L8	0:04:00	2.26	5.73	7.15	9.20	16.30	45.30	88.11	163.72	0.0237	0.0374	0.0053	0.0321	606.3%	
L9	0:04:00	2.47	6.50	8.84	12.14	20.59	51.25	96.00	176.34	0.0265	0.0403	0.0064	0.0339	534.3%	
L9	0:08:00	2.48	6.72	9.07	12.43	21.15	51.72	96.76	177.22	0.0268	0.0406	0.0065	0.0341	528.9%	
L9	0:16:00	2.48	6.77	9.33	12.85	21.59	52.68	98.02	177.41	0.0271	0.0409	0.0067	0.0342	509.8%	
L10	0:04:00	2.78	7.80	11.38	16.26	26.35	59.13	106.42	189.70	0.0302	0.0440	0.0077	0.0363	474.6%	
L10	0:08:00	2.63	7.61	11.43	16.50	26.73	59.82	107.60	191.38	0.0305	0.0442	0.0078	0.0364	470.2%	
L11	0:04:00	2.84	8.56	13.75	20.54	32.36	68.27	119.25	205.18	0.0342	0.0479	0.0091	0.0388	426.2%	
L12	0:04:00	3.24	9.72	16.29	25.05	38.90	76.87	130.53	219.09	0.0381	0.0518	0.0107	0.0411	384.5%	
L12	0:08:00	3.01	9.57	16.32	25.33	39.37	77.48	131.47	219.85	0.0383	0.0520	0.0110	0.0410	374.8%	
L13	0:03:30	3.32	11.56	21.97	35.22	52.46	94.44	153.45	242.18	0.0457	0.0595	0.0144	0.0451	314.4%	
U1	0:00:00	0.13	0.59	1.44	2.94	4.57	9.35	13.11	6.38	0.0030	0.0168	0.0109	0.0059	54.6%	
U1	0:04:00	0.00	0.09	0.23	0.51	0.94	1.76	2.29	1.09	0.0005	0.0143				
U1	0:08:00	-0.04	0.01	0.11	0.27	0.41	0.76	1.11	0.56	0.0002	0.0140				
U1	0:15:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0137				

Table C.8 Movement at Segment Centerline, Shaft 11 - 1996

Load Interval	Elapsed Time hhmmss	Segment Movement, in									Top Bot Cell
		CL Elev., ft	+33.50	+16.00	+5.00	-4.00	-12.00	-20.50	-27.00	-31.50	-34.00
		Length, ft	23.00	12.00	10.00	8.00	8.00	9.00	4.00	5.00	-
L0	0:00:00		0.013	0.013	0.011	0.009	0.006	0.003	0.001	0.000	0.000
L1	0:04:00		0.022	0.021	0.020	0.019	0.017	0.015	0.015	0.016	0.017
L2	0:04:00		0.039	0.039	0.038	0.037	0.035	0.034	0.034	0.037	0.039
L3	0:03:30		0.058	0.058	0.058	0.057	0.056	0.056	0.057	0.061	0.063
L4	0:04:00		0.086	0.086	0.087	0.087	0.087	0.088	0.091	0.096	0.099
L5	0:04:00		0.112	0.112	0.113	0.113	0.113	0.115	0.118	0.123	0.127
L6	0:04:00		0.135	0.136	0.137	0.137	0.138	0.140	0.144	0.150	0.154
L7	0:04:00		0.163	0.164	0.165	0.165	0.166	0.169	0.173	0.179	0.184
L8	0:04:00		0.204	0.204	0.205	0.206	0.207	0.211	0.215	0.222	0.227
L9	0:04:00		0.252	0.253	0.254	0.255	0.257	0.261	0.266	0.273	0.279
L9	0:08:00		0.261	0.262	0.263	0.264	0.266	0.270	0.275	0.282	0.288
L9	0:16:00		0.272	0.273	0.274	0.275	0.277	0.281	0.286	0.294	0.299
L10	0:04:00		0.318	0.319	0.320	0.322	0.324	0.328	0.334	0.342	0.348
L10	0:08:00		0.331	0.332	0.333	0.334	0.336	0.341	0.347	0.355	0.361
L11	0:04:00		0.408	0.409	0.411	0.413	0.415	0.421	0.427	0.436	0.442
L12	0:04:00		0.521	0.522	0.524	0.526	0.529	0.535	0.542	0.552	0.559
L12	0:08:00		0.539	0.540	0.542	0.544	0.547	0.554	0.561	0.571	0.577
L13	0:03:30		0.787	0.788	0.790	0.793	0.798	0.805	0.814	0.825	0.832
U1	0:00:00		0.763	0.763	0.763	0.763	0.764	0.764	0.765	0.766	0.766

Table C.9 Section Properties, Shaft 11 - 1996

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	16	1.561	24.983
3/4" Galvanized Steel Teltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			28.927

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	4	4.431	17.724
Area of Pipe =			19.492

131

Concrete Modulus 3600 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
45	62	3019.07	28.93	19.49	2970.65	3820.13	4PVC pipe, 4hose
-4	62	3019.07	28.26	19.49	2971.32	3814.52	4PVC pipe, 4hose
-21	63	3117.25	26.93	18.61	3071.71	3797.94	4PVC pipe, 2hose

Figure C.1 Shaft Top VW Strain, Shaft 11 - 1996

132

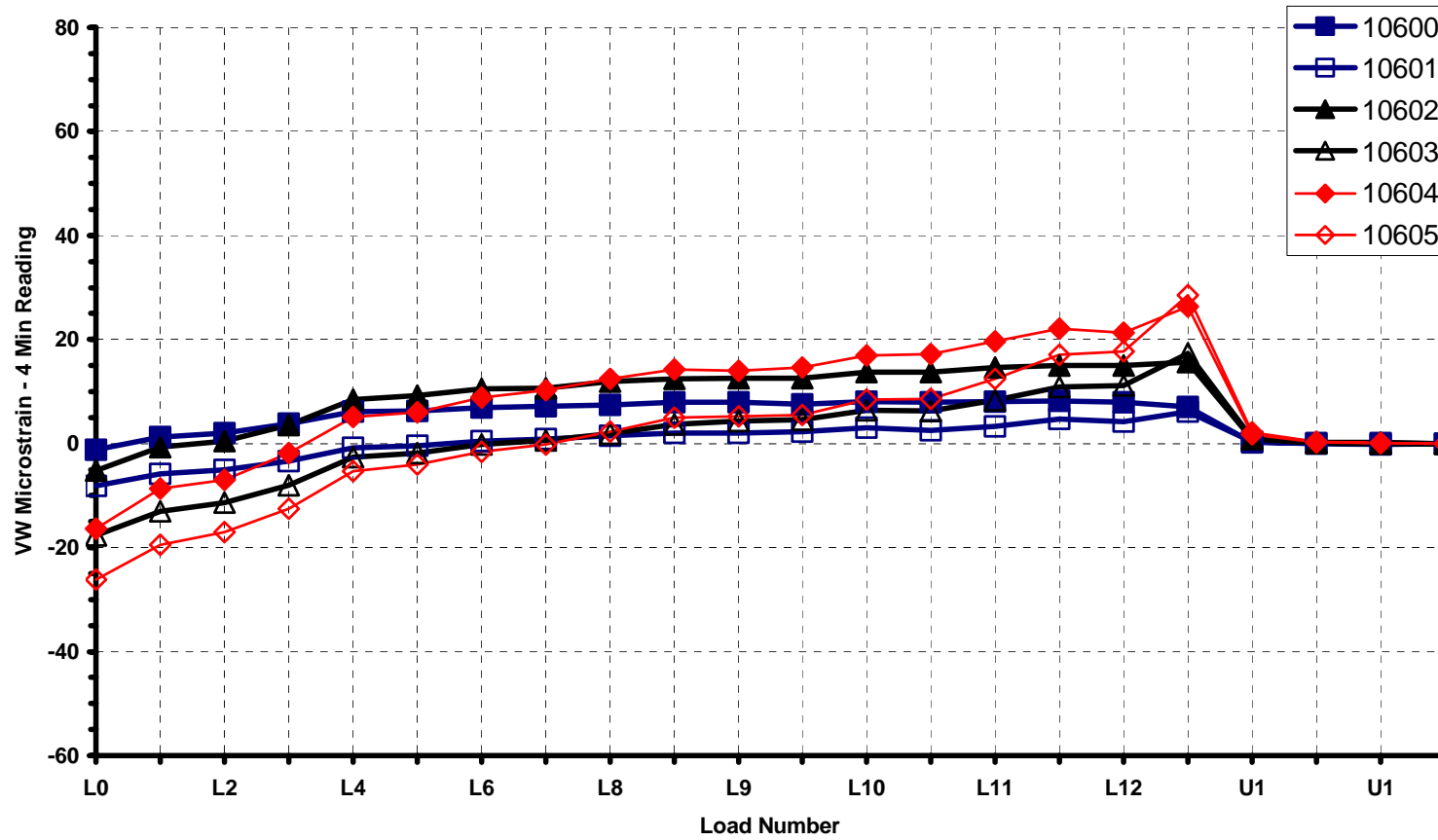


Figure C.2 Shaft Middle VW Strain, Shaft 11 -1996

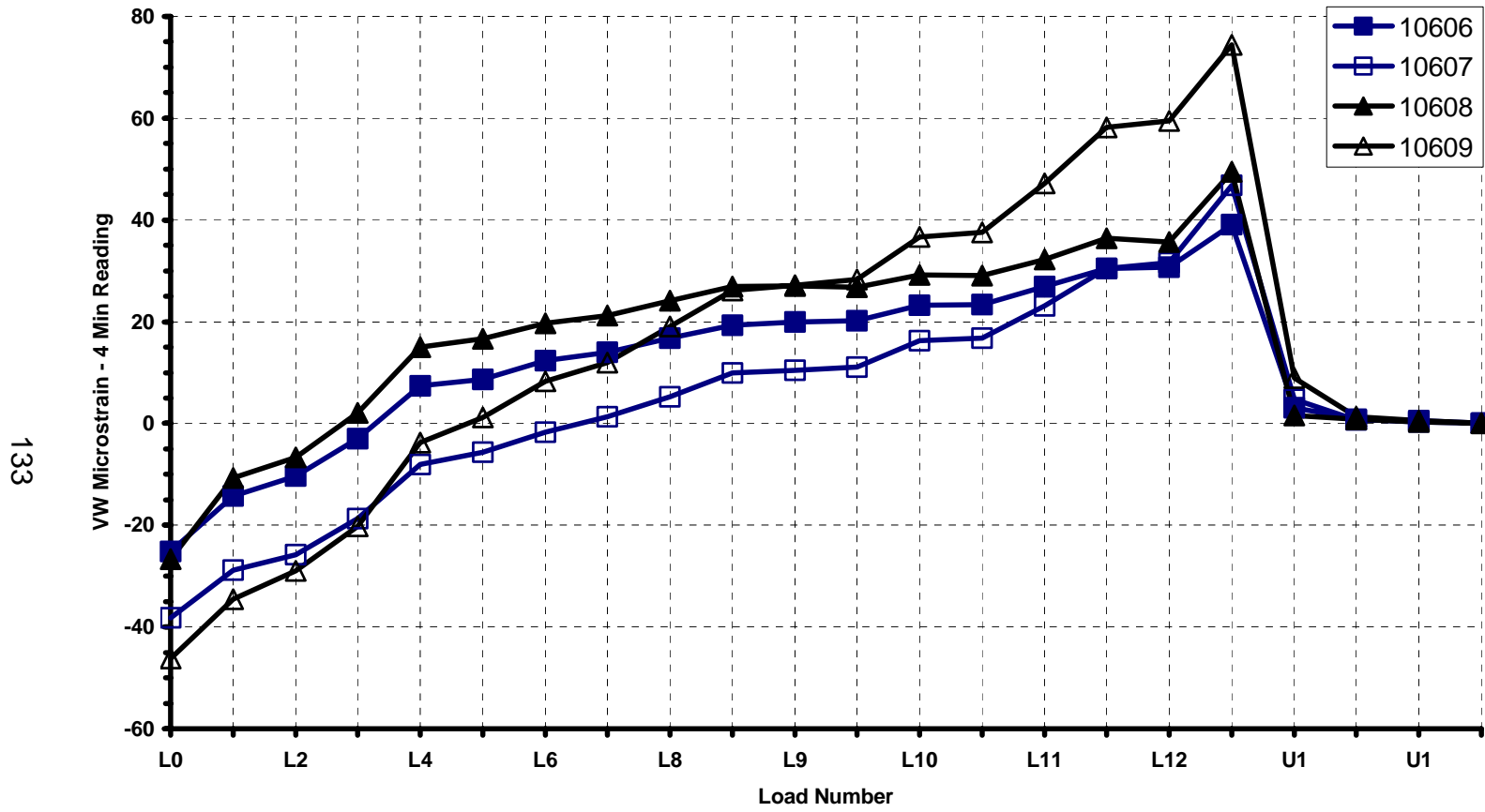


Figure C.3 Shaft Bottom VW Strain, Shaft 11 - 1996

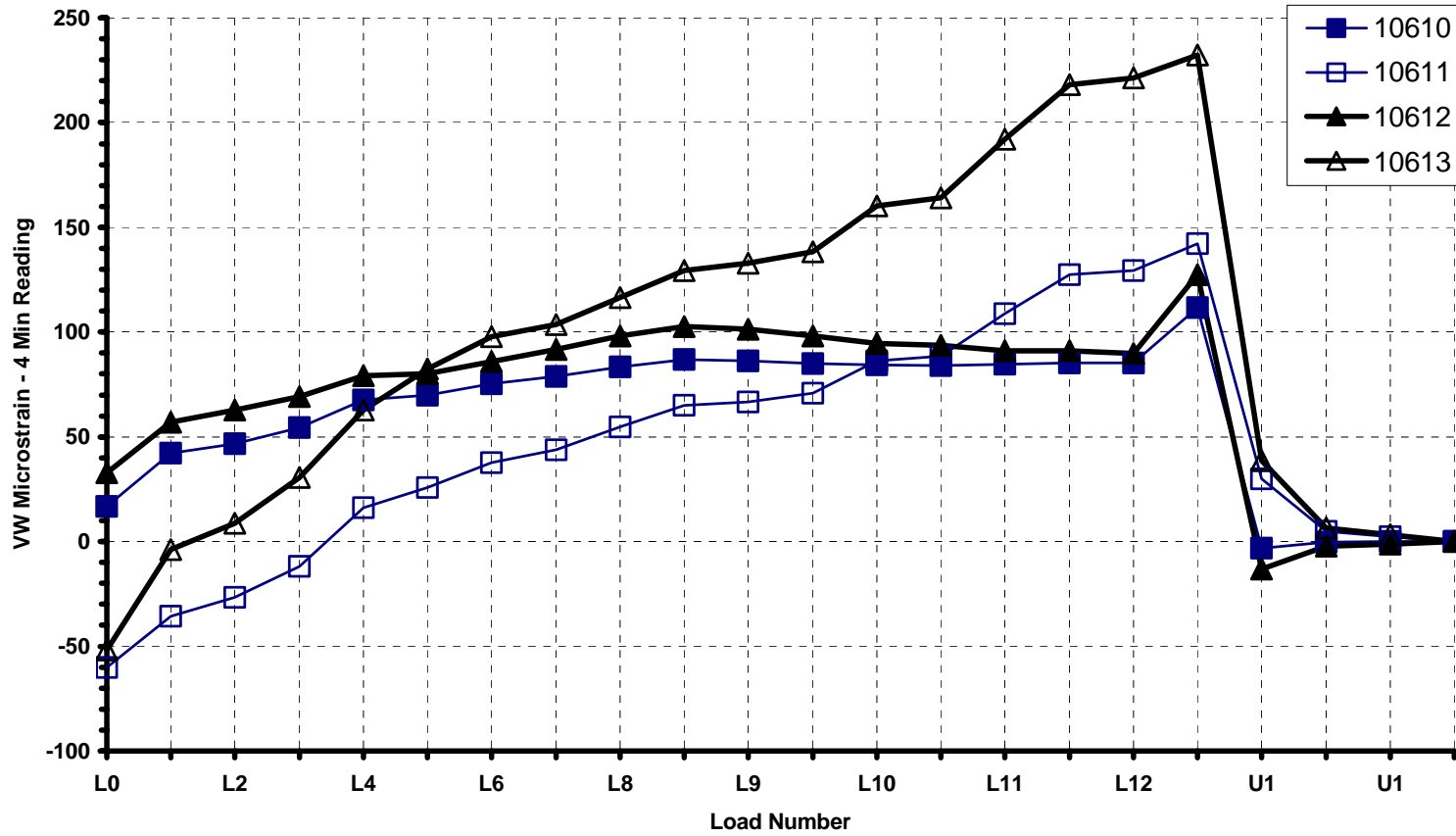


Figure C.4 Shaft Top Shear Stress vs. Movement, Shaft 11 - 1996

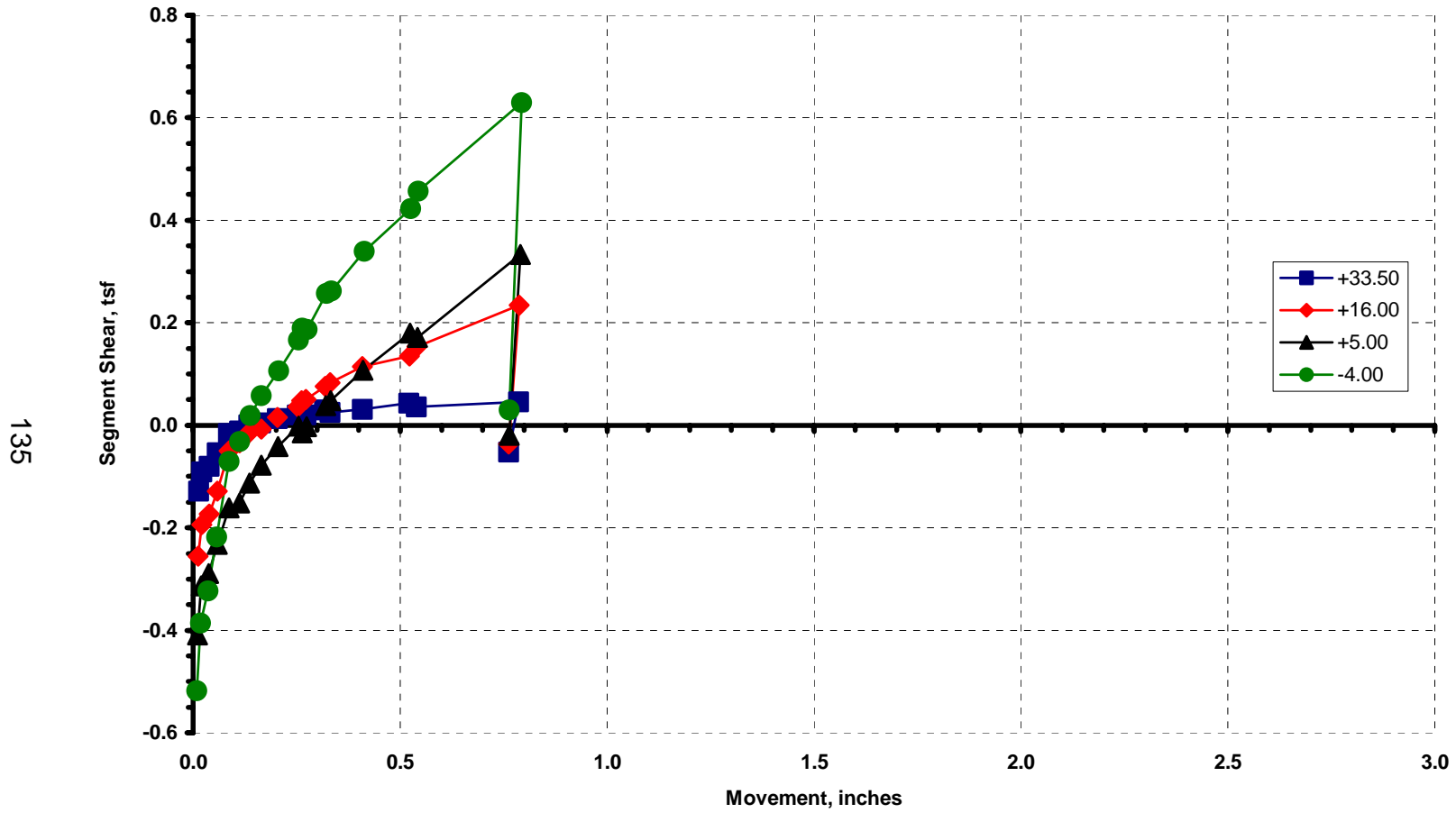


Figure C.5 Shaft Middle Shear Stress vs. Movement, Shaft 11 - 1996

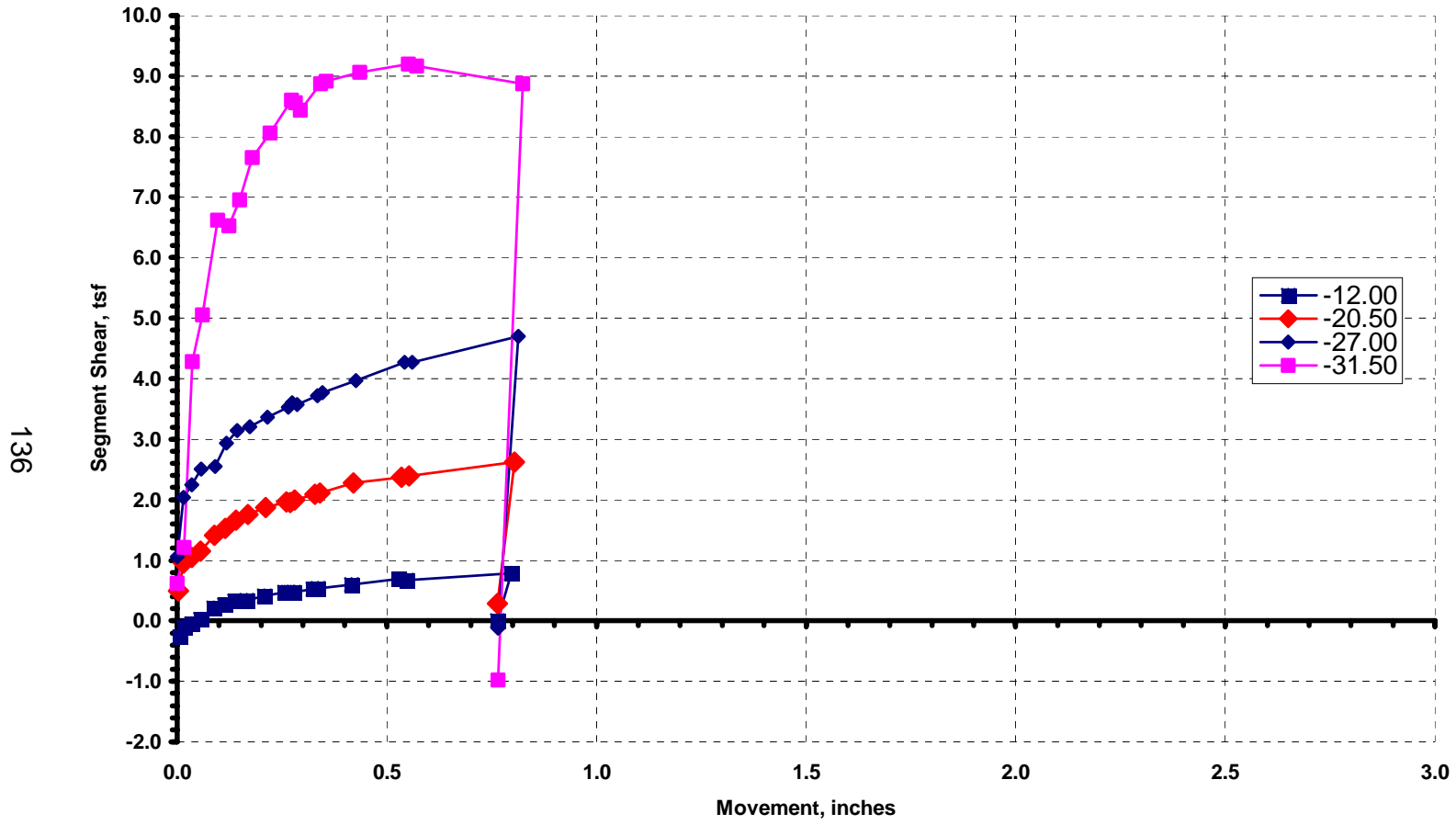


Figure C.6 Strain Distribution, Shaft 11 - 1996

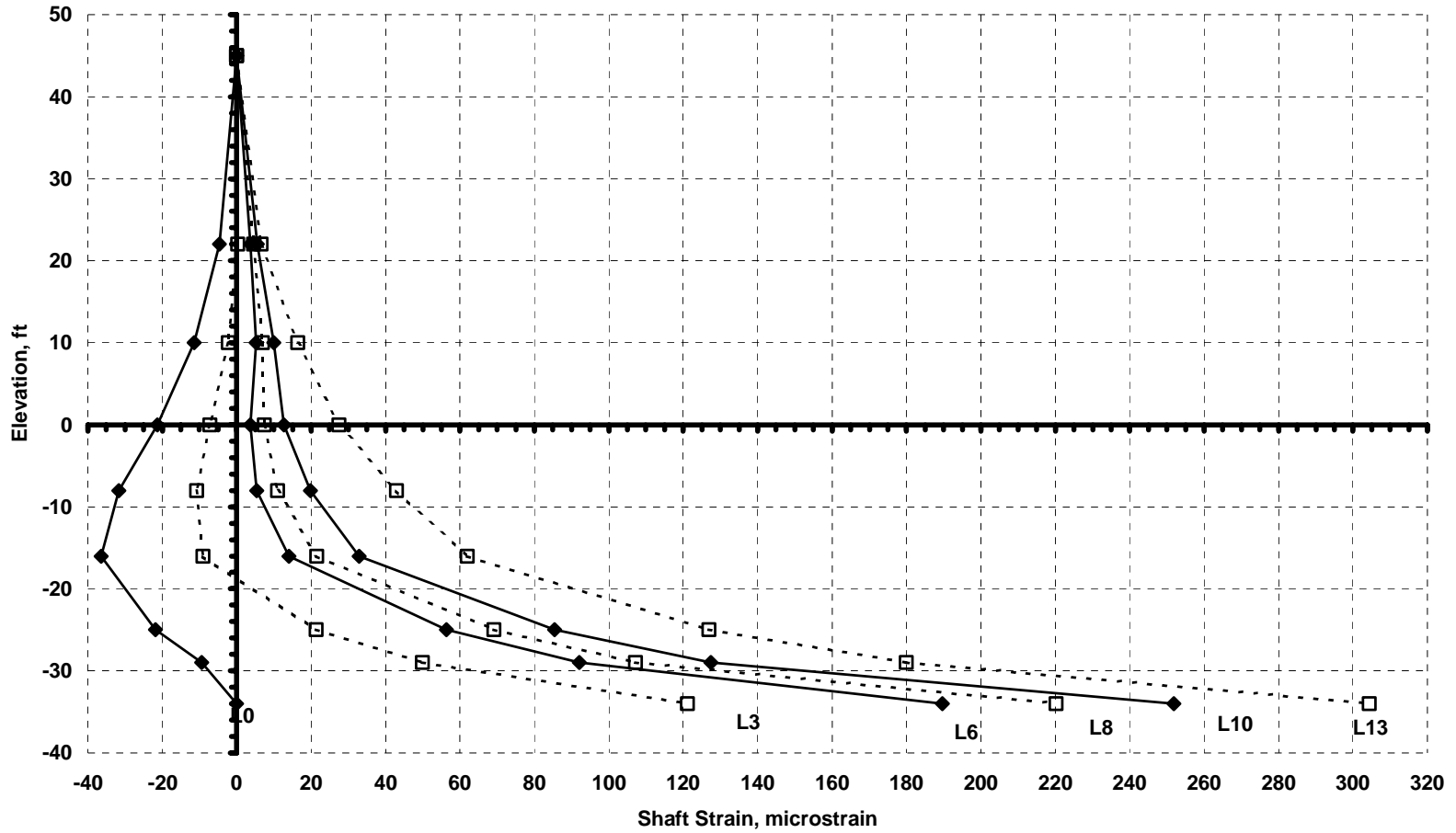


Figure C.7 Load Distribution, Shaft 11 - 1996

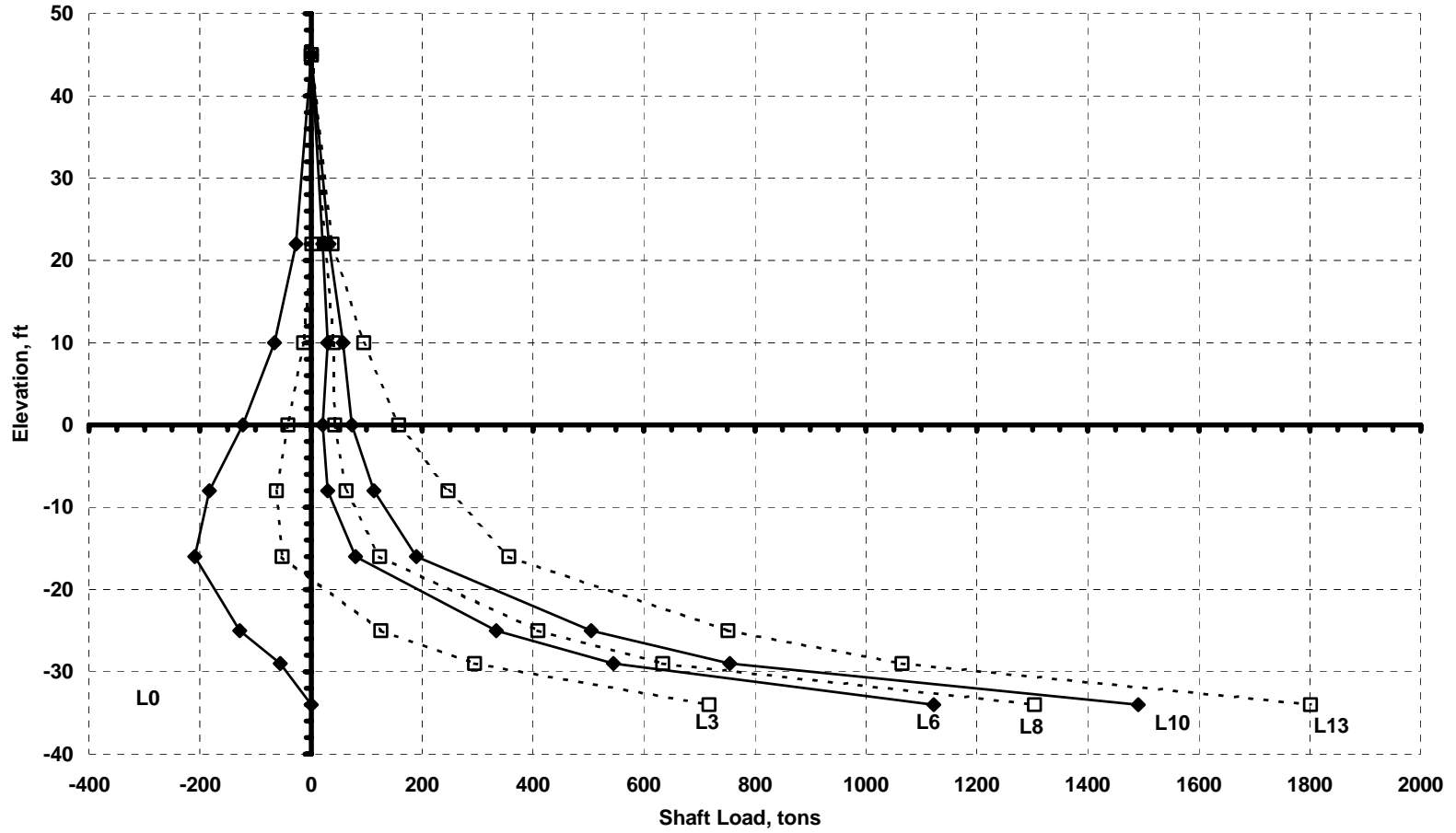


Figure C.9 Average Compression vs Load, Stage 1 - Shaft 11 - 1996

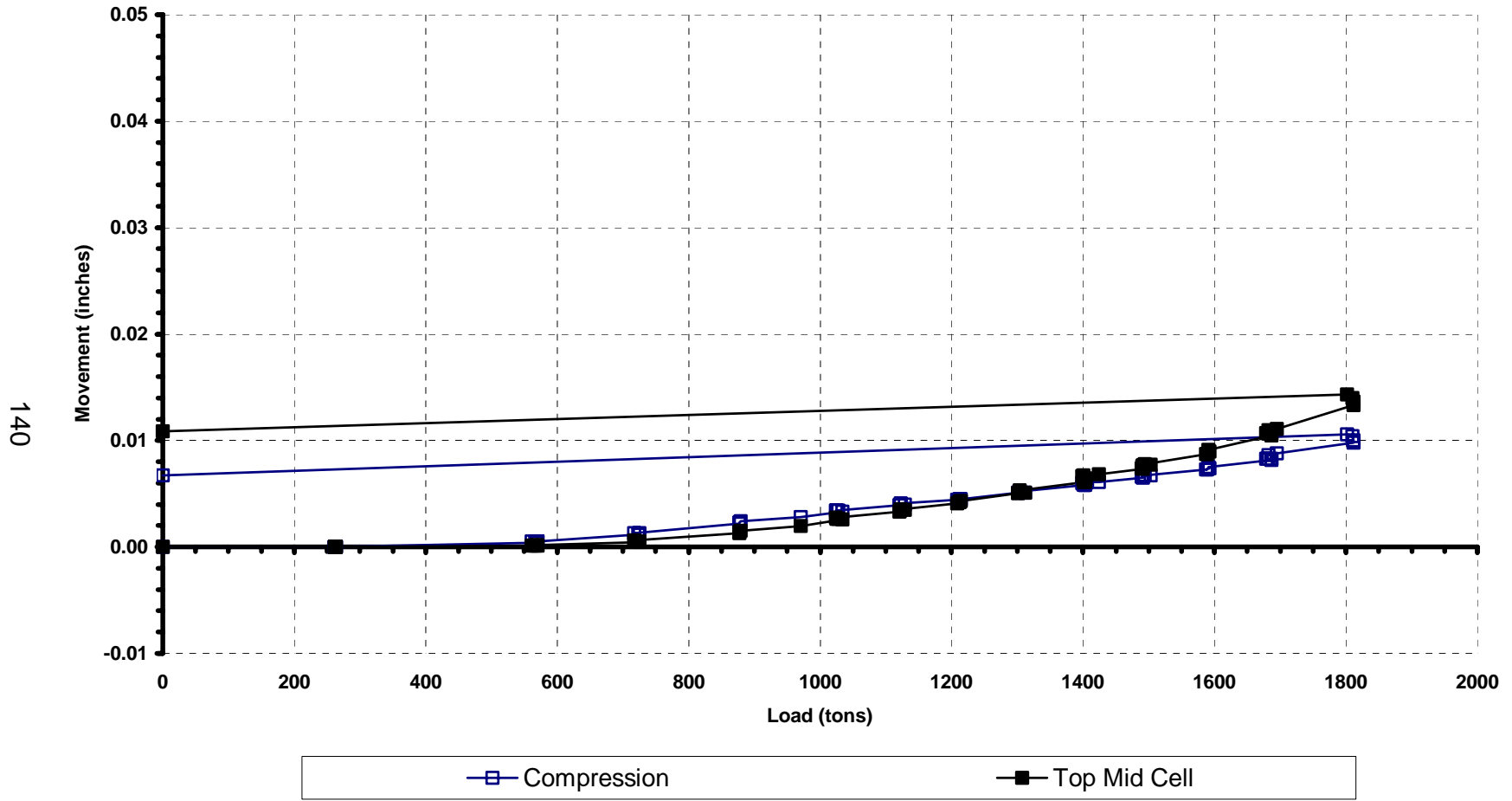
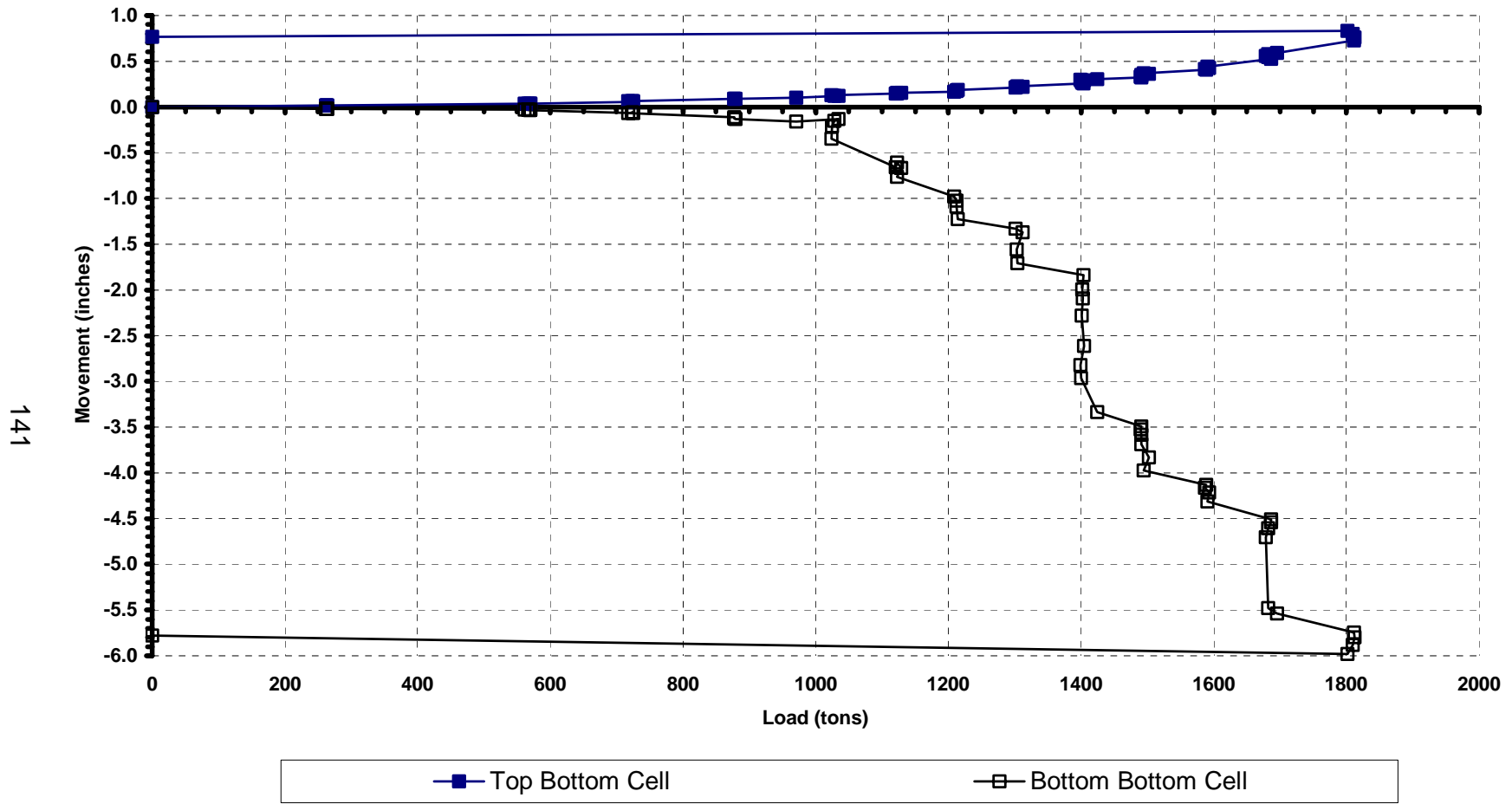


Figure C.10 Bottom Cell Movement vs Load, Stage 1 - Shaft 11 - 1996



**APPENDIX D
TEST SHAFT 11 – ANALYSIS OF 2002 TEST**

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement										
				Top of Shaft				Survey Level Readings				Compression		
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT #1 (inches)	TT #6 (inches)	Avg. Rdg (inches)
L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:00:30	110.8	0.0	0.0010	0.0064	0.0000	0.0025					0.0000	0.0000	0.0000
L1	0:01:00	107.6	0.0	0.0013	0.0068	0.0000	0.0027					0.0000	0.0000	0.0000
L1	0:02:00	105.4	0.0	0.0013	0.0077	0.0000	0.0030	0.00	0.00	-0.01	0.00	0.0000	0.0000	0.0000
L1	0:04:00	103.3	0.0	0.0016	0.0097	0.0000	0.0038	-0.03	-0.02	-0.03	-0.03	0.0000	0.0000	0.0000
L2	0:00:30	158.4	0.0	-0.0002	0.0092	0.0076	0.0055					0.0000	0.0000	0.0000
L2	0:01:00	155.5	0.0	-0.0005	0.0098	0.0076	0.0056					0.0000	0.0000	0.0000
L2	0:02:00	160.9	0.0	0.0004	0.0108	0.0076	0.0063	-0.02	-0.02	-0.02	-0.02	0.0000	0.0000	0.0000
L2	0:04:00	157.6	0.0	-0.0008	0.0121	0.0076	0.0063	-0.02	-0.02	-0.02	-0.02	0.0000	0.0000	0.0000
L3	0:00:30	220.1	0.0	0.0005	0.0141	0.0076	0.0074					0.0000	0.0000	0.0000
L3	0:01:00	216.9	0.0	-0.0002	0.0146	0.0076	0.0073					0.0000	0.0000	0.0000
L3	0:02:00	214.4	0.0	0.0005	0.0152	0.0076	0.0078	-0.02	-0.02	-0.02	-0.02	0.0000	0.0000	0.0000
L3	0:04:00	211.9	0.0	0.0003	0.0169	0.0076	0.0083	-0.02	-0.02	-0.02	-0.02	0.0000	0.0000	0.0000
L4	0:00:30	277.8	0.0	-0.0007	0.0178	0.0076	0.0082					0.0000	0.0000	0.0000
L4	0:01:00	274.6	0.0	0.0002	0.0180	0.0076	0.0086					0.0000	0.0000	0.0000
L4	0:02:00	272.2	0.0	0.0072	0.0180	0.0076	0.0109	-0.03	-0.04	-0.04	-0.04	0.0000	0.0000	0.0000
L4	0:04:00	269.6	0.0	0.0002	0.0196	0.0076	0.0091	-0.05	-0.05	-0.03	-0.04	0.0000	0.0000	0.0000
L5	0:00:30	342.7	0.0	0.0023	0.0207	0.0076	0.0102					0.0000	0.0000	0.0000
L5	0:01:00	338.3	0.0	0.0016	0.0206	0.0076	0.0099					0.0000	0.0000	0.0000
L5	0:02:00	334.9	0.0	0.0015	0.0206	0.0076	0.0099	-0.06	-0.06	-0.04	-0.05	0.0000	0.0000	0.0000
L5	0:04:00	331.7	0.0	0.0012	0.0209	0.0076	0.0099	-0.06	-0.06	-0.04	-0.05	0.0000	0.0000	0.0000
L5	0:08:00	328.4	0.0	0.0012	0.0281	0.0076	0.0123	-0.06	-0.06	-0.06	-0.06	0.0000	0.0000	0.0000
L6	0:00:30	398.5	0.0	0.0033	0.0223	0.0076	0.0111					0.0000	0.0000	0.0000
L6	0:01:00	392.9	0.0	0.0039	0.0221	0.0076	0.0112					0.0000	0.0000	0.0000
L6	0:02:00	401.7	0.0	0.0036	0.0221	0.0076	0.0111	-0.06	-0.07	-0.06	-0.06	0.0000	0.0000	0.0000
L6	0:04:00	397.5	0.0	0.0040	0.0221	0.0076	0.0112	-0.06	-0.07	-0.06	-0.06	0.0000	0.0000	0.0000
L7	0:00:30	454.6	0.0	0.0120	0.0170	0.0076	0.0122					0.0000	0.0000	0.0000
L7	0:01:00	464.2	0.0	0.0120	0.0170	0.0076	0.0122					0.0000	0.0002	0.0001
L7	0:02:00	462.7	0.0	0.0125	0.0162	0.0076	0.0121	-0.05	-0.07	-0.06	-0.06	0.0000	0.0003	0.0002
L7	0:04:00	460.5	0.0	0.0119	0.0176	0.0076	0.0124	-0.06	-0.07	-0.05	-0.06	0.0000	0.0004	0.0002
L8	0:00:30	468.2	0.0	0.0151	0.0150	0.0076	0.0126					0.0003	0.0008	0.0006
L8	0:01:00	459.8	0.0	0.0148	0.0152	0.0076	0.0125					0.0003	0.0008	0.0006
L8	0:02:00	449.9	0.0	0.0148	0.0152	0.0076	0.0125	-0.06	-0.07	-0.06	-0.06	0.0003	0.0008	0.0006
L8	0:04:00	439.3	0.0	0.0149	0.0159	0.0076	0.0128	-0.06	-0.07	-0.06	-0.06	0.0003	0.0008	0.0006
L8	0:08:00	427.4	0.0	0.0158	0.0171	0.0076	0.0135	-0.06	-0.08	-0.06	-0.07	0.0003	0.0008	0.0006
L8	0:12:00	419.5	0.0	0.0154	0.0181	0.0076	0.0137	-0.06	-0.07	-0.06	-0.06	0.0003	0.0008	0.0006
L8	0:16:00	426.5	0.0	0.0198	0.0143	0.0076	0.0139	-0.04	-0.07	-0.05	-0.05	0.0003	0.0010	0.0007
L9	0:00:30	529.8	0.0	0.0282	0.0078	0.0076	0.0145					0.0008	0.0012	0.0010
L9	0:01:00	534.0	0.0	0.0284	0.0078	0.0076	0.0146					0.0008	0.0012	0.0010
L9	0:02:00	528.0	0.0	0.0289	0.0079	0.0076	0.0148	-0.04	-0.07	-0.06	-0.06	0.0008	0.0012	0.0010
L9	0:04:00	509.4	0.0	0.0299	0.0068	0.0076	0.0148	-0.04	-0.06	-0.03	-0.04	0.0009	0.0013	0.0011
L10	0:00:30	587.0	0.0	0.0412	0.0052	0.0076	0.0180					0.0012	0.0018	0.0015

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement								Compression		
				Top of Shaft				Survey Level Readings				TT #1 (inches)	TT #6 (inches)	Avg. Rdg (inches)
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)			
L10	0:01:00	599.1	0.0	0.0422	0.0054	0.0076	0.0184					0.0012	0.0018	0.0015
L10	0:02:00	592.2	0.0	0.0424	0.0066	0.0076	0.0189	-0.03	-0.06	-0.03	-0.04	0.0012	0.0018	0.0015
L10	0:04:00	580.1	0.0	0.0436	0.0070	0.0076	0.0194	-0.03	-0.06	-0.03	-0.04	0.0012	0.0018	0.0015
L11	0:00:30	633.4	0.0	0.0522	0.0167	0.0076	0.0255					0.0018	0.0021	0.0020
L11	0:01:00	621.7	0.0	0.0524	0.0161	0.0076	0.0254					0.0018	0.0021	0.0020
L11	0:02:00	574.0	0.0	0.0517	0.0144	0.0076	0.0246	-0.02	-0.05	-0.02	-0.03	0.0018	0.0021	0.0020
L11	0:04:00	652.9	0.0	0.0553	0.0174	0.0109	0.0279	-0.02	-0.04	-0.02	-0.03	0.0018	0.0021	0.0020
L12	0:01:00	709.6	0.0	0.0704	0.0305	0.0109	0.0373					0.0021	0.0024	0.0023
L12	0:02:00	708.5	0.0	0.0719	0.0327	0.0109	0.0385	-0.01	-0.03	0.00	-0.01	0.0021	0.0024	0.0023
L12	0:04:00	700.5	0.0	0.0724	0.0336	0.0109	0.0390	0.00	-0.02	-0.01	-0.01	0.0021	0.0024	0.0023
L13	0:00:30	777.1	0.0	0.0884	0.0481	0.0422	0.0596					0.0025	0.0024	0.0025
L13	0:01:00	772.6	0.0	0.0891	0.0488	0.0422	0.0600					0.0025	0.0024	0.0025
L13	0:02:00	774.9	0.0	0.0874	0.0486	0.0422	0.0594	0.01	0.00	0.01	0.01	0.0025	0.0024	0.0025
L13	0:04:00	776.3	0.0	0.0893	0.0496	0.0422	0.0604	0.01	0.00	0.01	0.01	0.0025	0.0024	0.0025
L14	0:00:30	828.6	0.0	0.1059	0.0647	0.0422	0.0709					0.0027	0.0031	0.0029
L14	0:01:00	827.6	0.0	0.1058	0.0647	0.0422	0.0709					0.0027	0.0031	0.0029
L14	0:02:00	827.0	0.0	0.1078	0.0669	0.0422	0.0723	0.02	0.01	0.02	0.02	0.0027	0.0031	0.0029
L14	0:04:00	826.5	0.0	0.1107	0.0707	0.0422	0.0745	0.03	0.01	0.02	0.02	0.0027	0.0031	0.0029
L15	0:00:30	905.9	0.0	0.1301	0.0903	0.0422	0.0875					0.0030	0.0036	0.0033
L15	0:01:00	887.6	0.0	0.1330	0.0912	0.0422	0.0888					0.0030	0.0036	0.0033
L15	0:02:00	908.5	0.0	0.1362	0.0953	0.0422	0.0912	0.04	0.04	0.05	0.04	0.0030	0.0036	0.0033
L15	0:04:00	902.5	0.0	0.1409	0.0983	0.0422	0.0938	0.06	0.03	0.06	0.05	0.0030	0.0036	0.0033
L16	0:00:30	936.8	0.0	0.1616	0.1173	0.0422	0.1070					0.0032	0.0043	0.0038
L16	0:01:00	917.6	0.0	0.1617	0.1173	0.0422	0.1071					0.0032	0.0043	0.0038
L16	0:02:00	903.7	0.0	0.1702	0.1261	0.0422	0.1128	0.08	0.09	0.09	0.09	0.0032	0.0043	0.0038
L16	0:04:00	956.2	0.0	0.1783	0.1336	0.0422	0.1180	0.09	0.09	0.09	0.09	0.0032	0.0043	0.0038
L17	0:00:30	1011.0	0.0	0.2229	0.1769	0.0734	0.1577					0.0032	0.0051	0.0042
L17	0:01:00	1026.8	0.0	0.2280	0.1804	0.0734	0.1606					0.0032	0.0051	0.0042
L17	0:02:00	1025.2	0.0	0.2366	0.1868	0.0734	0.1656	0.13	0.13	0.14	0.13	0.0032	0.0052	0.0042
L17	0:04:00	1026.5	0.0	0.2477	0.1478	0.0734	0.1563	0.14	0.14	0.14	0.14	0.0032	0.0052	0.0042
L18	0:00:30	1081.6	0.0	0.2995	0.2502	0.1984	0.2494					0.0032	0.0063	0.0048
L18	0:01:00	1085.8	0.0	0.3077	0.2551	0.1984	0.2537					0.0032	0.0063	0.0048
L18	0:02:00	1087.7	0.0	0.3175	0.2666	0.1984	0.2608	0.22	0.22	0.23	0.22	0.0032	0.0063	0.0048
L18	0:04:00	1082.5	0.0	0.3221	0.2745	0.1984	0.2650	0.23	0.22	0.24	0.23	0.0032	0.0064	0.0048
L19	0:00:30	1139.8	0.0	0.3873	0.3432	0.2609	0.3305					0.0032	0.0075	0.0054
L19	0:01:00	1142.2	0.0	0.3969	0.3701	0.2609	0.3426					0.0032	0.0075	0.0054
L19	0:02:00	1146.1	0.0	0.4173	0.3825	0.2609	0.3536	0.32	0.22	0.32	0.29	0.0032	0.0076	0.0054
L19	0:04:00	1140.0	0.0	0.4387	0.4889	0.3234	0.4170	0.33	0.33	0.33	0.33	0.0032	0.0076	0.0054
L20	0:00:30	1219.9	0.0	0.5342	0.5213	0.4484	0.5013					0.0032	0.0080	0.0056
L20	0:01:00	1213.2	0.0	0.5527	0.5506	0.4484	0.5172					0.0032	0.0080	0.0056
L20	0:02:00	1205.9	0.0	0.5721	0.6602	0.5109	0.5811	0.47	0.49	0.49	0.48	0.0032	0.0083	0.0058
L20	0:04:00	1212.5	0.0	0.6045	0.6934	0.5734	0.6238	0.50	0.51	0.50	0.50	0.0032	0.0090	0.0061

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement								Compression			
				Top of Shaft				Survey Level Readings				TT #1 (inches)	TT #6 (inches)	Avg. Rdg (inches)	
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)				
L21	0:00:30	1265.8	0.0	0.7682	0.7224	0.7609	0.7505						0.0032	0.0099	0.0066
L21	0:01:00	1266.4	0.0	0.7870	0.7276	0.7609	0.7585						0.0032	0.0099	0.0066
L21	0:02:00	1274.3	0.0	0.8279	0.7748	0.7609	0.7879	0.72	0.72	0.76	0.73	0.0032	0.0100	0.0066	
L21	0:04:00	1268.3	0.0	0.8782	0.8207	0.8547	0.8512	0.75	0.76	0.81	0.77	0.0032	0.0100	0.0066	
L22	0:01:00	1294.1	0.0	1.0112	0.9628	0.8859	0.9533					0.0032	0.0104	0.0068	
L22	0:02:00	1301.2	0.0	1.0582	1.0011	0.8859	0.9817	0.94	0.95	0.98	0.96	0.0031	0.0106	0.0069	
L22	0:04:00	1296.2	0.0	1.1258	1.0016	0.9484	1.0253	1.01	1.02	1.03	1.02	0.0031	0.0106	0.0069	
L23	0:00:30	1312.6	0.0	1.3082	1.2509	1.1359	1.2317					0.0027	0.0108	0.0068	
L23	0:01:00	1315.7	0.0	1.3512	1.2850	1.1359	1.2574					0.0027	0.0108	0.0068	
L23	0:02:00	1317.6	0.0	1.4312	1.3713	1.1359	1.3128	1.31	1.34	1.37	1.34	0.0025	0.0108	0.0067	
L23	0:04:00	1317.7	0.0	1.5342	1.4686	1.1359	1.3796	1.42	1.43	1.46	1.44	0.0023	0.0108	0.0066	
U1	0:00:30	1207.5	0.0	1.5950	1.5227		1.5589	1.45	1.50	1.49	1.48	0.0019	0.0108	0.0064	
U1	0:03:00	1192.6	0.0	1.5960	1.5235		1.5598	1.45	1.45	1.48	1.46	0.0019	0.0108	0.0064	
U2	0:00:30	1052.8	0.0	1.5918	1.5206		1.5562	1.45	1.45	1.48	1.46	0.0015	0.0229	0.0122	
U2	0:03:00	1057.6	0.0	1.5918	1.5203		1.5561	1.45	1.45	1.48	1.46	0.0015	0.0229	0.0122	
U3	0:00:30	890.7	0.0	1.5844	1.5126		1.5485	1.44	1.44	1.48	1.45	0.0010	0.0229	0.0120	
U3	0:03:00	904.7	0.0	1.5839	1.5124		1.5482	1.43	1.43	1.47	1.44	0.0010	0.0229	0.0120	
U4	0:00:30	597.1	0.0	1.5595	1.4908		1.5252	1.42	1.42	1.44	1.43	-0.0005	0.0211	0.0103	
U4	0:03:00	607.0	0.0	1.5584	1.4900		1.5242	1.41	1.42	1.43	1.42	-0.0005	0.0211	0.0103	
U5	0:00:30	281.4	0.0	1.4994	1.4365		1.4680	1.34	1.33	1.36	1.34	-0.0029	0.0142	0.0057	
U5	0:03:00	305.1	0.0	1.4984	1.4358		1.4671	1.32	1.33	1.34	1.33	-0.0029	0.0142	0.0057	
U6	0:00:30	0.0	0.0	1.2242	1.1728		1.1985	1.05	1.03	1.06	1.05	-0.0006	0.0026	0.0010	
U6	0:03:00	0.0	0.0	1.2058	1.1545		1.1802	1.02	1.03	1.03	1.03	-0.0006	0.0026	0.0010	
U6	0:06:00	0.0	0.0	1.1968	1.1440		1.1704	1.02	1.03	1.04	1.03	-0.0006	0.0026	0.0010	

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Mvmt.	TT #3	TT #8	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0000	0.0000	0.0000	0.0025	-0.0008	-0.0011	-0.0010	0.0015	0.0000	0.0000	0.0000	0.0025	0.0000	0.0000	0.0000	0.0025
L1	0:01:00	0.0000	0.0000	0.0000	0.0027	-0.0008	-0.0011	-0.0010	0.0018	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0000	0.0027
L1	0:02:00	0.0000	0.0000	0.0000	0.0030	-0.0008	-0.0011	-0.0010	0.0021	0.0000	0.0000	0.0000	0.0030	0.0000	0.0000	0.0000	0.0030
L1	0:04:00	0.0000	0.0000	0.0000	0.0038	-0.0012	-0.0012	-0.0012	0.0026	0.0000	0.0000	0.0000	0.0038	0.0000	0.0000	0.0000	0.0038
L2	0:00:30	0.0000	0.0000	0.0000	0.0055	-0.0018	-0.0023	-0.0021	0.0035	0.0000	0.0000	0.0000	0.0055	0.0000	0.0000	0.0000	0.0055
L2	0:01:00	0.0000	0.0000	0.0000	0.0056	-0.0019	-0.0023	-0.0021	0.0035	0.0000	0.0000	0.0000	0.0056	0.0000	0.0000	0.0000	0.0056
L2	0:02:00	0.0000	0.0000	0.0000	0.0063	-0.0020	-0.0023	-0.0022	0.0041	0.0000	0.0000	0.0000	0.0063	0.0000	0.0000	0.0000	0.0063
L2	0:04:00	0.0000	0.0000	0.0000	0.0063	-0.0020	-0.0023	-0.0022	0.0042	0.0000	0.0000	0.0000	0.0063	0.0000	0.0000	0.0000	0.0063
L3	0:00:30	0.0000	0.0000	0.0000	0.0074	-0.0042	-0.0046	-0.0044	0.0030	-0.0005	0.0000	-0.0003	0.0072	0.0000	0.0000	0.0000	0.0074
L3	0:01:00	0.0000	0.0000	0.0000	0.0073	-0.0043	-0.0046	-0.0045	0.0029	-0.0005	0.0000	-0.0003	0.0071	0.0000	0.0000	0.0000	0.0073
L3	0:02:00	0.0000	0.0000	0.0000	0.0078	-0.0044	-0.0046	-0.0045	0.0033	-0.0005	0.0000	-0.0003	0.0075	0.0000	0.0000	0.0000	0.0078
L3	0:04:00	0.0000	0.0000	0.0000	0.0083	-0.0047	-0.0046	-0.0047	0.0036	-0.0006	0.0000	-0.0003	0.0080	0.0000	0.0000	0.0000	0.0083
L4	0:00:30	0.0000	0.0000	0.0000	0.0082	-0.0096	-0.0086	-0.0091	-0.0009	-0.0019	-0.0011	-0.0015	0.0067	-0.0003	-0.0006	-0.0005	0.0078
L4	0:01:00	0.0000	0.0000	0.0000	0.0086	-0.0096	-0.0086	-0.0091	-0.0005	-0.0019	-0.0011	-0.0015	0.0071	-0.0003	-0.0006	-0.0005	0.0082
L4	0:02:00	0.0000	0.0000	0.0000	0.0109	-0.0097	-0.0086	-0.0092	0.0018	-0.0019	-0.0012	-0.0016	0.0094	-0.0003	-0.0006	-0.0005	0.0105
L4	0:04:00	0.0000	0.0000	0.0000	0.0091	-0.0099	-0.0086	-0.0093	-0.0001	-0.0019	-0.0012	-0.0016	0.0076	-0.0003	-0.0006	-0.0005	0.0087
L5	0:00:30	0.0000	0.0000	0.0000	0.0102	-0.0181	-0.0157	-0.0169	-0.0067	-0.0055	-0.0048	-0.0052	0.0051	-0.0026	-0.0034	-0.0030	0.0072
L5	0:01:00	0.0000	0.0000	0.0000	0.0099	-0.0182	-0.0157	-0.0170	-0.0070	-0.0056	-0.0048	-0.0052	0.0047	-0.0026	-0.0034	-0.0030	0.0069
L5	0:02:00	0.0000	0.0000	0.0000	0.0099	-0.0182	-0.0157	-0.0170	-0.0071	-0.0056	-0.0049	-0.0053	0.0047	-0.0026	-0.0034	-0.0030	0.0069
L5	0:04:00	0.0000	0.0000	0.0000	0.0099	-0.0183	-0.0157	-0.0170	-0.0071	-0.0058	-0.0050	-0.0054	0.0045	-0.0026	-0.0036	-0.0031	0.0068
L5	0:08:00	0.0000	0.0000	0.0000	0.0123	-0.0199	-0.0157	-0.0178	-0.0055	-0.0059	-0.0090	-0.0075	0.0049	-0.0026	-0.0047	-0.0037	0.0087
L6	0:00:30	0.0000	0.0000	0.0000	0.0111	-0.0297	-0.0273	-0.0285	-0.0174	-0.0135	-0.0130	-0.0133	-0.0022	-0.0064	-0.0057	-0.0061	0.0050
L6	0:01:00	0.0000	0.0000	0.0000	0.0112	-0.0316	-0.0278	-0.0297	-0.0185	-0.0151	-0.0145	-0.0148	-0.0036	-0.0064	-0.0057	-0.0061	0.0052
L6	0:02:00	0.0000	0.0000	0.0000	0.0111	-0.0327	-0.0288	-0.0308	-0.0197	-0.0163	-0.0156	-0.0160	-0.0049	-0.0066	-0.0057	-0.0062	0.0050
L6	0:04:00	0.0000	0.0000	0.0000	0.0112	-0.0341	-0.0299	-0.0320	-0.0208	-0.0175	-0.0166	-0.0171	-0.0058	-0.0070	-0.0061	-0.0066	0.0047
L7	0:00:30	0.0000	0.0000	0.0000	0.0122	-0.0678	-0.0630	-0.0654	-0.0532	-0.0484	-0.0471	-0.0478	-0.0356	-0.0175	-0.0148	-0.0162	-0.0040
L7	0:01:00	0.0000	0.0000	0.0000	0.0122	-0.0678	-0.0920	-0.0799	-0.0677	-0.0753	-0.0740	-0.0747	-0.0625	-0.0200	-0.0153	-0.0177	-0.0055
L7	0:02:00	0.0000	0.0000	0.0000	0.0121	-0.1086	-0.1068	-0.1077	-0.0956	-0.0913	-0.0877	-0.0895	-0.0774	-0.0201	-0.0153	-0.0177	-0.0056
L7	0:04:00	0.0000	0.0008	0.0004	0.0128	-0.2505	-0.2418	-0.2462	-0.2338	-0.2253	-0.2264	-0.2259	-0.2135	-0.0193	-0.0152	-0.0173	-0.0049
L8	0:00:30	0.0001	0.0015	0.0008	0.0134	-0.4687	-0.4570	-0.4629	-0.4503	-0.4410	-0.4423	-0.4417	-0.4291	-0.0240	-0.0100	-0.0170	-0.0044
L8	0:01:00	0.0001	0.0015	0.0008	0.0133	-0.4700	-0.4583	-0.4642	-0.4516	-0.4424	-0.4436	-0.4430	-0.4305	-0.0257	-0.0097	-0.0177	-0.0052
L8	0:02:00	0.0001	0.0015	0.0008	0.0133	-0.4708	-0.4589	-0.4649	-0.4523	-0.4431	-0.4445	-0.4438	-0.4313	-0.0264	-0.0096	-0.0180	-0.0055
L8	0:04:00	0.0001	0.0015	0.0008	0.0136	-0.4719	-0.4600	-0.4660	-0.4532	-0.4440	-0.4456	-0.4448	-0.4320	-0.2760	-0.0096	-0.1428	-0.1300
L8	0:08:00	0.0001	0.0015	0.0008	0.0143	-0.4737	-0.4619	-0.4678	-0.4543	-0.4459	-0.4477	-0.4468	-0.4333	-0.0287	-0.0089	-0.0188	-0.0053
L8	0:12:00	0.0001	0.0015	0.0008	0.0145	-0.4745	-0.4627	-0.4686	-0.4549	-0.4465	-0.4484	-0.4475	-0.4338	-0.0291	-0.0086	-0.0189	-0.0052
L8	0:16:00	0.0001	0.0022	0.0012	0.0151	-0.5146	-0.5048	-0.5097	-0.4958	-0.4864	-0.4880	-0.4872	-0.4733	-0.0321	-0.0097	-0.0209	-0.0070
L9	0:00:30	0.0008	0.0024	0.0016	0.0161	-0.5649	-0.5517	-0.5583	-0.5438	-0.5387	-0.5413	-0.5400	-0.5255	-0.0417	-0.0145	-0.0281	-0.0136
L9	0:01:00	0.0008	0.0024	0.0016	0.0162	-0.5704	-0.5571	-0.5638	-0.5492	-0.5387	-0.5413	-0.5400	-0.5254	-0.0417	-0.0145	-0.0281	-0.0135
L9	0:02:00	0.0008	0.0024	0.0016	0.0164	-0.5759	-0.5625	-0.5692	-0.5544	-0.5439	-0.5468	-0.5454	-0.5306	-0.0423	-0.0145	-0.0284	-0.0136
L9	0:04:00	0.0011	0.0025	0.0018	0.0166	-0.5829	-0.5694	-0.5762	-0.5614	-0.5509	-0.5537	-0.5523	-0.5375	-0.0443	-0.0157	-0.0300	-0.0152
L10	0:00:30	0.0019	0.0036	0.0028	0.0208	-0.6339	-0.6194	-0.6267	-0.6087	-0.5984	-0.6024	-0.6004	-0.5824	-0.0560	-0.0261	-0.0411	-0.0231

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Mvmt.	TT #3	TT #8	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L10	0:01:00	0.0019	0.0036	0.0028	0.0212	-0.6394	-0.6252	-0.6323	-0.6139	-0.6094	-0.6066	-0.6080	-0.5896	-0.0568	-0.0262	-0.0415	-0.0231
L10	0:02:00	0.0019	0.0036	0.0028	0.0216	-0.6435	-0.6293	-0.6364	-0.6175	-0.6088	-0.6108	-0.6098	-0.5909	-0.0573	-0.0262	-0.0418	-0.0229
L10	0:04:00	0.0019	0.0036	0.0028	0.0222	-0.6380	-0.6338	-0.6359	-0.6165	-0.6133	-0.6149	-0.6141	-0.5947	-0.0580	-0.0262	-0.0421	-0.0227
L11	0:00:30	0.0029	0.0044	0.0037	0.0292	-0.6884	-0.6740	-0.6812	-0.6557	-0.6515	-0.6519	-0.6517	-0.6262	-0.0702	-0.0364	-0.0533	-0.0278
L11	0:01:00	0.0029	0.0044	0.0037	0.0290	-0.6891	-0.6747	-0.6819	-0.6565	-0.6523	-0.6527	-0.6525	-0.6271	-0.0705	-0.0361	-0.0533	-0.0279
L11	0:02:00	0.0029	0.0044	0.0037	0.0282	-0.6893	-0.6751	-0.6822	-0.6576	-0.6526	-0.6530	-0.6528	-0.6282	-0.0706	-0.0351	-0.0529	-0.0283
L11	0:04:00	0.0029	0.0044	0.0037	0.0315	-0.7025	-0.6878	-0.6952	-0.6673	-0.6644	-0.6643	-0.6644	-0.6365	-0.0734	-0.0374	-0.0554	-0.0275
L12	0:01:00	0.0037	0.0053	0.0045	0.0418	-0.7621	-0.7486	-0.7554	-0.7181	-0.7225	-0.7222	-0.7224	-0.6851	-0.0897	-0.0521	-0.0709	-0.0336
L12	0:02:00	0.0037	0.0053	0.0045	0.0430	-0.7697	-0.7548	-0.7623	-0.7238	-0.7275	-0.7280	-0.7278	-0.6893	-0.0904	-0.0537	-0.0721	-0.0336
L12	0:04:00	0.0037	0.0053	0.0045	0.0435	-0.7740	-0.7607	-0.7674	-0.7284	-0.7327	-0.7336	-0.7332	-0.6942	-0.0917	-0.0546	-0.0732	-0.0342
L13	0:00:30	0.0047	0.0062	0.0055	0.0650	-0.8185	-0.8047	-0.8116	-0.7521	-0.7753	-0.7769	-0.7761	-0.7166	-0.1089	-0.0722	-0.0906	-0.0310
L13	0:01:00	0.0047	0.0062	0.0055	0.0655	-0.8217	-0.8079	-0.8148	-0.7548	-0.7789	-0.7788	-0.7789	-0.7188	-0.1091	-0.0727	-0.0909	-0.0309
L13	0:02:00	0.0047	0.0062	0.0055	0.0648	-0.8269	-0.8133	-0.8201	-0.7607	-0.7837	-0.7835	-0.7836	-0.7242	-0.1097	-0.0731	-0.0914	-0.0320
L13	0:04:00	0.0047	0.0062	0.0055	0.0658	-0.8336	-0.8200	-0.8268	-0.7665	-0.7899	-0.7901	-0.7900	-0.7297	-0.1111	-0.0747	-0.0929	-0.0326
L14	0:00:30	0.0053	0.0071	0.0062	0.0771	-0.8751	-0.8606	-0.8679	-0.7969	-0.8296	-0.8284	-0.8290	-0.7581	-0.1290	-0.0935	-0.1113	-0.0403
L14	0:01:00	0.0054	0.0071	0.0063	0.0771	-0.8763	-0.8621	-0.8692	-0.7983	-0.8212	-0.8300	-0.8256	-0.7547	-0.1291	-0.0935	-0.1113	-0.0404
L14	0:02:00	0.0054	0.0071	0.0063	0.0785	-0.8831	-0.8685	-0.8758	-0.8035	-0.8382	-0.8365	-0.8374	-0.7651	-0.1311	-0.0953	-0.1132	-0.0409
L14	0:04:00	0.0054	0.0071	0.0063	0.0808	-0.8906	-0.8762	-0.8834	-0.8089	-0.8443	-0.8438	-0.8441	-0.7695	-0.1334	-0.0976	-0.1155	-0.0410
L15	0:00:30	0.0062	0.0074	0.0068	0.0943	-0.9347	-0.9185	-0.9266	-0.8391	-0.8893	-0.8879	-0.8886	-0.8011	-0.1550	-0.1199	-0.1375	-0.0499
L15	0:01:00	0.0062	0.0074	0.0068	0.0956	-0.9412	-0.9249	-0.9331	-0.8443	-0.8943	-0.8928	-0.8936	-0.8048	-0.1570	-0.1221	-0.1396	-0.0508
L15	0:02:00	0.0062	0.0074	0.0068	0.0980	-0.9509	-0.9340	-0.9425	-0.8512	-0.9023	-0.9015	-0.9019	-0.8107	-0.1623	-0.1255	-0.1439	-0.0527
L15	0:04:00	0.0062	0.0079	0.0071	0.1008	-0.9607	-0.9432	-0.9520	-0.8582	-0.9130	-0.9106	-0.9118	-0.8180	-0.1656	-0.1289	-0.1473	-0.0535
L16	0:00:30	0.0071	0.0093	0.0082	0.1152	-0.9987	-0.9814	-0.9901	-0.8830	-0.9443	-0.9476	-0.9460	-0.8389	-0.1876	-0.1526	-0.1701	-0.0631
L16	0:01:00	0.0071	0.0093	0.0082	0.1153	-0.9993	-0.9820	-0.9907	-0.8836	-0.9508	-0.9488	-0.9498	-0.8428	-0.1877	-0.1526	-0.1702	-0.0631
L16	0:02:00	0.0071	0.0095	0.0083	0.1211	-1.0169	-0.9980	-1.0075	-0.8946	-0.9827	-0.9632	-0.9730	-0.8601	-0.1974	-0.1617	-0.1796	-0.0667
L16	0:04:00	0.0071	0.0095	0.0083	0.1263	-1.0324	-1.0142	-1.0233	-0.9053	-0.9832	-0.9805	-0.9819	-0.8638	-0.2074	-0.1700	-0.1887	-0.0707
L17	0:00:30	0.0081	0.0111	0.0096	0.1673	-1.1047	-1.0830	-1.0939	-0.9361	-1.0514	-1.0484	-1.0499	-0.8922	-0.2515	-0.2170	-0.2343	-0.0765
L17	0:01:00	0.0081	0.0111	0.0096	0.1702	-1.1123	-1.0932	-1.1028	-0.9422	-1.0624	-1.0604	-1.0614	-0.9008	-0.2553	-0.2216	-0.2385	-0.0779
L17	0:02:00	0.0081	0.0111	0.0096	0.1752	-1.1265	-1.1076	-1.1171	-0.9515	-1.0759	-1.0736	-1.0748	-0.9092	-0.2647	-0.2301	-0.2474	-0.0818
L17	0:04:00	0.0081	0.0112	0.0097	0.1660	-1.1446	-1.1252	-1.1349	-0.9786	-1.0943	-1.0909	-1.0926	-0.9363	-0.2762	-0.2409	-0.2586	-0.1023
L18	0:00:30	0.0090	0.0128	0.0109	0.2603	-1.2180	-1.1990	-1.2085	-0.9591	-1.1668	-1.1655	-1.1662	-0.9168	-0.3317	-0.2958	-0.3138	-0.0644
L18	0:01:00	0.0090	0.0128	0.0109	0.2646	-1.2299	-1.2097	-1.2198	-0.9661	-1.1778	-1.1758	-1.1768	-0.9231	-0.3487	-0.3030	-0.3259	-0.0721
L18	0:02:00	0.0090	0.0128	0.0109	0.2717	-1.2461	-1.2251	-1.2356	-0.9748	-1.1947	-1.1912	-1.1930	-0.9321	-0.3487	-0.3137	-0.3312	-0.0704
L18	0:04:00	0.0090	0.0128	0.0109	0.2759	-1.2639	-1.2425	-1.2532	-0.9882	-1.2119	-1.2084	-1.2102	-0.9452	-0.3805	-0.3253	-0.3529	-0.0879
L19	0:00:30	0.0097	0.0151	0.0124	0.3429	-1.3389	-1.3176	-1.3283	-0.9978	-1.2875	-1.2854	-1.2865	-0.9560	-0.4224	-0.3853	-0.4039	-0.0734
L19	0:01:00	0.0097	0.0151	0.0124	0.3550	-1.3556	-1.3343	-1.3450	-1.0023	-1.3048	-1.3032	-1.3040	-0.9614	-0.4334	-0.3977	-0.4155	-0.0729
L19	0:02:00	0.0097	0.0151	0.0124	0.3660	-1.3803	-1.3602	-1.3703	-1.0167	-1.3319	-1.3283	-1.3301	-0.9765	-0.4528	-0.4165	-0.4347	-0.0811
L19	0:04:00	0.0097	0.0153	0.0125	0.4295	-1.4121	-1.3931	-1.4026	-0.9856	-1.3643	-1.3600	-1.3622	-0.9452	-0.4751	-0.4399	-0.4575	-0.0405
L20	0:00:30	0.0103	0.0172	0.0138	0.5151	-1.5331	-1.5129	-1.5230	-1.0217	-1.4823	-1.4791	-1.4807	-0.9794	-0.5750	-0.5370	-0.5560	-0.0547
L20	0:01:00	0.0103	0.0173	0.0138	0.5310	-1.5865	-1.5356	-1.5611	-1.0438	-1.5378	-1.5042	-1.5210	-1.0038	-0.6145	-0.5549	-0.5847	-0.0675
L20	0:02:00	0.0103	0.0174	0.0139	0.5949	-1.6278	-1.5638	-1.5958	-1.0147	-1.5378	-1.5322	-1.5350	-0.9539	-0.6540	-0.5769	-0.6155	-0.0344
L20	0:04:00	0.0103	0.0176	0.0140	0.6377	-1.7266	-1.6038	-1.6652	-1.0414	-1.5792	-1.5744	-1.5768	-0.9530	-0.6934	-0.6090	-0.6512	-0.0274

Table D.1 Adjusted Indicator Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Mvmt.	TT #3	TT #8	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L21	0:00:30	0.0109	0.0196	0.0153	0.7658	-1.8254	-1.7990	-1.8122	-1.0617	-1.7803	-1.7704	-1.7754	-1.0249	-0.8222	-0.7734	-0.7978	-0.0473
L21	0:01:00	0.0109	0.0196	0.0153	0.7738	-1.8511	-1.8220	-1.8366	-1.0781	-1.7803	-1.7914	-1.7859	-1.0274	-0.8342	-0.7920	-0.8131	-0.0546
L21	0:02:00	0.0109	0.0199	0.0154	0.8033	-1.9001	-1.8737	-1.8869	-1.0990	-1.8463	-1.8429	-1.8446	-1.0567	-0.8768	-0.8349	-0.8559	-0.0680
L21	0:04:00	0.0109	0.0199	0.0154	0.8666	-1.9608	-1.9329	-1.9469	-1.0957	-1.9139	-1.9068	-1.9104	-1.0592	-0.9171	-0.8866	-0.9019	-0.0507
L22	0:01:00	0.0109	0.0207	0.0158	0.9691	-2.1231	-2.0963	-2.1097	-1.1564	-2.0703	-2.0681	-2.0692	-1.1159	-1.0605	-1.0233	-1.0419	-0.0886
L22	0:02:00	0.0109	0.0211	0.0160	0.9977	-2.1764	-2.1493	-2.1629	-1.1811	-2.1533	-2.1234	-2.1384	-1.1566	-1.1020	-1.0682	-1.0851	-0.1034
L22	0:04:00	0.0109	0.0212	0.0161	1.0413	-2.2587	-2.2249	-2.2418	-1.2165	-2.2543	-2.2644	-2.2594	-1.2341	-1.1691	-1.1357	-1.1524	-0.1271
L23	0:00:30	0.0109	0.0223	0.0166	1.2483	-2.4748	-2.4450	-2.4599	-1.2282	-2.4265	-2.4234	-2.4250	-1.1933	-1.2600	-1.3197	-1.2899	-0.0582
L23	0:01:00	0.0109	0.0223	0.0166	1.2740	-2.5244	-2.4958	-2.5101	-1.2527	-2.4763	-2.4744	-2.4754	-1.2180	-1.3912	-1.3610	-1.3761	-0.1187
L23	0:02:00	0.0109	0.0223	0.0166	1.3294	-2.6263	-2.5948	-2.6106	-1.2978	-2.5823	-2.5744	-2.5784	-1.2656	-1.4800	-1.4420	-1.4610	-0.1482
L23	0:04:00	0.0109	0.0228	0.0169	1.3964	-2.7586	-2.7300	-2.7443	-1.3647	-2.7058	-2.7064	-2.7061	-1.3265	-1.5751	-1.5450	-1.5601	-0.1805
U1	0:00:30	0.0109	0.0230	0.0170	1.5758	-2.8379	-2.8104	-2.8242	-1.2653	-2.7871	-2.7860	-2.7866	-1.2277	-1.6341	-1.6065	-1.6203	-0.0615
U1	0:03:00	0.0109	0.0230	0.0170	1.5767	-2.8379	-2.8104	-2.8242	-1.2644	-2.7877	-2.7860	-2.7869	-1.2271	-1.6341	-1.6065	-1.6203	-0.0605
U2	0:00:30	0.0109	0.0104	0.0107	1.5669	-2.8379	-2.8084	-2.8232	-1.2670	-2.7843	-2.7831	-2.7837	-1.2275	-1.6321	-1.6038	-1.6180	-0.0618
U2	0:03:00	0.0109	0.0104	0.0107	1.5667	-2.8379	-2.8084	-2.8232	-1.2671	-2.7843	-2.7827	-2.7835	-1.2275	-1.6320	-1.6036	-1.6178	-0.0617
U3	0:00:30	0.0109	0.0104	0.0107	1.5592	-2.8316	-2.7952	-2.8134	-1.2649	-2.7723	-2.7701	-2.7712	-1.2227	-1.6204	-1.5913	-1.6059	-0.0573
U3	0:03:00	0.0109	0.0108	0.0109	1.5590	-2.8315	-2.7949	-2.8132	-1.2651	-2.7719	-2.7697	-2.7708	-1.2227	-1.6201	-1.5909	-1.6055	-0.0574
U4	0:00:30	0.0080	0.0042	0.0061	1.5313	-2.7925	-2.7549	-2.7737	-1.2486	-2.7333	-2.7301	-2.7317	-1.2066	-1.5838	-1.5521	-1.5680	-0.0428
U4	0:03:00	0.0080	0.0042	0.0061	1.5303	-2.7911	-2.7539	-2.7725	-1.2483	-2.7334	-2.7294	-2.7314	-1.2072	-1.5834	-1.5519	-1.5677	-0.0435
U5	0:00:30	0.0008	0.0041	0.0025	1.4704	-2.7045	-2.6694	-2.6870	-1.2190	-2.6512	-2.6444	-2.6478	-1.1799	-1.5051	-1.4665	-1.4858	-0.0178
U5	0:03:00	0.0008	0.0041	0.0025	1.4696	-2.7042	-2.6683	-2.6863	-1.2192	-2.6503	-2.6257	-2.6380	-1.1709	-1.5057	-1.4665	-1.4861	-0.0190
U6	0:00:30	-0.0094	0.0001	-0.0047	1.1939	-2.3657	-2.3320	-2.3489	-1.1504	-2.3253	-2.3077	-2.3165	-1.1180	-1.1795	-1.2200	-1.1998	-0.0012
U6	0:03:00	-0.0094	0.0001	-0.0047	1.1755	-2.2382	-2.3070	-2.2726	-1.0925	-2.2987	-2.2898	-2.2943	-1.1141	-1.1611	-1.1194	-1.1403	0.0399
U6	0:06:00	-0.0094	0.0000	-0.0047	1.1657	-2.3307	-2.2982	-2.3145	-1.1441	-2.2914	-2.2828	-2.2871	-1.1167	-1.1541	-1.1120	-1.1331	0.0374

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L0	0:00:00		8.16	4.82	NR	9.89	NR	12.39	26.62	14.90	23.65	24.76	2.19	31.78	7.84	22.51
L1	0:00:30		8.23	5.03	NR	10.04	NR	12.25	26.87	15.12	24.27	24.98	2.82	31.64	8.37	22.69
L1	0:01:00		8.19	4.86	NR	10.00	NR	12.57	26.51	15.23	24.23	24.98	2.60	31.64	8.30	22.62
L1	0:01:30		8.23	4.86	NR	10.00	NR	12.57	26.51	15.26	24.19	24.94	2.67	31.64	8.30	22.62
L1	0:02:00		8.19	4.86	NR	10.00	NR	12.39	26.84	15.23	23.98	24.94	2.71	31.64	8.27	22.62
L1	0:02:30		8.12	4.96	NR	10.04	NR	12.28	26.66	15.08	24.08	24.98	2.71	31.64	8.30	22.65
L1	0:03:00		8.26	4.96	NR	10.00	NR	12.32	26.48	15.23	24.16	24.98	2.67	31.64	8.27	22.62
L1	0:03:30		8.12	5.03	NR	10.00	NR	12.57	26.84	15.19	24.16	24.94	2.60	31.64	8.27	22.62
L1	0:04:00		8.16	4.86	NR	10.00	NR	12.39	26.84	15.23	24.08	24.98	2.63	31.68	8.23	22.62
L1	0:04:30		8.19	4.96	NR	10.00	NR	12.46	26.84	15.19	24.16	24.98	2.63	31.68	8.23	22.65
L1	0:05:00		8.19	4.86	NR	10.00	NR	12.46	26.84	15.23	24.08	24.94	2.63	31.68	8.23	22.65
L1	0:05:30		8.08	4.89	NR	10.00	NR	12.50	26.84	15.19	24.16	24.94	2.49	31.68	8.23	22.62
L1	0:06:00		8.16	4.86	NR	10.00	NR	12.53	26.84	15.19	24.12	24.94	2.63	31.64	8.23	22.62
L1	0:06:30		8.16	5.07	NR	10.04	NR	12.28	26.84	15.05	24.12	24.94	2.67	31.64	8.23	22.62
L2	0:00:30		8.12	5.10	NR	10.07	NR	12.57	26.66	15.26	24.74	24.94	3.36	31.57	8.62	22.65
L2	0:01:00		8.16	5.03	NR	10.07	NR	12.32	27.02	15.26	24.67	24.94	3.14	31.60	8.59	22.69
L2	0:01:30		8.08	4.93	NR	10.07	NR	12.61	27.02	15.23	24.48	24.94	3.33	31.50	8.59	22.65
L2	0:02:00		8.16	4.93	NR	10.07	NR	12.32	27.02	15.23	24.67	24.94	3.36	31.60	8.62	22.69
L2	0:02:30		8.16	4.93	NR	10.07	NR	12.32	27.02	15.08	24.52	24.94	3.44	31.57	8.59	22.62
L2	0:03:00		8.16	5.10	NR	10.11	NR	12.35	27.02	15.12	24.67	24.94	3.44	31.57	8.59	22.65
L2	0:03:30		8.12	4.93	NR	10.07	NR	12.32	27.02	15.08	24.67	24.94	3.25	31.57	8.59	22.65
L2	0:04:00		8.12	4.93	NR	10.11	NR	12.46	26.66	15.23	24.67	24.94	3.36	31.60	8.59	22.62
L2	0:04:30		8.05	4.93	NR	10.07	NR	12.32	26.62	15.23	24.67	24.91	3.36	31.53	8.59	22.65
L2	0:05:00		8.05	4.93	NR	10.11	NR	12.61	26.62	15.23	24.63	24.94	3.40	31.57	8.59	22.62
L2	0:05:30		8.05	5.03	NR	10.07	NR	12.28	26.98	15.23	24.67	24.94	3.40	31.57	8.59	22.65
L3	0:00:30		8.19	5.00	NR	10.29	NR	12.46	27.70	15.19	26.81	24.19	6.76	30.09	10.05	22.29
L3	0:01:00		8.12	5.00	NR	10.29	NR	12.61	27.66	15.19	26.70	24.30	6.76	30.09	9.98	22.25
L3	0:01:30		8.08	5.14	NR	10.26	NR	12.68	27.63	15.19	26.66	24.30	6.58	30.09	9.98	22.29
L3	0:02:00		8.12	5.03	NR	10.26	NR	12.46	27.63	15.08	26.59	24.19	6.54	30.09	9.95	22.25
L3	0:02:30		8.08	5.14	NR	10.26	NR	12.46	27.16	15.05	26.63	24.23	6.62	30.09	9.91	22.29
L3	0:03:00		8.05	5.00	NR	10.22	NR	12.46	27.59	15.15	26.56	24.30	6.47	30.05	9.91	22.25
L3	0:03:30		8.08	5.00	NR	10.22	NR	12.75	27.59	15.19	26.56	24.30	6.44	30.12	9.91	22.29
L3	0:04:00		8.05	5.00	NR	10.26	NR	12.43	27.16	15.12	26.52	24.30	6.44	30.12	9.88	22.25
L3	0:04:30		8.08	5.00	NR	10.22	NR	12.46	27.16	15.15	26.52	24.30	6.54	30.12	9.88	22.25
L3	0:05:00		8.08	5.00	NR	10.22	NR	12.46	27.55	15.15	26.52	24.30	6.44	30.09	9.88	22.25
L3	0:05:30		8.05	5.17	NR	10.26	NR	12.43	27.55	15.19	26.48	24.23	6.40	30.48	9.88	22.29
L3	0:06:00		8.01	5.00	NR	10.18	NR	12.75	27.55	15.05	26.48	24.23	6.40	30.20	9.84	22.25
L4	0:00:30		8.08	5.32	NR	10.58	NR	12.97	28.38	15.08	30.08	23.37	12.61	27.99	12.67	22.15
L4	0:01:00		8.16	5.21	NR	10.58	NR	12.79	28.27	15.15	29.90	23.44	11.96	28.10	12.56	22.11
L4	0:01:30		8.19	5.28	NR	10.58	NR	12.82	28.74	15.19	29.82	23.51	12.25	28.10	12.52	22.15
L4	0:02:00		8.08	5.17	NR	10.58	NR	13.07	28.74	15.05	29.79	23.44	12.10	28.10	12.49	22.15
L4	0:02:30		8.19	5.17	NR	10.58	NR	13.04	28.70	15.05	29.75	23.44	12.18	28.14	12.45	22.11

149

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L4	0:03:00		8.08	5.17	NR	10.55	NR	12.79	28.20	15.19	29.75	23.51	12.10	28.14	12.45	22.15
L4	0:03:30		8.05	5.17	NR	10.55	NR	13.00	28.70	15.19	29.72	23.51	12.03	28.14	12.45	22.07
L4	0:04:00		8.05	5.17	NR	10.55	NR	12.75	28.66	15.19	29.72	23.55	11.66	27.88	12.42	22.11
L4	0:04:30		8.08	5.35	NR	10.58	NR	12.75	28.66	15.19	29.68	23.44	12.07	28.14	12.42	22.11
L4	0:05:00		8.08	5.28	NR	10.55	NR	12.71	28.66	15.19	29.68	23.51	12.03	28.14	12.42	22.11
L4	0:05:30		8.01	5.17	NR	10.51	NR	13.00	28.66	15.19	29.68	23.55	11.99	28.14	12.42	22.07
L4	0:06:00		8.08	5.17	NR	10.55	NR	12.75	28.66	15.19	29.42	23.51	11.63	27.92	12.42	22.11
L4	0:06:30		8.01	5.28	NR	10.55	NR	13.00	28.63	15.15	29.64	23.44	11.63	28.14	12.38	22.07
L5	0:00:30		8.23	5.49	NR	11.20	NR	13.58	29.63	16.02	33.28	24.98	17.73	31.42	15.28	24.75
L5	0:01:00		8.41	5.64	NR	11.16	NR	13.83	29.99	15.98	33.13	24.87	17.48	31.28	15.03	24.46
L5	0:01:30		8.23	5.49	NR	11.16	NR	13.51	29.56	15.80	32.80	24.84	17.51	31.13	14.99	24.46
L5	0:02:00		8.33	5.56	NR	11.13	NR	13.83	29.95	15.95	33.02	24.80	17.29	31.17	14.96	24.39
L5	0:02:30		8.23	5.64	NR	11.13	NR	13.43	29.52	15.84	33.02	24.73	17.18	31.13	14.88	24.43
L5	0:03:00		8.19	5.56	NR	11.13	NR	13.72	29.95	15.95	32.98	24.76	17.33	30.99	14.88	24.39
L5	0:03:30		8.23	5.49	NR	11.09	NR	13.47	29.92	15.80	32.69	24.73	17.15	31.10	14.81	24.39
L5	0:04:00		8.26	5.64	NR	11.09	NR	13.43	29.92	15.88	32.95	24.76	17.18	31.10	14.81	24.35
L5	0:04:30		8.19	5.56	NR	11.09	NR	13.47	29.92	15.88	32.88	24.76	17.26	31.06	14.81	24.35
L5	0:05:00		8.26	5.46	NR	11.09	NR	13.40	29.92	15.77	32.91	24.73	17.04	31.06	14.78	24.39
L5	0:05:30		8.23	5.56	NR	11.09	NR	13.47	29.88	15.88	32.66	24.73	17.18	31.13	14.78	24.46
L5	0:06:00		8.23	5.46	NR	11.09	NR	13.47	29.88	15.84	32.88	24.66	17.18	31.03	14.74	24.35
L5	0:06:30		8.19	5.46	NR	11.09	NR	13.65	29.88	15.88	32.88	24.66	16.97	31.06	14.74	24.35
L5	0:07:00		8.16	5.53	NR	11.06	NR	13.47	29.88	15.84	32.88	24.66	16.97	31.03	14.74	24.32
L5	0:07:30		8.23	5.46	NR	11.09	NR	13.43	29.45	15.84	32.88	24.69	17.15	31.03	14.71	24.32
L5	0:08:00		8.23	5.46	NR	11.09	NR	13.43	29.85	15.84	32.59	24.69	17.15	31.03	14.71	24.35
L5	0:08:30		8.19	5.46	NR	11.06	NR	13.76	29.85	15.84	32.88	24.69	17.11	31.03	14.71	24.35
L5	0:09:00		8.26	5.46	NR	11.09	NR	13.61	29.85	15.84	32.55	24.69	16.93	31.03	14.71	24.32
L5	0:09:30		8.19	5.60	NR	11.06	NR	13.36	29.42	15.69	32.55	24.62	16.89	30.99	14.71	24.32
L5	0:10:00		8.19	5.46	NR	11.13	NR	13.76	29.92	15.88	32.77	24.73	17.40	31.21	14.85	24.50
L6	0:00:30		8.69	5.92	NR	12.00	NR	14.91	31.24	17.43	35.89	27.84	22.96	36.62	17.85	26.60
L6	0:01:00		8.59	5.88	NR	11.93	NR	14.95	31.14	17.43	35.67	27.45	22.38	36.34	17.32	26.38
L6	0:01:30		8.73	6.06	NR	12.07	NR	15.13	31.28	17.53	35.96	27.84	22.78	37.42	17.35	26.92
L6	0:02:00		8.51	5.95	NR	12.04	NR	15.06	31.03	17.61	36.04	27.98	22.78	37.82	17.25	27.07
L6	0:02:30		8.62	5.99	NR	12.07	NR	15.16	31.28	17.64	35.89	27.88	22.52	37.49	16.96	26.85
L6	0:03:00		8.48	6.06	NR	12.00	NR	14.77	31.24	17.61	35.85	27.84	22.30	37.71	16.67	26.89
L6	0:03:30		8.48	6.02	NR	12.11	NR	14.84	30.99	17.68	36.00	27.98	22.63	38.11	16.75	27.10
L6	0:04:00		8.59	5.92	NR	12.04	NR	14.77	31.24	17.64	35.85	27.95	22.38	37.78	16.64	26.78
L6	0:04:30		8.51	5.92	NR	12.07	NR	15.09	31.03	17.68	35.82	28.09	22.27	37.71	16.46	26.96
L6	0:05:00		8.48	5.92	NR	12.07	NR	15.13	31.21	17.61	35.75	27.88	22.16	37.67	16.42	26.92
L6	0:05:30		8.51	5.92	NR	12.07	NR	15.13	31.28	17.72	36.18	28.24	22.82	38.76	16.78	27.21
L7	0:00:30		9.30	6.98	NR	13.89	NR	17.61	33.39	21.58	41.12	33.53	26.91	45.11	17.53	29.49
L7	0:01:00		9.41	6.98	NR	14.11	NR	17.76	33.54	21.76	41.63	33.96	27.28	46.49	17.17	31.30
L7	0:01:30		9.30	7.09	NR	14.11	NR	17.83	33.57	21.79	41.52	33.93	26.91	46.59	16.67	32.42

150

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L7	0:02:00		9.30	7.02	NR	14.11	NR	17.86	33.61	21.76	41.56	34.00	26.91	47.21	16.53	34.23
L7	0:02:30		9.30	7.09	NR	14.11	NR	17.79	33.61	21.68	41.59	34.07	26.54	47.89	16.64	36.01
L7	0:03:00		9.23	7.02	NR	14.07	NR	17.65	33.47	21.54	41.27	33.89	26.65	47.75	17.07	36.98
L7	0:03:30		9.26	6.95	NR	13.89	NR	17.58	33.43	21.43	41.45	33.78	27.50	47.57	17.82	38.72
L7	0:04:00		9.19	6.98	NR	13.82	NR	17.54	33.39	21.36	41.01	33.46	27.93	47.17	18.86	39.66
L7	0:04:30		9.19	7.02	NR	13.97	NR	17.72	33.39	21.32	41.27	33.60	28.67	47.14	19.89	40.53
L7	0:05:00		9.44	6.95	NR	13.78	NR	17.72	33.47	21.32	41.34	33.67	29.36	46.74	21.04	41.32
L7	0:05:30		9.12	6.91	NR	13.75	NR	17.22	33.07	21.07	40.54	33.28	28.08	45.00	20.57	40.06
L8	0:00:30		9.55	7.37	NR	14.58	NR	18.95	34.33	22.95	42.79	35.57	33.78	45.37	25.48	41.11
L8	0:01:00		9.77	7.37	NR	14.47	NR	18.87	34.15	22.80	42.47	35.32	32.91	44.68	25.12	40.38
L8	0:01:30		9.44	7.27	NR	14.44	NR	18.41	34.04	22.77	42.21	35.14	32.47	44.28	24.87	40.02
L8	0:02:00		9.69	7.30	NR	14.51	NR	18.73	33.97	22.66	42.14	35.03	32.39	43.96	24.72	39.73
L8	0:02:30		9.66	7.23	NR	14.55	NR	18.66	33.93	22.62	41.96	35.00	31.96	43.85	24.62	39.52
L8	0:03:00		9.66	7.23	NR	14.33	NR	18.66	33.90	22.59	41.85	35.03	31.77	43.45	24.55	39.37
L8	0:03:30		9.66	7.30	NR	14.44	NR	18.44	33.90	22.55	41.78	34.93	31.85	43.23	24.44	39.30
L8	0:04:00		9.62	7.19	NR	14.33	NR	18.59	33.82	22.51	41.74	34.93	31.74	43.13	24.40	39.19
L8	0:04:30		9.34	7.23	NR	14.33	NR	18.59	33.90	22.51	41.81	34.89	31.41	42.98	24.37	39.04
L8	0:05:00		9.59	7.16	NR	14.47	NR	18.48	33.79	22.48	41.70	34.86	31.33	42.84	24.33	38.79
L8	0:05:30		9.34	7.23	NR	14.29	NR	18.55	33.79	22.48	41.56	34.86	31.26	42.62	24.29	38.57
L8	0:06:00		9.59	7.27	NR	14.29	NR	18.48	33.86	22.48	41.49	34.82	31.44	42.87	24.29	38.39
L8	0:06:30		9.55	7.23	NR	14.26	NR	18.41	33.82	22.44	41.41	34.82	31.15	42.69	24.29	38.25
L8	0:07:00		9.55	7.16	NR	14.26	NR	18.48	33.79	22.44	41.30	34.78	31.12	42.55	24.29	38.14
L8	0:07:30		9.23	7.12	NR	14.44	NR	18.15	33.68	22.41	41.30	34.75	31.33	41.86	24.29	37.92
L8	0:08:00		9.52	7.16	NR	14.22	NR	18.48	33.68	22.41	41.30	34.75	31.26	41.65	24.19	37.96
L8	0:08:30		9.26	7.27	NR	14.26	NR	18.44	33.75	22.37	41.16	34.71	30.97	42.19	24.15	37.89
L8	0:09:00		9.52	7.27	NR	14.22	NR	18.44	33.72	22.37	41.23	34.71	30.93	41.54	24.22	37.85
L8	0:09:30		9.23	7.23	NR	14.22	NR	18.08	33.61	22.37	41.12	34.64	31.15	41.32	24.22	37.81
L8	0:10:00		9.48	7.27	NR	14.22	NR	18.37	33.68	22.37	41.12	34.71	31.12	41.93	24.19	37.74
L8	0:10:30		9.48	7.16	NR	14.22	NR	18.44	33.68	22.33	40.98	34.68	30.79	41.14	24.15	37.56
L8	0:11:00		9.48	7.16	NR	14.18	NR	18.37	33.61	22.33	41.05	34.68	31.04	41.79	24.15	37.71
L8	0:11:30		9.19	7.19	NR	14.22	NR	18.44	33.65	22.33	40.98	34.64	30.71	41.72	24.08	37.67
L8	0:12:00		9.44	7.19	NR	14.37	NR	18.30	33.50	22.30	40.98	34.61	30.93	41.68	24.12	37.63
L8	0:12:30		9.19	7.19	NR	14.18	NR	18.37	33.61	22.30	40.94	34.64	30.64	41.03	24.08	37.63
L8	0:13:00		9.41	7.23	NR	14.18	NR	18.37	33.50	22.30	40.87	34.64	30.60	41.00	24.08	37.60
L8	0:13:30		9.16	7.09	NR	14.18	NR	18.33	33.32	22.30	41.16	34.57	30.57	41.54	24.08	37.60
L8	0:14:00		9.41	7.19	NR	14.33	NR	18.41	33.61	22.30	40.90	34.53	30.82	41.28	24.04	37.60
L8	0:14:30		9.41	7.48	NR	14.84	NR	19.09	34.58	23.16	43.16	35.68	35.32	45.08	26.80	40.96
L8	0:15:00		9.55	7.37	NR	14.51	NR	18.80	34.22	22.84	42.14	35.25	33.82	43.23	26.01	39.41
L8	0:15:30		9.26	7.37	NR	14.58	NR	18.41	34.08	22.73	41.96	35.28	33.35	42.69	25.80	38.90
L8	0:16:00		9.48	7.23	NR	14.40	NR	18.73	33.93	22.66	41.30	35.11	32.36	42.62	25.33	38.36
L8	0:16:30		9.62	7.83	NR	15.42	NR	20.06	35.62	24.43	45.45	37.58	38.79	47.28	29.48	43.06
L8	0:17:00		10.20	8.12	NR	15.97	NR	20.67	36.55	25.15	46.46	38.11	39.45	47.53	30.02	42.92

151

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L8	0:17:30		9.77	8.08	NR	15.82	NR	20.42	36.33	24.79	46.10	37.65	38.65	46.49	29.55	41.94
L9	0:00:30		10.37	8.43	NR	16.58	NR	21.25	37.52	26.16	48.17	39.72	42.23	48.51	32.27	44.47
L9	0:01:00		10.02	8.43	NR	16.55	NR	21.43	37.59	26.19	48.02	39.79	42.27	48.47	32.38	43.79
L9	0:01:30		9.98	8.47	NR	16.62	NR	21.54	37.66	26.16	47.99	39.69	42.01	47.64	32.13	43.13
L9	0:02:00		10.02	8.47	NR	16.62	NR	21.57	37.73	26.16	48.21	39.87	43.29	47.79	32.56	43.46
L9	0:02:30		9.94	8.40	NR	16.51	NR	21.39	37.26	25.94	47.73	39.47	41.50	46.63	31.81	42.34
L9	0:03:00		10.05	8.54	NR	16.77	NR	21.83	38.05	26.63	48.28	40.37	42.74	47.64	32.67	43.13
L9	0:03:30		10.02	8.51	NR	16.69	NR	21.61	37.41	26.41	47.92	39.97	41.90	46.77	32.13	42.30
L9	0:04:00		9.94	8.22	NR	16.62	NR	21.50	37.62	26.19	47.73	39.76	42.27	46.16	31.88	42.19
L9	0:04:30		9.91	8.43	NR	16.58	NR	21.43	37.52	26.19	47.62	39.54	41.97	45.80	31.70	41.69
L9	0:05:00		10.23	8.36	NR	16.55	NR	21.07	37.55	26.19	47.59	39.79	41.50	46.34	31.99	42.48
L9	0:05:30		9.98	8.47	NR	16.69	NR	21.61	37.80	26.45	48.21	40.12	42.67	47.17	32.67	42.84
L10	0:00:30		10.48	9.18	NR	18.37	NR	23.45	39.99	29.01	51.33	44.02	49.95	48.91	37.39	45.38
L10	0:01:00		10.87	9.21	NR	18.62	NR	24.10	40.02	29.66	51.95	44.55	51.01	49.34	38.18	45.92
L10	0:01:30		10.45	9.21	NR	18.29	NR	23.88	40.31	29.19	51.11	44.16	49.54	47.93	37.18	44.54
L10	0:02:00		10.73	9.21	NR	18.37	NR	23.81	39.63	29.37	51.33	44.27	49.80	48.54	37.57	44.91
L10	0:02:30		10.34	9.11	NR	18.29	NR	23.77	40.09	29.01	51.04	43.77	48.74	47.39	36.75	43.82
L10	0:03:00		10.66	9.11	NR	18.04	NR	23.59	39.41	29.08	50.71	44.12	48.04	46.81	36.32	43.24
L10	0:03:30		10.30	9.07	NR	18.07	NR	23.66	40.02	29.08	51.11	44.20	49.29	47.86	37.32	44.51
L10	0:04:00		10.66	9.14	NR	18.29	NR	23.74	39.59	29.26	51.22	43.98	49.14	47.35	37.03	44.00
L10	0:04:30		10.62	9.14	NR	18.22	NR	23.66	40.02	29.12	50.97	43.69	48.67	47.03	36.64	43.35
L10	0:05:00		10.59	9.11	NR	18.15	NR	23.59	39.92	29.01	50.60	43.55	48.12	46.70	36.39	43.21
L10	0:05:30		10.23	9.04	NR	18.11	NR	23.48	39.84	28.97	50.68	43.59	48.04	46.20	36.21	42.99
L10	0:06:00		10.55	8.97	NR	18.07	NR	23.48	39.31	28.90	50.39	43.41	47.86	46.16	36.07	43.31
L10	0:06:30		10.16	9.00	NR	18.04	NR	23.41	39.23	28.68	50.31	43.34	47.42	46.16	35.96	43.17
L10	0:07:00		10.52	8.93	NR	18.00	NR	23.41	39.16	28.83	50.24	43.37	47.28	46.02	35.85	42.63
L10	0:07:30		10.70	9.29	NR	18.66	NR	24.38	39.99	30.16	52.86	45.45	52.36	49.45	39.43	46.93
L11	0:00:30		11.13	9.89	NR	19.60	NR	25.82	41.56	31.79	53.76	48.42	55.58	48.98	41.25	45.74
L11	0:01:00		10.62	9.60	NR	19.57	NR	25.50	41.28	31.39	53.26	47.02	53.71	47.50	39.86	44.26
L11	0:01:30		10.91	9.57	NR	19.38	NR	25.28	40.35	31.35	52.82	46.84	52.91	46.88	39.43	43.93
L11	0:02:00		10.45	9.50	NR	19.13	NR	24.96	39.88	31.10	51.00	46.52	50.68	46.34	38.28	42.66
L11	0:02:30		10.77	9.39	NR	19.06	NR	24.60	39.81	31.03	51.11	46.59	50.46	46.09	38.07	42.41
L11	0:03:00		10.37	9.32	NR	19.02	NR	24.85	40.24	30.99	51.00	46.77	50.31	45.69	37.86	42.27
L11	0:03:30		11.02	9.75	NR	19.89	NR	25.97	40.95	32.04	54.38	48.67	56.78	49.66	41.58	45.96
L11	0:04:00		11.02	9.75	NR	19.89	NR	26.04	41.03	32.22	54.78	49.03	57.07	49.66	41.76	46.14
L11	0:04:30		10.95	9.68	NR	19.75	NR	25.46	40.74	31.86	53.87	47.60	54.73	48.11	40.50	44.80
L11	0:05:00		10.55	9.71	NR	19.78	NR	25.90	40.88	32.04	54.38	48.74	55.98	49.30	41.36	45.81
L11	0:05:30		10.55	9.71	NR	19.86	NR	25.97	40.92	32.08	54.78	47.92	56.27	49.01	41.11	45.52
L11	0:06:00		10.59	9.75	NR	19.93	NR	26.08	41.03	32.22	54.64	48.20	56.05	49.30	41.22	45.20
L11	0:06:30		10.91	9.68	NR	19.82	NR	25.93	40.81	31.97	54.56	47.85	55.54	48.58	40.57	44.83
L11	0:07:00		10.95	9.75	NR	19.89	NR	26.08	41.31	32.15	55.00	48.81	56.01	49.01	41.40	45.09
L12	0:01:00		11.34	10.35	NR	21.49	NR	28.35	43.00	35.21	58.27	53.29	63.47	49.74	45.01	45.92

152

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L12	0:01:30		10.77	10.21	NR	21.24	NR	28.13	42.50	35.00	57.91	53.18	63.03	50.13	44.80	46.28
L12	0:02:00		10.84	10.28	NR	21.35	NR	28.31	42.96	35.14	57.94	52.75	62.89	49.23	44.58	45.41
L12	0:02:30		11.20	10.21	NR	21.31	NR	28.27	42.50	35.11	58.05	52.75	62.71	49.01	44.37	45.27
L12	0:03:00		11.13	10.17	NR	21.20	NR	28.09	42.35	35.00	57.94	52.35	62.82	49.56	44.51	45.49
L12	0:03:30		11.16	10.21	NR	21.31	NR	28.20	42.39	35.11	58.30	52.78	62.74	49.05	44.33	45.49
L12	0:04:00		11.09	10.17	NR	21.20	NR	28.09	42.32	34.93	57.61	52.07	61.90	48.15	43.76	44.94
L12	0:04:30		11.13	10.21	NR	21.31	NR	28.24	42.53	35.14	58.20	52.50	62.96	49.16	44.37	45.88
L13	0:00:30		11.48	10.84	NR	22.80	NR	30.47	44.82	37.96	61.32	56.40	70.27	49.95	48.02	47.08
L13	0:01:00		11.48	10.84	NR	22.95	NR	30.58	44.97	38.24	61.83	57.08	69.54	49.70	47.48	46.68
L13	0:01:30		11.30	10.67	NR	22.40	NR	30.11	44.22	37.67	60.52	56.26	67.60	48.69	45.98	45.49
L13	0:02:00		10.91	10.70	NR	22.55	NR	30.44	44.68	37.99	61.36	56.94	69.18	49.99	46.98	46.54
L13	0:02:30		10.84	10.70	NR	22.40	NR	29.75	44.25	37.63	60.74	55.86	67.75	48.94	46.01	45.49
L13	0:03:00		10.95	10.63	NR	22.48	NR	30.33	44.43	37.85	61.07	56.11	68.41	49.52	46.34	45.85
L13	0:03:30		11.23	10.67	NR	22.69	NR	29.93	44.61	37.85	61.36	56.76	68.67	49.95	46.55	46.28
L13	0:04:00		10.80	10.60	NR	22.44	NR	30.26	44.61	37.88	61.36	56.83	68.67	50.02	46.37	46.32
L13	0:04:30		11.16	10.56	NR	22.55	NR	30.15	44.36	37.70	60.96	56.36	67.82	49.66	45.94	45.78
L13	0:05:00		10.77	10.60	NR	22.58	NR	30.15	44.47	37.81	61.17	56.69	68.15	49.84	46.16	46.14
L13	0:05:30		11.13	10.53	NR	22.55	NR	29.86	44.61	37.96	61.86	57.22	69.62	51.43	47.30	47.15
L14	0:00:30		11.27	11.38	NR	23.89	NR	31.80	46.58	40.34	64.92	60.34	73.71	53.13	49.02	48.06
L14	0:01:00		11.52	11.20	NR	24.11	NR	32.38	46.80	40.55	64.95	60.98	73.97	53.09	48.41	48.42
L14	0:01:30		11.38	11.02	NR	23.71	NR	31.52	46.15	40.05	64.15	60.34	71.55	51.98	46.84	46.28
L14	0:02:00		11.41	11.09	NR	23.93	NR	32.20	46.58	40.45	64.15	60.69	72.61	53.20	47.73	47.48
L14	0:02:30		11.02	11.06	NR	23.78	NR	32.20	46.62	40.45	64.99	60.87	73.16	53.71	47.80	47.62
L14	0:03:00		11.02	11.06	NR	23.97	NR	32.27	46.54	40.59	65.35	60.80	73.93	54.58	48.09	48.06
L14	0:03:30		10.91	11.13	NR	23.86	NR	31.66	46.47	40.37	64.73	60.80	72.07	53.20	47.05	47.01
L14	0:04:00		11.30	10.99	NR	23.82	NR	31.73	46.51	40.37	64.95	60.91	72.32	53.56	47.09	47.19
L14	0:04:30		10.87	11.09	NR	23.82	NR	32.16	46.51	40.41	64.99	60.62	72.14	53.53	47.09	46.97
L14	0:05:00		10.87	10.99	NR	23.86	NR	31.77	46.58	40.41	64.95	60.87	72.29	54.07	47.05	47.44
L14	0:06:04		11.27	11.52	NR	25.20	NR	34.11	49.09	42.94	68.26	64.49	77.51	59.81	49.56	51.17
L15	0:00:30		11.63	11.80	NR	25.17	NR	34.22	48.95	43.12	68.62	65.77	76.60	60.32	48.52	51.13
L15	0:01:00		11.16	11.52	NR	25.28	NR	33.89	49.09	43.22	68.80	65.74	76.01	60.61	47.52	50.37
L15	0:01:30		11.05	11.62	NR	24.98	NR	33.60	48.95	42.97	68.26	65.27	74.77	59.78	46.73	49.79
L15	0:02:00		11.55	11.52	NR	25.42	NR	34.15	49.48	43.77	69.38	66.67	76.53	62.23	47.69	51.31
L15	0:02:30		11.45	11.41	NR	25.20	NR	34.22	49.09	43.44	68.40	66.13	74.81	60.93	46.48	50.15
L15	0:03:00		11.45	11.41	NR	25.17	NR	33.86	49.09	43.40	68.88	66.10	74.92	61.51	46.55	50.44
L15	0:03:30		10.98	11.34	NR	25.13	NR	33.82	49.34	43.30	68.73	65.24	75.21	61.91	46.69	50.62
L15	0:04:00		10.98	11.38	NR	25.17	NR	33.86	49.20	43.51	68.91	66.31	75.39	62.31	46.73	51.17
L15	0:04:30		11.34	11.38	NR	25.20	NR	33.93	49.27	43.44	69.20	66.42	75.36	62.12	46.55	50.81
L16	0:00:30		11.48	12.01	NR	26.66	NR	36.23	51.52	46.00	72.87	69.46	78.03	67.33	47.23	54.13
L16	0:01:00		11.52	11.70	NR	26.04	NR	35.55	50.59	45.21	71.56	68.67	75.83	65.70	45.69	52.58
L16	0:01:30		11.38	11.55	NR	25.71	NR	34.97	50.27	44.88	70.73	67.81	74.92	64.62	45.15	51.57
L16	0:02:00		11.30	11.48	NR	25.68	NR	35.05	50.45	44.81	70.37	67.99	74.33	64.18	44.83	51.53

Table D.2 Calculated Strain, Shaft 11 - 2002

154

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L16	0:02:30	11.34	11.98	NR	26.77	NR	36.70	52.60	46.76	74.29	70.71	78.65	69.78	47.55	54.86	
L16	0:03:00	11.66	11.87	NR	26.77	NR	36.23	52.17	46.65	74.22	70.39	77.99	69.89	46.76	54.75	
L16	0:03:30	11.27	12.19	NR	26.84	NR	36.74	52.38	46.98	74.54	70.57	77.99	70.11	46.23	55.04	
L16	0:04:00	11.27	11.91	NR	26.88	NR	36.45	52.53	47.08	74.43	70.64	77.95	70.58	45.98	55.18	
L16	0:04:30	11.45	11.73	NR	26.55	NR	36.31	51.85	46.69	73.74	70.10	76.31	69.31	45.19	54.46	
L16	0:05:00	11.52	11.84	NR	26.88	NR	36.92	52.81	47.12	75.45	71.29	78.46	71.95	46.37	55.65	
L16	0:05:30	11.52	11.77	NR	26.69	NR	36.31	52.53	47.01	74.11	70.61	76.67	70.25	45.33	54.42	
L17	0:00:30	11.48	12.37	NR	28.19	NR	38.86	55.97	49.75	78.90	74.76	80.84	77.80	46.76	59.35	
L17	0:01:00	11.84	12.44	NR	28.55	NR	39.40	56.54	50.69	81.12	75.83	80.66	79.46	46.30	59.24	
L17	0:01:30	11.27	12.30	NR	28.29	NR	39.08	56.51	50.33	79.77	74.97	78.76	78.05	44.58	58.04	
L17	0:02:00	11.30	12.30	NR	28.48	NR	39.04	56.54	50.73	81.23	75.76	80.00	80.44	45.05	60.29	
L17	0:02:30	11.34	12.33	NR	28.62	NR	39.73	56.79	50.94	81.45	76.01	79.49	80.18	44.55	60.43	
L17	0:03:00	11.30	12.30	NR	28.55	NR	39.30	56.86	51.05	81.66	76.15	79.45	81.48	44.76	59.74	
L17	0:03:30	11.34	12.23	NR	28.51	NR	39.26	56.79	51.02	81.81	75.87	79.09	80.55	44.30	60.61	
L17	0:04:00	11.63	12.23	NR	28.55	NR	39.30	56.90	51.05	82.17	76.26	78.98	80.83	44.22	60.79	
L17	0:04:30	11.20	12.19	NR	28.55	NR	39.33	56.86	51.16	81.63	76.05	78.98	81.34	43.62	60.43	
L17	0:05:00	11.66	12.19	NR	28.66	NR	39.48	57.65	51.31	82.64	76.33	78.57	81.05	43.83	59.56	
L17	0:05:30	11.23	12.09	NR	28.44	NR	39.22	56.79	51.09	81.99	76.05	78.54	80.87	43.65	59.45	
L17	0:06:00	11.55	12.12	NR	28.51	NR	39.40	56.94	51.16	82.39	76.15	78.50	81.34	43.69	60.94	
L18	0:00:30	11.88	13.11	NR	29.97	NR	41.78	59.73	54.12	86.71	80.38	81.86	87.81	44.80	63.69	
L18	0:01:00	11.55	12.83	NR	30.40	NR	42.29	60.52	54.77	87.51	80.45	81.46	88.71	44.08	64.92	
L18	0:01:30	11.77	12.69	NR	30.19	NR	42.65	60.88	54.77	87.73	81.02	81.54	89.39	43.58	64.45	
L18	0:02:00	11.34	12.65	NR	30.22	NR	42.72	60.66	54.95	87.95	81.16	80.91	89.76	43.04	64.63	
L18	0:02:30	11.30	12.58	NR	30.19	NR	42.32	60.66	54.95	87.88	81.16	80.88	89.72	42.44	64.56	
L18	0:03:00	11.59	12.51	NR	30.19	NR	42.61	60.52	54.88	87.69	81.02	80.29	89.68	42.11	64.63	
L18	0:03:30	11.23	12.87	NR	30.08	NR	42.29	60.59	54.95	87.88	81.20	80.04	89.79	42.01	64.70	
L18	0:04:00	11.63	12.83	NR	30.15	NR	42.79	61.06	55.13	88.06	81.38	80.15	90.12	42.15	65.57	
L18	0:04:30	11.23	12.44	NR	30.19	NR	42.54	60.88	55.31	88.27	81.45	80.29	90.37	41.93	65.75	
L18	0:05:00	11.63	12.48	NR	30.22	NR	42.65	61.02	55.38	88.60	81.74	80.22	90.59	42.04	65.89	
L18	0:05:30	11.38	12.83	NR	30.26	NR	43.11	61.20	55.56	88.86	81.56	80.77	90.91	42.22	66.08	
L18	0:06:00	11.66	12.44	NR	30.33	NR	42.86	61.38	55.74	89.15	81.99	80.37	91.92	41.90	65.53	
L19	0:00:30	11.88	12.94	NR	31.60	NR	45.38	63.96	58.34	93.69	84.99	83.55	96.15	43.04	69.01	
L19	0:01:00	11.52	12.94	NR	31.79	NR	45.56	64.42	58.77	94.27	85.89	83.14	96.94	42.54	68.75	
L19	0:01:30	11.88	12.87	NR	31.75	NR	45.60	64.57	59.06	94.52	85.81	82.92	97.27	41.72	68.93	
L19	0:02:00	11.45	12.79	NR	31.82	NR	45.85	64.82	59.46	94.49	86.21	83.00	97.81	41.50	69.40	
L19	0:02:30	11.84	12.76	NR	31.89	NR	46.07	65.50	59.82	94.45	86.57	83.33	98.17	41.54	69.77	
L19	0:03:00	11.45	12.72	NR	32.00	NR	46.32	65.82	60.04	95.50	86.67	83.18	98.75	41.18	71.00	
L19	0:03:30	11.84	12.65	NR	31.93	NR	46.46	65.28	60.07	94.96	86.67	82.96	98.68	41.15	71.00	
L19	0:04:00	11.77	12.55	NR	31.82	NR	46.32	65.07	60.00	95.29	86.60	82.85	98.32	40.75	70.71	
L19	0:04:30	11.48	12.55	NR	31.89	NR	46.86	65.25	60.22	95.03	87.46	82.92	98.71	40.86	71.21	
L19	0:05:00	11.41	12.55	NR	32.04	NR	46.68	65.50	60.54	96.05	87.28	83.03	99.22	40.65	70.60	
L19	0:05:30	11.80	12.90	NR	32.08	NR	47.33	65.75	61.01	97.47	88.71	84.42	100.66	41.72	72.70	

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L20	0:00:30		11.70	12.83	NR	32.88	NR	49.88	68.15	64.19	100.26	90.93	85.63	105.07	41.18	73.89
L20	0:01:00		12.20	12.79	NR	33.02	NR	50.43	68.40	65.16	102.08	91.56	86.51	105.50	41.22	74.25
L20	0:01:30		12.16	12.55	NR	32.73	NR	50.86	68.11	65.30	101.79	91.87	86.03	104.20	40.75	73.67
L20	0:02:00		11.84	12.44	NR	32.73	NR	50.71	68.22	65.77	102.04	92.03	86.00	105.36	40.43	73.75
L20	0:02:30		11.77	12.30	NR	32.59	NR	50.75	68.08	65.74	101.10	92.11	85.81	105.14	40.29	73.75
L20	0:03:00		11.88	12.65	NR	32.69	NR	51.40	68.40	66.24	102.30	92.15	85.89	105.11	40.11	73.67
L20	0:03:30		11.88	12.23	NR	32.69	NR	51.58	68.47	66.39	101.75	92.17	86.25	104.46	40.07	74.29
L20	0:04:00		12.20	12.16	NR	32.66	NR	51.69	68.51	66.68	102.59	92.17	86.40	104.53	40.04	74.33
L20	0:04:30		11.88	12.05	NR	32.51	NR	51.25	68.19	66.50	102.33	92.18	85.92	105.07	40.04	73.71
L20	0:05:00		12.20	12.26	NR	32.55	NR	51.43	68.33	66.78	101.75	92.36	86.03	104.13	40.11	73.75
L20	0:05:30		12.20	11.98	NR	32.59	NR	51.87	68.44	66.96	102.59	94.87	86.22	104.28	39.86	74.29
L21	0:00:30		12.77	12.23	NR	32.40	NR	55.32	71.16	71.94	106.29	97.37	89.73	112.22	40.57	76.93
L21	0:01:00		12.59	12.09	NR	32.29	NR	55.90	71.55	73.10	107.16	98.34	89.58	112.22	40.79	77.37
L21	0:01:30		12.95	11.59	NR	32.08	NR	56.30	71.30	73.53	107.75	98.79	89.58	112.22	40.47	77.91
L21	0:02:00		13.02	11.48	NR	31.97	NR	56.48	71.52	74.22	108.22	99.01	90.35	112.22	40.40	78.16
L21	0:02:30		13.06	11.31	NR	31.79	NR	56.58	71.20	74.51	107.35	99.12	89.65	112.22	40.25	77.73
L21	0:03:00		12.73	11.16	NR	31.57	NR	56.80	70.87	74.79	107.89	99.23	90.09	111.35	40.40	77.84
L21	0:03:30		12.77	11.13	NR	31.68	NR	57.27	71.27	75.41	108.40	99.99	90.68	111.43	40.50	77.58
L21	0:04:00		13.02	10.99	NR	31.49	NR	56.73	70.55	75.19	107.78	100.36	90.35	111.21	40.50	77.37
L21	0:04:30		13.06	10.99	NR	31.57	NR	57.12	70.91	75.59	108.15	100.74	90.24	110.99	40.79	77.55
L21	0:05:00		12.73	10.92	NR	31.49	NR	57.27	70.87	75.80	108.33	101.74	90.60	110.99	41.04	77.11
L21	0:05:30		12.73	10.88	NR	31.46	NR	57.38	70.84	76.06	108.36	103.80	90.57	112.33	40.86	77.47
L21	0:06:00		12.73	10.81	NR	31.46	NR	57.48	70.87	76.35	107.75	104.83	91.01	95.75	41.18	77.08
L22	0:01:00		12.91	10.84	NR	31.28	NR	58.35	71.45	78.22	109.09	105.85	92.54	95.75	41.72	78.31
L22	0:01:30		13.24	10.74	NR	31.35	NR	58.67	71.98	79.16	109.63	89.59	93.13	112.66	41.86	78.81
L22	0:02:00		12.91	10.67	NR	31.17	NR	59.18	71.81	79.81	110.18	73.33	93.38	112.80	42.15	78.89
L22	0:02:30		13.13	10.56	NR	31.02	NR	58.85	71.12	79.77	109.63	89.88	93.09	112.33	41.97	78.38
L22	0:03:00		12.84	10.53	NR	31.09	NR	59.18	71.59	80.60	110.00	106.43	93.64	112.73	42.01	78.20
L22	0:03:30		12.81	10.53	NR	31.17	NR	59.36	71.41	81.00	109.16	105.82	93.46	112.73	42.01	78.56
L22	0:04:00		12.70	10.42	NR	30.91	NR	59.07	71.20	81.29	109.34	105.87	93.82	112.51	42.29	77.91
L22	0:04:30		12.77	10.42	NR	30.66	NR	59.32	71.20	81.79	109.27	105.93	93.97	112.51	42.51	78.20
L22	0:05:00		12.66	10.38	NR	30.95	NR	59.43	71.09	82.15	109.31	106.84	94.11	112.51	42.61	78.70
L22	0:05:30		12.99	10.35	NR	30.80	NR	59.83	70.98	82.44	109.71	107.30	93.93	112.51	42.47	77.55
L23	0:00:30		12.81	10.35	NR	30.29	NR	60.19	70.01	85.55	109.71	107.75	96.42	111.90	45.08	78.70
L23	0:01:00		12.77	10.24	NR	30.15	NR	60.69	69.94	86.45	110.25	108.43	97.04	111.82	45.51	79.32
L23	0:01:30		12.27	10.21	NR	29.97	NR	60.51	69.30	87.24	110.00	108.61	97.00	111.68	45.58	79.54
L23	0:02:00		12.56	10.17	NR	29.97	NR	61.01	69.33	88.47	110.07	108.88	97.48	111.68	45.80	79.43
L23	0:02:30		12.13	10.17	NR	29.79	NR	60.98	69.08	89.08	109.53	109.01	97.92	111.68	45.87	79.46
L23	0:03:00		12.31	9.96	NR	29.57	NR	60.83	68.62	89.01	109.31	109.15	98.14	112.11	46.23	79.75
L23	0:03:30		11.91	9.85	NR	29.57	NR	60.91	68.19	89.73	108.51	109.65	97.77	110.27	46.23	79.68
L23	0:04:00		12.16	9.96	NR	29.57	NR	61.05	68.04	90.13	108.36	109.90	98.06	110.09	46.48	79.61
L23	0:04:30		12.13	9.78	NR	29.53	NR	61.09	67.97	90.60	109.02	110.02	98.35	109.95	46.69	79.14

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
L23	0:05:00		12.06	9.78	NR	29.42	NR	61.23	67.90	90.89	108.25	110.15	98.50	110.70	46.73	79.72
L23	0:05:30		11.70	9.85	NR	29.53	NR	61.45	68.29	91.28	109.05	110.36	98.72	108.86	47.05	78.85
U1	0:00:30		11.66	9.25	NR	28.37	NR	59.57	64.71	88.68	103.68	107.00	92.61	104.89	43.83	74.40
U1	0:01:00		11.66	9.14	NR	28.33	NR	59.61	64.78	88.25	102.51	107.00	92.32	103.01	43.97	74.94
U1	0:01:30		11.63	9.11	NR	28.37	NR	59.47	64.07	88.04	102.44	55.97	92.25	101.35	44.01	74.36
U1	0:02:00		11.63	9.21	NR	28.29	NR	59.39	64.32	87.82	102.01	80.98	91.66	102.07	44.01	74.36
U1	0:02:30		11.23	9.18	NR	28.33	NR	59.36	63.74	87.64	102.62	93.49	91.66	100.56	44.01	74.11
U1	0:03:00		11.23	9.07	NR	28.33	NR	59.32	63.64	87.46	101.79	106.00	91.52	101.39	44.08	73.67
U1	0:03:30		11.23	9.14	NR	28.33	NR	59.29	63.53	87.39	101.53	105.82	91.19	101.13	44.12	73.46
U1	0:04:00		11.27	9.04	NR	28.29	NR	59.03	63.42	87.28	101.90	105.68	91.26	99.83	44.12	73.42
U2	0:00:30		10.84	8.58	NR	27.13	NR	57.52	60.73	84.79	95.58	103.80	83.51	94.20	39.43	67.63
U2	0:01:00		10.91	8.65	NR	27.24	NR	57.48	60.23	84.64	95.61	102.86	83.84	94.31	39.47	68.21
U2	0:01:30		10.87	8.72	NR	27.20	NR	57.56	60.23	84.75	95.76	101.92	83.73	93.91	39.64	68.10
U2	0:02:00		11.09	8.65	NR	27.28	NR	57.56	60.20	84.72	96.38	101.92	83.69	94.05	39.61	68.28
U2	0:02:30		10.91	8.65	NR	27.28	NR	57.63	60.20	84.72	96.34	101.90	83.69	94.02	39.61	68.28
U2	0:03:00		10.95	8.72	NR	27.28	NR	57.34	60.66	84.68	96.34	101.89	83.73	93.98	39.64	68.72
U2	0:03:30		10.91	8.75	NR	27.28	NR	57.38	60.59	84.68	96.30	101.88	83.77	94.23	39.68	68.32
U2	0:04:00		11.34	8.65	NR	27.24	NR	57.52	60.63	84.64	95.54	101.88	83.73	93.76	39.72	68.28
U3	0:00:30		10.73	7.94	NR	25.38	NR	54.57	56.25	80.31	87.73	95.55	72.83	83.54	32.70	60.10
U3	0:01:00		10.45	8.01	NR	25.49	NR	54.50	56.22	80.28	87.84	95.62	73.02	83.76	32.88	61.44
U3	0:01:30		10.80	8.08	NR	25.31	NR	54.57	55.86	80.28	87.88	95.66	73.38	83.90	32.99	60.36
U3	0:02:00		10.48	8.08	NR	25.49	NR	54.39	56.25	80.24	87.91	95.67	72.91	83.18	33.02	60.39
U3	0:02:30		10.48	8.08	NR	25.53	NR	54.64	55.86	80.28	87.91	95.69	72.94	83.15	33.10	61.59
U3	0:03:00		10.48	8.08	NR	25.49	NR	54.42	55.86	80.28	87.95	95.69	74.15	83.18	33.10	60.47
U3	0:03:30		10.84	8.12	NR	25.53	NR	54.64	55.86	80.28	87.88	88.00	73.56	83.18	33.10	61.59
U3	0:04:00		10.52	8.12	NR	25.53	NR	54.60	55.90	80.24	87.95	84.15	73.60	83.22	33.13	61.66
U4	0:00:30		9.19	6.27	NR	20.80	NR	46.50	43.32	68.95	67.20	80.30	52.32	59.74	19.50	44.29
U4	0:01:00		9.26	6.41	NR	20.80	NR	46.75	42.82	68.52	66.66	63.99	52.10	59.13	19.29	43.89
U4	0:01:30		9.30	6.41	NR	20.91	NR	46.75	42.67	68.55	66.59	64.06	52.32	59.42	19.39	44.07
U4	0:02:00		9.34	6.49	NR	21.06	NR	46.36	42.67	68.52	66.62	80.20	52.36	59.56	19.46	44.18
U4	0:02:30		9.37	6.52	NR	20.91	NR	46.64	42.89	68.52	66.91	80.73	52.50	59.67	19.50	44.51
U4	0:03:00		9.66	6.59	NR	20.98	NR	46.43	42.89	68.55	67.13	80.77	52.36	59.74	19.50	44.54
U4	0:03:30		9.37	6.56	NR	21.13	NR	46.86	42.71	68.55	66.99	80.41	52.39	59.99	19.54	44.44
U4	0:04:00		9.41	6.63	NR	20.98	NR	46.57	42.75	68.52	67.53	80.30	52.69	60.03	19.43	44.58
U5	0:00:30		7.01	3.51	NR	13.31	NR	31.98	25.05	45.35	39.20	50.03	28.04	33.77	5.62	26.02
U5	0:01:00		7.08	3.93	NR	13.53	NR	31.77	25.12	45.03	38.94	50.17	28.23	33.59	6.19	26.02
U5	0:01:30		7.15	3.93	NR	13.71	NR	31.95	25.08	45.10	38.76	50.49	28.23	33.66	6.37	26.23
U5	0:02:00		7.19	4.11	NR	13.78	NR	31.95	25.15	45.17	39.16	50.67	28.41	33.74	6.44	26.05
U5	0:02:30		7.23	3.97	NR	13.82	NR	32.02	25.19	44.99	39.09	49.99	28.74	33.77	6.48	25.95
U5	0:03:00		7.23	4.00	NR	13.71	NR	32.13	25.40	45.21	39.16	50.89	28.92	33.95	6.51	26.09
U5	0:03:30		7.30	4.04	NR	13.93	NR	32.06	25.23	45.24	39.20	50.92	28.67	33.84	6.55	25.91
U5	0:04:00		7.26	4.08	NR	13.89	NR	31.95	25.44	45.03	39.23	51.00	29.07	33.84	6.44	26.13

156

Table D.2 Calculated Strain, Shaft 11 - 2002

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	+29.00
U6	0:00:30		0.82	-0.07	NR	0.73	NR	3.35	1.07	4.33	1.67	4.40	1.13	3.03	-1.29	3.29
U6	0:01:00		0.32	0.04	NR	0.36	NR	1.58	0.57	2.06	1.13	2.15	0.55	2.17	-0.47	2.24
U6	0:01:30		0.21	0.11	NR	0.25	NR	1.22	0.47	1.44	0.94	1.57	0.40	1.81	-0.11	1.99
U6	0:02:00		0.14	-0.11	NR	0.07	NR	0.94	0.36	1.08	0.22	1.22	0.55	1.44	0.07	1.45
U6	0:02:30		0.14	0.11	NR	-0.04	NR	0.72	0.32	0.87	0.65	0.93	0.26	1.19	0.04	1.27
U6	0:03:00		0.11	-0.04	NR	0.11	NR	0.54	0.25	0.65	0.51	0.79	0.18	0.90	0.11	1.19
U6	0:03:30		0.07	-0.07	NR	-0.04	NR	0.58	0.21	0.54	0.44	0.64	0.33	0.83	0.18	0.90
U6	0:04:00		0.07	0.11	NR	0.07	NR	0.36	0.11	0.43	-0.33	0.54	0.04	0.72	0.11	0.80
U6	0:04:30		0.07	0.11	NR	-0.15	NR	0.29	0.18	0.32	0.29	0.43	0.22	0.47	0.00	0.62
U6	0:05:00		0.04	0.11	NR	-0.15	NR	0.25	0.07	0.29	-0.22	0.32	0.15	0.36	0.04	0.47
U6	0:05:30		0.25	0.11	NR	-0.18	NR	0.11	0.04	0.22	-0.54	0.25	-0.11	0.25	0.04	0.51
U6	0:06:00		0.04	0.00	NR	-0.11	NR	0.14	0.00	0.14	-0.58	0.21	0.07	0.14	-0.04	0.33
U6	0:06:30		0.00	0.11	NR	-0.22	NR	0.18	-0.04	0.07	-0.65	0.11	-0.18	-0.04	0.00	0.11
U6	0:07:00		0.00	0.00	NR	0.00	NR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D.3 Calculated Strain, 4 Minute Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10600	10601	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613
		Elev. ft	+22.00	+22.00	+10.00	+10.00	+0.00	+0.00	-8.00	-8.00	-16.00	-16.00	-25.00	-25.00	-29.00	-29.00
L0	0:00:00		8.16	4.82	NR	9.89	NR	12.39	26.62	14.90	23.65	24.76	2.19	31.78	7.84	22.51
L1	0:04:00		8.16	4.86	NR	10.00	NR	12.39	26.84	15.23	24.08	24.98	2.63	31.68	8.23	22.62
L2	0:04:00		8.12	4.93	NR	10.11	NR	12.46	26.66	15.23	24.67	24.94	3.36	31.60	8.59	22.62
L3	0:04:00		8.05	5.00	NR	10.26	NR	12.43	27.16	15.12	26.52	24.30	6.44	30.12	9.88	22.25
L4	0:04:00		8.05	5.17	NR	10.55	NR	12.75	28.66	15.19	29.72	23.55	11.66	27.88	12.42	22.11
L5	0:04:00		8.26	5.64	NR	11.09	NR	13.43	29.92	15.88	32.95	24.76	17.18	31.10	14.81	24.35
L5	0:08:00		8.23	5.46	NR	11.09	NR	13.43	29.85	15.84	32.59	24.69	17.15	31.03	14.71	24.35
L6	0:04:00		8.59	5.92	NR	12.04	NR	14.77	31.24	17.64	35.85	27.95	22.38	37.78	16.64	26.78
L7	0:04:00		9.19	6.98	NR	13.82	NR	17.54	33.39	21.36	41.01	33.46	27.93	47.17	18.86	39.66
L8	0:04:00		9.62	7.19	NR	14.33	NR	18.59	33.82	22.51	41.74	34.93	31.74	43.13	24.40	39.19
L8	0:08:00		9.52	7.16	NR	14.22	NR	18.48	33.68	22.41	41.30	34.75	31.26	41.65	24.19	37.96
L8	0:12:00		9.44	7.19	NR	14.37	NR	18.30	33.50	22.30	40.98	34.61	30.93	41.68	24.12	37.63
L8	0:16:00		9.48	7.23	NR	14.40	NR	18.73	33.93	22.66	41.30	35.11	32.36	42.62	25.33	38.36
L9	0:04:00		9.94	8.22	NR	16.62	NR	21.50	37.62	26.19	47.73	39.76	42.27	46.16	31.88	42.19
L10	0:04:00		10.66	9.14	NR	18.29	NR	23.74	39.59	29.26	51.22	43.98	49.14	47.35	37.03	44.00
L11	0:04:00		11.02	9.75	NR	19.89	NR	26.04	41.03	32.22	54.78	49.03	57.07	49.66	41.76	46.14
L12	0:04:00		11.09	10.17	NR	21.20	NR	28.09	42.32	34.93	57.61	52.07	61.90	48.15	43.76	44.94
L13	0:04:00		10.80	10.60	NR	22.44	NR	30.26	44.61	37.88	61.36	56.83	68.67	50.02	46.37	46.32
L14	0:04:00		11.30	10.99	NR	23.82	NR	31.73	46.51	40.37	64.95	60.91	72.32	53.56	47.09	47.19
L15	0:04:00		10.98	11.38	NR	25.17	NR	33.86	49.20	43.51	68.91	66.31	75.39	62.31	46.73	51.17
L16	0:04:00		11.27	11.91	NR	26.88	NR	36.45	52.53	47.08	74.43	70.64	77.95	70.58	45.98	55.18
L17	0:04:00		11.63	12.23	NR	28.55	NR	39.30	56.90	51.05	82.17	76.26	78.98	80.83	44.22	60.79
L18	0:04:00		11.63	12.83	NR	30.15	NR	42.79	61.06	55.13	88.06	81.38	80.15	90.12	42.15	65.57
L19	0:04:00		11.77	12.55	NR	31.82	NR	46.32	65.07	60.00	95.29	86.60	82.85	98.32	40.75	70.71
L20	0:04:00		12.20	12.16	NR	32.66	NR	51.69	68.51	66.68	102.59	92.17	86.40	104.53	40.04	74.33
L21	0:04:00		13.02	10.99	NR	31.49	NR	56.73	70.55	75.19	107.78	100.36	90.35	111.21	40.50	77.37
L22	0:04:00		12.70	10.42	NR	30.91	NR	59.07	71.20	81.29	109.34	105.87	93.82	112.51	42.29	77.91
L23	0:04:00		12.16	9.96	NR	29.57	NR	61.05	68.04	90.13	108.36	109.90	98.06	110.09	46.48	79.61
U1	0:03:00		11.23	9.07	NR	28.33	NR	59.32	63.64	87.46	101.79	106.00	91.52	101.39	44.08	73.67
U2	0:03:00		10.95	8.72	NR	27.28	NR	57.34	60.66	84.68	96.34	101.89	83.73	93.98	39.64	68.72
U3	0:03:00		10.48	8.08	NR	25.49	NR	54.42	55.86	80.28	87.95	95.69	74.15	83.18	33.10	60.47
U4	0:03:00		9.66	6.59	NR	20.98	NR	46.43	42.89	68.55	67.13	80.77	52.36	59.74	19.50	44.54
U5	0:03:00		7.23	4.00	NR	13.71	NR	32.13	25.40	45.21	39.16	50.89	28.92	33.95	6.51	26.09
U6	0:03:00		0.11	-0.04	NR	0.11	NR	0.54	0.25	0.65	0.51	0.79	0.18	0.90	0.11	1.19
U6	0:06:00		0.04	0.00	NR	-0.11	NR	0.14	0.00	0.14	-0.58	0.21	0.07	0.14	-0.04	0.33

Table D.4 Average Calculated Strain, 4 Minute Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain									
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+45.00	+40.47	+22.00	+10.00	+0.00	-8.00	-16.00	-21.00	-25.00	-29.00
L0	0:00:00	0.00	0.00	6.49	9.89	12.39	20.76	24.21	0.00	16.99	15.17
L1	0:04:00	0.00	0.00	6.51	10.00	12.39	21.03	24.53	17.45	17.15	15.42
L2	0:04:00	0.00	0.00	6.52	10.11	12.46	20.94	24.80	26.63	17.48	15.60
L3	0:04:00	0.00	0.00	6.52	10.26	12.43	21.14	25.41	35.80	18.28	16.06
L4	0:04:00	0.00	0.00	6.61	10.55	12.75	21.93	26.63	45.55	19.77	17.26
L5	0:04:00	0.00	0.00	6.95	11.09	13.43	22.90	28.86	56.04	24.14	19.58
L5	0:08:00	0.00	0.00	6.84	11.09	13.43	22.84	28.64	55.49	24.09	19.53
L6	0:04:00	0.00	0.00	7.25	12.04	14.77	24.44	31.90	67.15	30.08	21.71
L7	0:04:00	0.00	0.00	8.09	13.82	17.54	27.38	37.24	77.80	37.55	29.26
L8	0:04:00	0.00	0.00	8.41	14.33	18.59	28.17	38.33	74.21	37.43	31.80
L8	0:08:00	0.00	0.00	8.34	14.22	18.48	28.04	38.03	72.21	36.45	31.07
L8	0:12:00	0.00	0.00	8.32	14.37	18.30	27.90	37.79	70.86	36.31	30.87
L8	0:16:00	0.00	0.00	8.35	14.40	18.73	28.30	38.20	72.05	37.49	31.84
L9	0:04:00	0.00	0.00	9.08	16.62	21.50	31.91	43.75	86.05	44.21	37.04
L10	0:04:00	0.00	0.00	9.90	18.29	23.74	34.43	47.60	98.00	48.25	40.52
L11	0:04:00	0.00	0.00	10.38	19.89	26.04	36.62	51.90	110.29	53.37	43.95
L12	0:04:00	0.00	0.00	10.63	21.20	28.09	38.62	54.84	118.34	55.02	44.35
L13	0:04:00	0.00	0.00	10.70	22.44	30.26	41.25	59.09	131.14	59.35	46.34
L14	0:04:00	0.00	0.00	11.15	23.82	31.73	43.44	62.93	139.62	62.94	47.14
L15	0:04:00	0.00	0.00	11.18	25.17	33.86	46.35	67.61	152.45	68.85	48.95
L16	0:04:00	0.00	0.00	11.59	26.88	36.45	49.81	72.54	161.52	74.26	50.58
L17	0:04:00	0.00	0.00	11.93	28.55	39.30	53.98	79.22	173.41	79.91	52.51
L18	0:04:00	0.00	0.00	12.23	30.15	42.79	58.09	84.72	182.86	85.13	53.86
L19	0:04:00	0.00	0.00	12.16	31.82	46.32	62.54	90.94	192.58	90.58	55.73
L20	0:04:00	0.00	0.00	12.18	32.66	51.69	67.59	97.38	204.84	95.46	57.18
L21	0:04:00	0.00	0.00	12.00	31.49	56.73	72.87	104.07	214.26	100.78	58.93
L22	0:04:00	0.00	0.00	11.56	30.91	59.07	76.24	107.61	218.97	103.17	60.10
L23	0:04:00	0.00	0.00	11.06	29.57	61.05	79.09	109.13	222.60	104.08	63.04
U1	0:03:00	0.00	0.00	10.15	28.33	59.32	75.55	103.89	201.46	96.45	58.88
U2	0:03:00	0.00	0.00	9.83	27.28	57.34	72.67	99.12	178.66	88.86	54.18
U3	0:03:00	0.00	0.00	9.28	25.49	54.42	68.07	91.82	152.83	78.67	46.78
U4	0:03:00	0.00	0.00	8.13	20.98	46.43	55.72	73.95	102.55	56.05	32.02
U5	0:03:00	0.00	0.00	5.62	13.71	32.13	35.31	45.02	51.54	31.44	16.30
U6	0:03:00	0.00	0.00	0.04	0.11	0.54	0.45	0.65	0.00	0.54	0.65
U6	0:06:00	0.00	0.00	0.02	-0.11	0.14	0.07	-0.18	0.00	0.11	0.14

Top of Shaft Ground Surface

Top of Mid Cell

Table D.5 Shaft Load, 4 Minute Readings, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Shaft Load, tons							
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+45.00	+40.47	+22.00	+10.00	+0.00	-8.00	-16.00	-21.00
L0	0:00:00	0.00	0.00	37.41	57.04	71.45	119.55	143.92	0.0
L1	0:04:00	0.00	0.00	37.52	57.67	71.45	121.10	145.85	103.3
L2	0:04:00	0.00	0.00	37.62	58.30	71.86	120.59	147.47	157.6
L3	0:04:00	0.00	0.00	37.62	59.14	71.66	121.72	151.06	211.9
L4	0:04:00	0.00	0.00	38.13	60.82	73.53	126.26	158.33	269.6
L5	0:04:00	0.00	0.00	40.07	63.96	77.47	131.84	171.56	331.7
L5	0:08:00	0.00	0.00	39.46	63.96	77.47	131.53	170.27	328.4
L6	0:04:00	0.00	0.00	41.82	69.42	85.16	140.75	189.67	397.5
L7	0:04:00	0.00	0.00	46.64	79.69	101.15	157.64	221.39	460.5
L8	0:04:00	0.00	0.00	48.49	82.63	107.17	162.20	227.91	439.3
L8	0:08:00	0.00	0.00	48.08	82.00	106.55	161.48	226.08	427.4
L8	0:12:00	0.00	0.00	47.97	82.84	105.51	160.65	224.68	419.5
L8	0:16:00	0.00	0.00	48.18	83.05	108.01	162.93	227.14	426.5
L9	0:04:00	0.00	0.00	52.38	95.84	124.00	183.73	260.09	509.4
L10	0:04:00	0.00	0.00	57.10	105.49	136.88	198.24	283.01	580.1
L11	0:04:00	0.00	0.00	59.87	114.72	150.17	210.88	308.59	652.9
L12	0:04:00	0.00	0.00	61.30	122.27	162.01	222.39	326.06	700.5
L13	0:04:00	0.00	0.00	61.70	129.40	174.47	237.51	351.33	776.3
L14	0:04:00	0.00	0.00	64.27	137.37	182.99	250.14	374.15	826.5
L15	0:04:00	0.00	0.00	64.47	145.13	195.24	266.91	401.98	902.5
L16	0:04:00	0.00	0.00	66.82	154.98	210.19	286.79	431.27	956.2
L17	0:04:00	0.00	0.00	68.78	164.63	226.60	310.80	470.97	1026.5
L18	0:04:00	0.00	0.00	70.51	173.86	246.75	334.51	503.68	1082.5
L19	0:04:00	0.00	0.00	70.11	183.51	267.10	360.09	540.70	1140.0
L20	0:04:00	0.00	0.00	70.22	188.33	298.05	389.21	578.97	1212.5
L21	0:04:00	0.00	0.00	69.22	181.62	327.13	419.60	618.75	1268.3
L22	0:04:00	0.00	0.00	66.66	178.26	340.63	439.01	639.78	1296.2
L23	0:04:00	0.00	0.00	63.78	170.50	352.05	455.39	648.83	1317.7
U1	0:03:00	0.00	0.00	58.55	163.37	342.09	435.01	617.69	1192.6
U2	0:03:00	0.00	0.00	56.70	157.29	330.66	418.45	589.28	1057.6
U3	0:03:00	0.00	0.00	53.52	147.01	313.84	391.95	545.91	904.7
U4	0:03:00	0.00	0.00	46.86	121.01	267.73	320.85	439.67	607.0
U5	0:03:00	0.00	0.00	32.38	79.06	185.27	203.30	267.69	305.1
U6	0:03:00	0.00	0.00	0.21	0.63	3.12	2.59	3.85	0.0
U6	0:06:00	0.00	0.00	0.10	-0.63	0.83	0.42	-1.09	0.0
Modulus, ksi		3820	3820	3820	3820	3820	3815	3815	3798
Diameter, in		62.00	62.00	62.00	62.00	62.00	62.00	63.00	63.00
		Top of Shaft	Ground Surface					Top of Mid Cell	

Table D.6 Average Segment Side Shear, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf							
		CL Elev., ft	+42.74	+31.24	+16.00	+5.00	-4.00	-12.00	-18.50
		Length, ft	4.53	18.47	12.00	10.00	8.00	8.00	9.00
L0	0:00:00	-0.10	0.07	0.04	0.03	0.31	0.13	-1.03	
L1	0:04:00	-0.10	0.07	0.05	0.03	0.33	0.13	-0.34	
L2	0:04:00	-0.10	0.07	0.05	0.03	0.32	0.15	0.01	
L3	0:04:00	-0.10	0.07	0.05	0.02	0.33	0.17	0.35	
L4	0:04:00	-0.10	0.07	0.06	0.02	0.35	0.19	0.69	
L5	0:04:00	-0.10	0.08	0.07	0.03	0.36	0.25	1.02	
L5	0:08:00	-0.10	0.08	0.07	0.03	0.36	0.24	1.01	
L6	0:04:00	-0.10	0.08	0.09	0.04	0.37	0.32	1.34	
L7	0:04:00	-0.10	0.10	0.11	0.08	0.38	0.43	1.55	
L8	0:04:00	-0.10	0.11	0.12	0.09	0.37	0.44	1.37	
L8	0:08:00	-0.10	0.10	0.12	0.09	0.37	0.44	1.30	
L8	0:12:00	-0.10	0.10	0.12	0.08	0.37	0.43	1.25	
L8	0:16:00	-0.10	0.10	0.12	0.10	0.37	0.43	1.29	
L9	0:04:00	-0.10	0.12	0.17	0.12	0.40	0.53	1.62	
L10	0:04:00	-0.10	0.13	0.19	0.14	0.42	0.59	1.94	
L11	0:04:00	-0.10	0.14	0.23	0.16	0.41	0.69	2.26	
L12	0:04:00	-0.10	0.15	0.26	0.19	0.41	0.73	2.47	
L13	0:04:00	-0.10	0.15	0.29	0.22	0.43	0.81	2.81	
L14	0:04:00	-0.10	0.16	0.32	0.22	0.46	0.89	2.99	
L15	0:04:00	-0.10	0.16	0.36	0.25	0.50	0.97	3.31	
L16	0:04:00	-0.10	0.17	0.40	0.28	0.53	1.05	3.48	
L17	0:04:00	-0.10	0.17	0.44	0.33	0.59	1.17	3.68	
L18	0:04:00	-0.10	0.18	0.47	0.39	0.62	1.24	3.84	
L19	0:04:00	-0.10	0.18	0.53	0.46	0.66	1.32	3.98	
L20	0:04:00	-0.10	0.18	0.55	0.62	0.65	1.39	4.21	
L21	0:04:00	-0.10	0.17	0.52	0.84	0.66	1.46	4.32	
L22	0:04:00	-0.10	0.17	0.52	0.94	0.70	1.48	4.36	
L23	0:04:00	-0.10	0.16	0.49	1.06	0.74	1.42	4.45	
U1	0:03:00	-0.10	0.14	0.48	1.04	0.66	1.34	3.82	
U2	0:03:00	-0.10	0.13	0.46	1.01	0.62	1.25	3.10	
U3	0:03:00	-0.10	0.12	0.42	0.97	0.54	1.12	2.36	
U4	0:03:00	-0.10	0.10	0.32	0.85	0.35	0.85	1.07	
U5	0:03:00	-0.10	0.05	0.18	0.60	0.08	0.43	0.19	
U6	0:03:00	-0.10	-0.06	-0.05	-0.04	-0.06	-0.05	-0.08	
U6	0:06:00	-0.10	-0.06	-0.06	-0.05	-0.06	-0.07	-0.05	
Segment Wt., tons			7.12	16.96	11.02	9.18	7.35	7.47	8.53
Maximum Shear, tsf			-0.10	0.18	0.55	1.06	0.74	1.48	4.45

Table D.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain								Shaft Compression				
		CL Elev., ft	+42.74	+31.24	+16.00	+5.00	-4.00	-12.00	-18.50	Strain Gage		TT in	Error in	Error %
		Length, ft	4.53	18.47	12.00	10.00	8.00	8.00	5.00	Net, in	Change, in			
L0	0:00:00		0.00	3.24	8.19	11.14	16.58	22.48	12.10	0.0077	0.0000	0.0000	0.0000	
L1	0:04:00		0.00	3.25	8.25	11.20	16.71	22.78	20.99	0.0083	0.0006	0.0000	0.0006	
L2	0:04:00		0.00	3.26	8.32	11.29	16.70	22.87	25.72	0.0086	0.0009	0.0000	0.0009	
L3	0:04:00		0.00	3.26	8.39	11.34	16.78	23.27	30.60	0.0090	0.0013	0.0000	0.0013	
L4	0:04:00		0.00	3.31	8.58	11.65	17.34	24.28	36.09	0.0095	0.0018	0.0000	0.0018	
L5	0:04:00		0.00	3.47	9.02	12.26	18.17	25.88	42.45	0.0103	0.0026	0.0000	0.0026	
L5	0:08:00		0.00	3.42	8.97	12.26	18.14	25.74	42.06	0.0103	0.0025	0.0000	0.0025	
L6	0:04:00		0.00	3.63	9.64	13.40	19.61	28.17	49.52	0.0114	0.0036	0.0000	0.0036	
L7	0:04:00		0.00	4.04	10.95	15.68	22.46	32.31	57.52	0.0131	0.0054	0.0004	0.0050	1238.1%
L8	0:04:00		0.00	4.20	11.37	16.46	23.38	33.25	56.27	0.0134	0.0056	0.0008	0.0048	605.6%
L8	0:08:00		0.00	4.17	11.28	16.35	23.26	33.03	55.12	0.0132	0.0055	0.0008	0.0047	588.7%
L8	0:12:00		0.00	4.16	11.34	16.33	23.10	32.85	54.33	0.0131	0.0054	0.0008	0.0046	579.2%
L8	0:16:00		0.00	4.18	11.38	16.57	23.51	33.25	55.13	0.0133	0.0056	0.0012	0.0044	386.8%
L9	0:04:00		0.00	4.54	12.85	19.06	26.71	37.83	64.90	0.0152	0.0075	0.0018	0.0057	317.9%
L10	0:04:00		0.00	4.95	14.10	21.01	29.08	41.01	72.80	0.0167	0.0090	0.0028	0.0063	228.5%
L11	0:04:00		0.00	5.19	15.14	22.97	31.33	44.26	81.10	0.0182	0.0105	0.0037	0.0068	187.6%
L12	0:04:00		0.00	5.32	15.92	24.65	33.36	46.73	86.59	0.0193	0.0116	0.0045	0.0071	157.8%
L13	0:04:00		0.00	5.35	16.57	26.35	35.75	50.17	95.12	0.0207	0.0130	0.0055	0.0075	138.1%
L14	0:04:00		0.00	5.57	17.48	27.78	37.59	53.19	101.27	0.0219	0.0142	0.0063	0.0079	126.6%
L15	0:04:00		0.00	5.59	18.17	29.51	40.11	56.98	110.03	0.0233	0.0156	0.0071	0.0086	121.4%
L16	0:04:00		0.00	5.79	19.23	31.66	43.13	61.17	117.03	0.0249	0.0172	0.0083	0.0089	106.9%
L17	0:04:00		0.00	5.96	20.24	33.92	46.64	66.60	126.31	0.0268	0.0190	0.0097	0.0094	97.4%
L18	0:04:00		0.00	6.11	21.19	36.47	50.44	71.41	133.79	0.0285	0.0208	0.0109	0.0099	90.8%
L19	0:04:00		0.00	6.08	21.99	39.07	54.43	76.74	141.76	0.0303	0.0226	0.0125	0.0101	80.7%
L20	0:04:00		0.00	6.09	22.42	42.17	59.64	82.49	151.11	0.0323	0.0246	0.0140	0.0107	76.6%
L21	0:04:00		0.00	6.00	21.75	44.11	64.80	88.47	159.17	0.0340	0.0263	0.0154	0.0109	70.8%
L22	0:04:00		0.00	5.78	21.24	44.99	67.66	91.93	163.29	0.0349	0.0271	0.0161	0.0111	69.1%
L23	0:04:00		0.00	5.53	20.31	45.31	70.07	94.11	165.87	0.0353	0.0276	0.0169	0.0107	63.7%
U1	0:03:00		0.00	5.08	19.24	43.83	67.43	89.72	152.68	0.0334	0.0257	0.0170	0.0087	51.6%
U2	0:03:00		0.00	4.92	18.55	42.31	65.01	85.89	138.89	0.0317	0.0239	0.0107	0.0133	124.9%
U3	0:03:00		0.00	4.64	17.39	39.96	61.25	79.94	122.32	0.0292	0.0215	0.0109	0.0107	98.2%
U4	0:03:00		0.00	4.06	14.55	33.71	51.07	64.84	88.25	0.0235	0.0158	0.0061	0.0097	158.2%
U5	0:03:00		0.00	2.81	9.66	22.92	33.72	40.17	48.28	0.0148	0.0070	0.0025	0.0046	187.4%
U6	0:03:00		0.00	0.02	0.07	0.32	0.50	0.55	0.32	0.0002	-0.0075	-0.0047	-0.0029	62.1%
U6	0:06:00		0.00	0.01	-0.05	0.02	0.11	-0.06	-0.09	0.0000	-0.0077	-0.0047	-0.0030	64.1%

Table D.8 Movement at Segment Centerline, Shaft 11 - 2002

Load Interval	Elapsed Time hhmmss	Segment Movement, in								Mid Cell
		CL Elev., ft	+42.74	+31.24	+16.00	+5.00	-4.00	-12.00	-18.50	-21.00
		Length, ft	4.53	18.47	12.00	10.00	8.00	8.00	5.00	-
L0	0:00:00	-0.008	-0.007	-0.006	-0.005	-0.004	-0.002	0.000	0.000	
L1	0:04:00	-0.005	-0.004	-0.003	-0.002	0.000	0.001	0.003	0.004	
L2	0:04:00	-0.002	-0.002	-0.001	0.000	0.002	0.004	0.006	0.006	
L3	0:04:00	-0.001	0.000	0.001	0.002	0.003	0.005	0.007	0.008	
L4	0:04:00	0.000	0.000	0.001	0.002	0.004	0.006	0.008	0.009	
L5	0:04:00	0.000	0.000	0.001	0.002	0.004	0.006	0.009	0.010	
L5	0:08:00	0.002	0.002	0.003	0.005	0.006	0.009	0.011	0.012	
L6	0:04:00	0.000	0.000	0.001	0.003	0.005	0.007	0.010	0.011	
L7	0:04:00	0.000	0.000	0.001	0.003	0.005	0.008	0.011	0.013	
L8	0:04:00	0.000	0.001	0.002	0.004	0.006	0.009	0.012	0.014	
L8	0:08:00	0.001	0.002	0.003	0.005	0.007	0.009	0.013	0.014	
L8	0:12:00	0.001	0.002	0.003	0.005	0.007	0.010	0.013	0.015	
L8	0:16:00	0.002	0.002	0.003	0.005	0.007	0.010	0.013	0.015	
L9	0:04:00	0.001	0.002	0.003	0.005	0.008	0.011	0.015	0.017	
L10	0:04:00	0.005	0.006	0.008	0.010	0.012	0.016	0.020	0.022	
L11	0:04:00	0.013	0.014	0.016	0.018	0.021	0.025	0.029	0.032	
L12	0:04:00	0.024	0.025	0.026	0.029	0.032	0.036	0.041	0.043	
L13	0:04:00	0.045	0.046	0.047	0.050	0.054	0.058	0.063	0.066	
L14	0:04:00	0.059	0.060	0.061	0.064	0.068	0.072	0.078	0.081	
L15	0:04:00	0.078	0.078	0.080	0.083	0.087	0.091	0.098	0.101	
L16	0:04:00	0.101	0.102	0.104	0.107	0.111	0.116	0.123	0.126	
L17	0:04:00	0.139	0.140	0.142	0.145	0.150	0.155	0.162	0.166	
L18	0:04:00	0.247	0.248	0.250	0.254	0.259	0.264	0.272	0.276	
L19	0:04:00	0.399	0.400	0.402	0.406	0.411	0.417	0.425	0.430	
L20	0:04:00	0.605	0.606	0.608	0.612	0.618	0.625	0.633	0.638	
L21	0:04:00	0.833	0.833	0.835	0.840	0.845	0.853	0.862	0.867	
L22	0:04:00	1.006	1.007	1.009	1.013	1.019	1.027	1.036	1.041	
L23	0:04:00	1.361	1.362	1.364	1.368	1.374	1.382	1.391	1.396	
U1	0:03:00	1.543	1.544	1.546	1.550	1.556	1.563	1.572	1.577	
U2	0:03:00	1.535	1.536	1.537	1.541	1.547	1.554	1.563	1.567	
U3	0:03:00	1.530	1.530	1.532	1.536	1.541	1.548	1.555	1.559	
U4	0:03:00	1.507	1.507	1.509	1.512	1.516	1.522	1.528	1.530	
U5	0:03:00	1.455	1.455	1.456	1.458	1.461	1.465	1.468	1.470	
U6	0:03:00	1.175	1.175	1.175	1.175	1.175	1.175	1.175	1.176	
U6	0:06:00	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	

Table D.9 Section Properties, Shaft 11 - 2002

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	16	1.561	24.983
3/4" Galvanized Steel Teltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			28.927

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	4	4.431	17.724
Area of Pipe =			19.492

164

Concrete Modulus 3600 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
45	62	3019.07	28.93	19.49	2970.65	3820.13	4PVC pipe, 4hose
-4	62	3019.07	28.26	19.49	2971.32	3814.52	4PVC pipe, 4hose
-21	63	3117.25	26.93	18.61	3071.71	3797.94	4PVC pipe, 2hose

Figure D.1 Shaft Top VW Strain, Shaft 11 - 2002

165

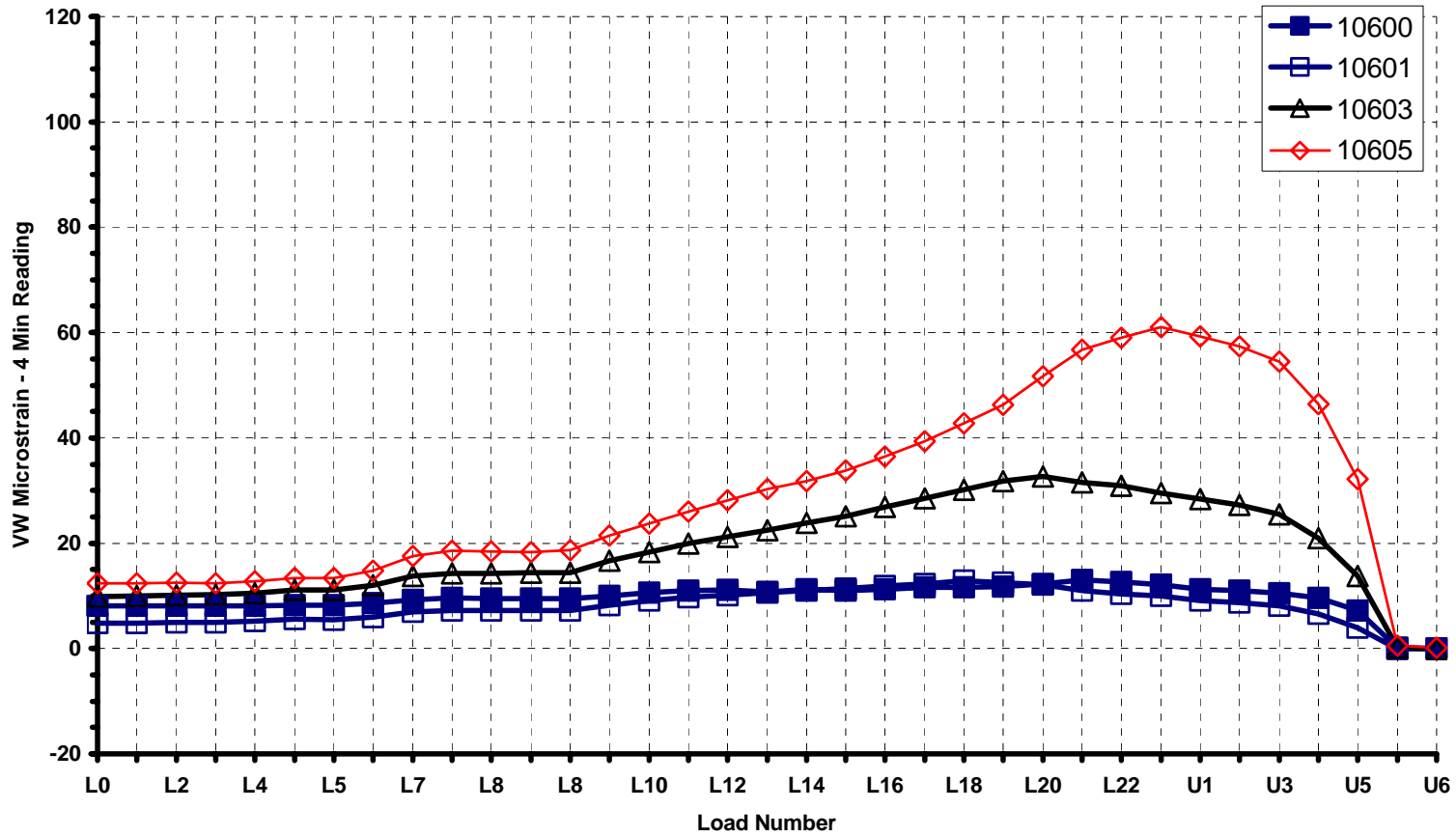


Figure D.2 Shaft Middle VW Strain, Shaft 11 - 2002

166

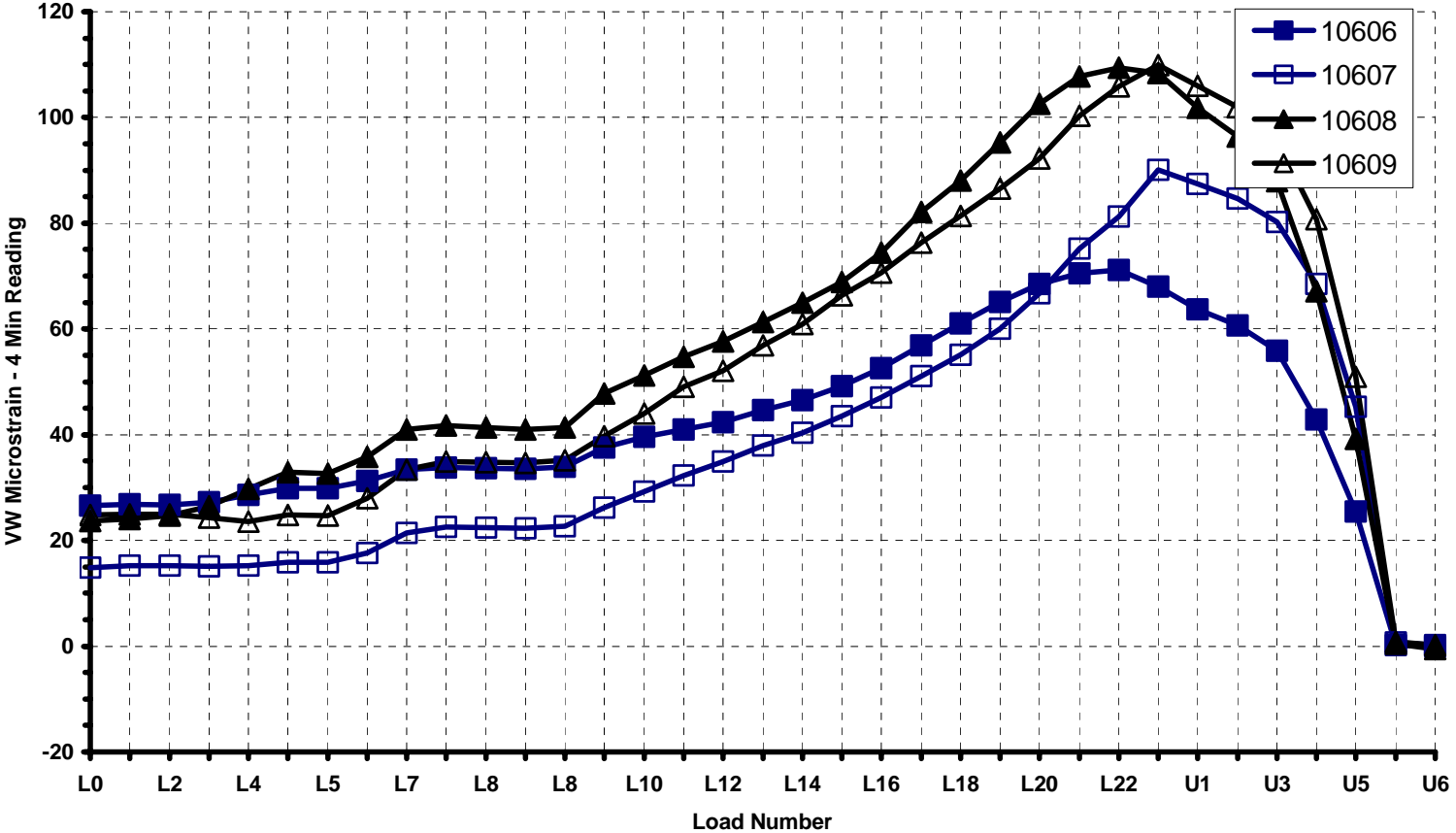


Figure D.3 Shaft Bottom VW Strain, Shaft 11 - 2002

167

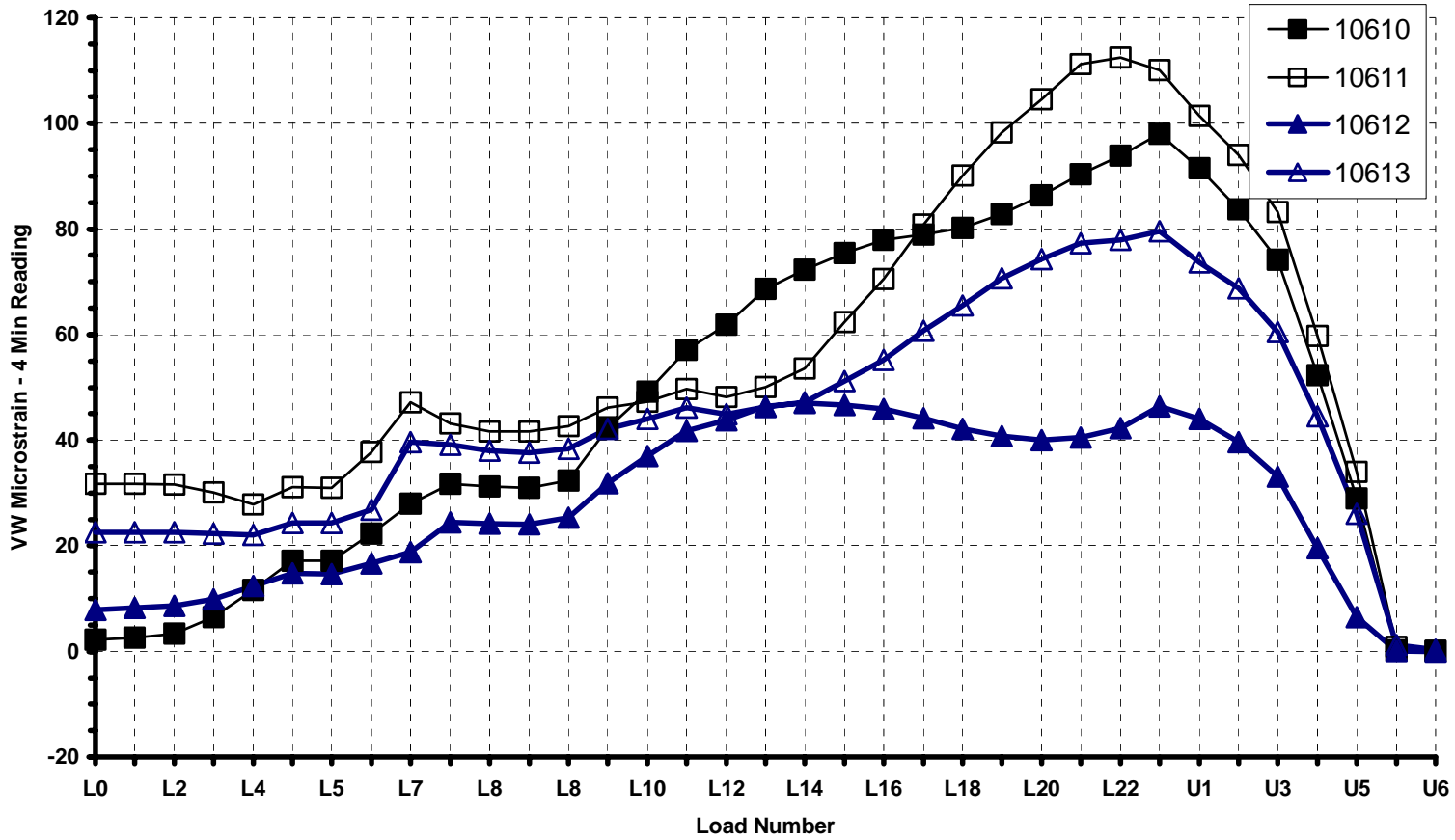


Figure D.4 Shaft Top Shear Stress vs. Movement, Shaft 11 - 2002

168

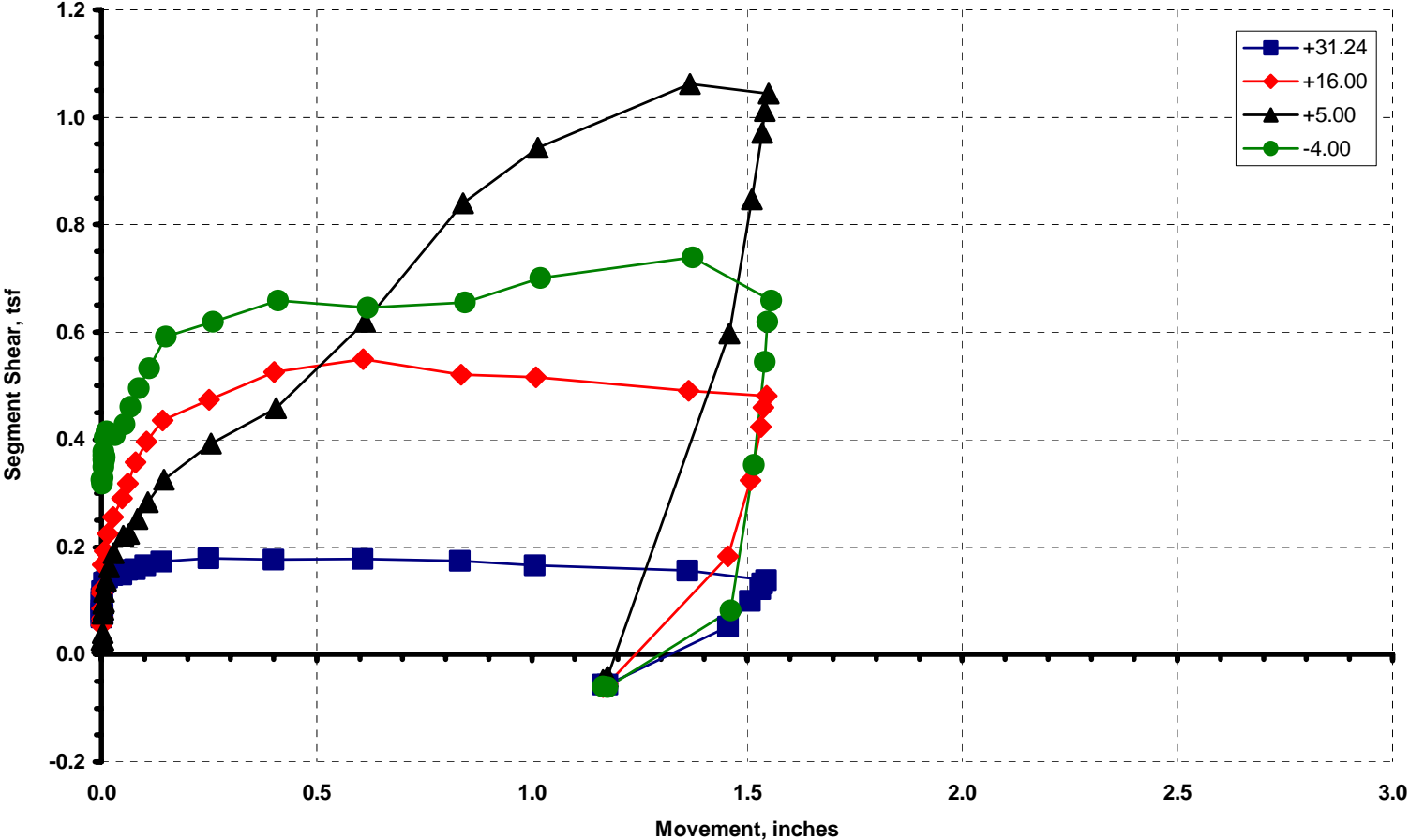
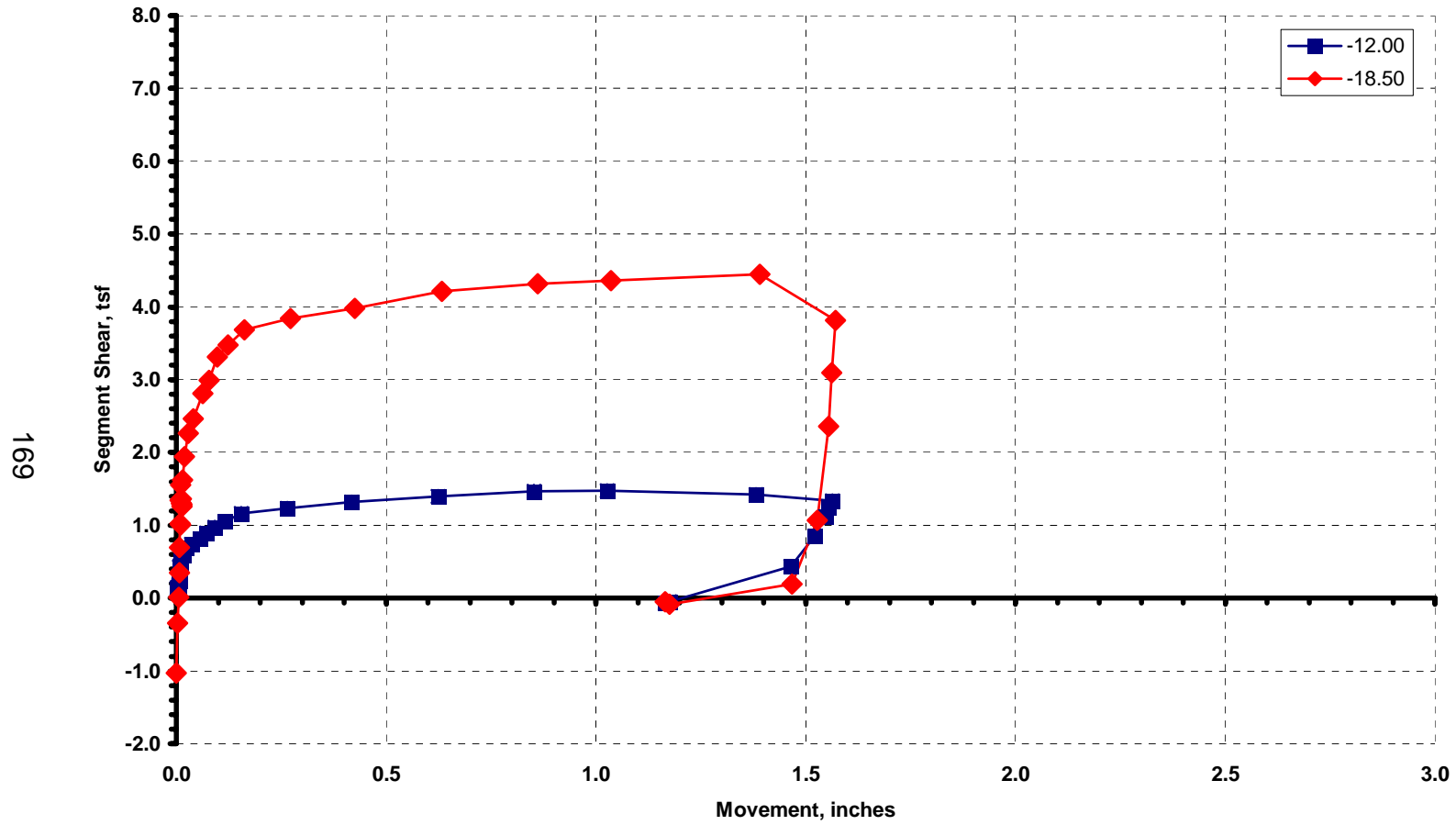


Figure D.5 Shaft Middle Shear Stress vs. Movement, Shaft 11 - 2002



169

Figure D.6 Strain Distribution, Shaft 11 - 2002

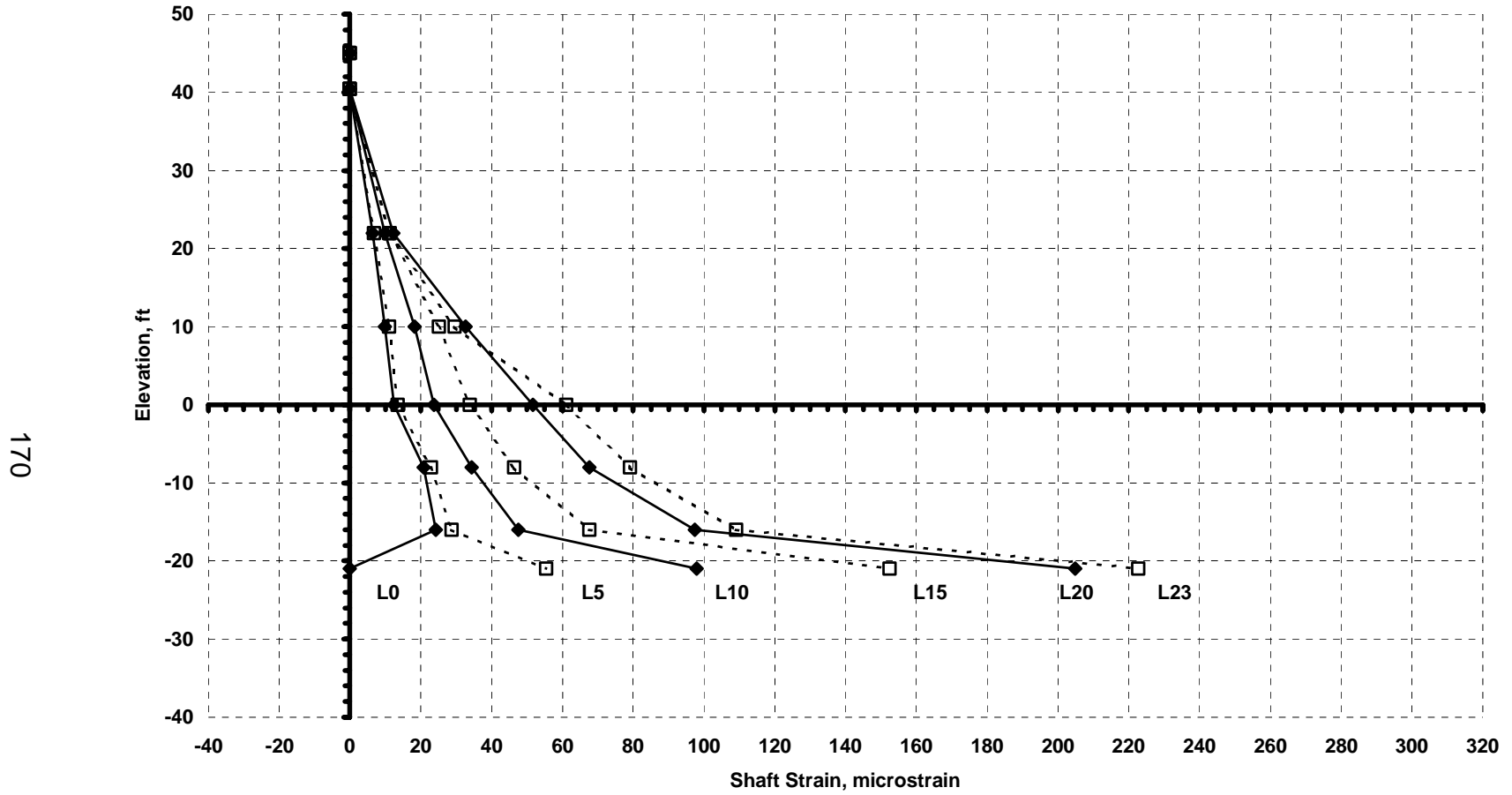


Figure D.7 Load Distribution, Shaft 11 - 2002

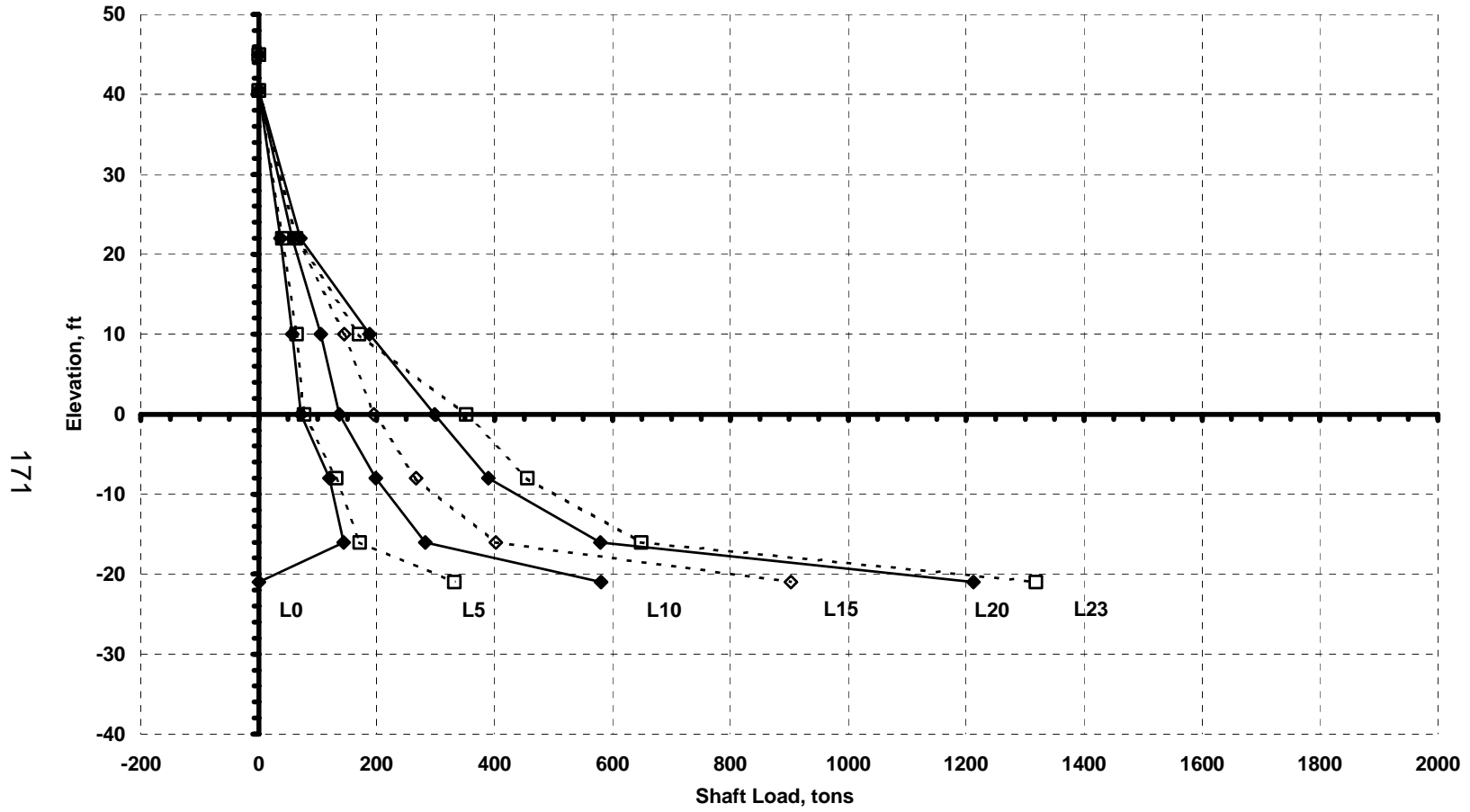


Figure D.8 Shear Stress Distribution, Shaft 11 - 2002

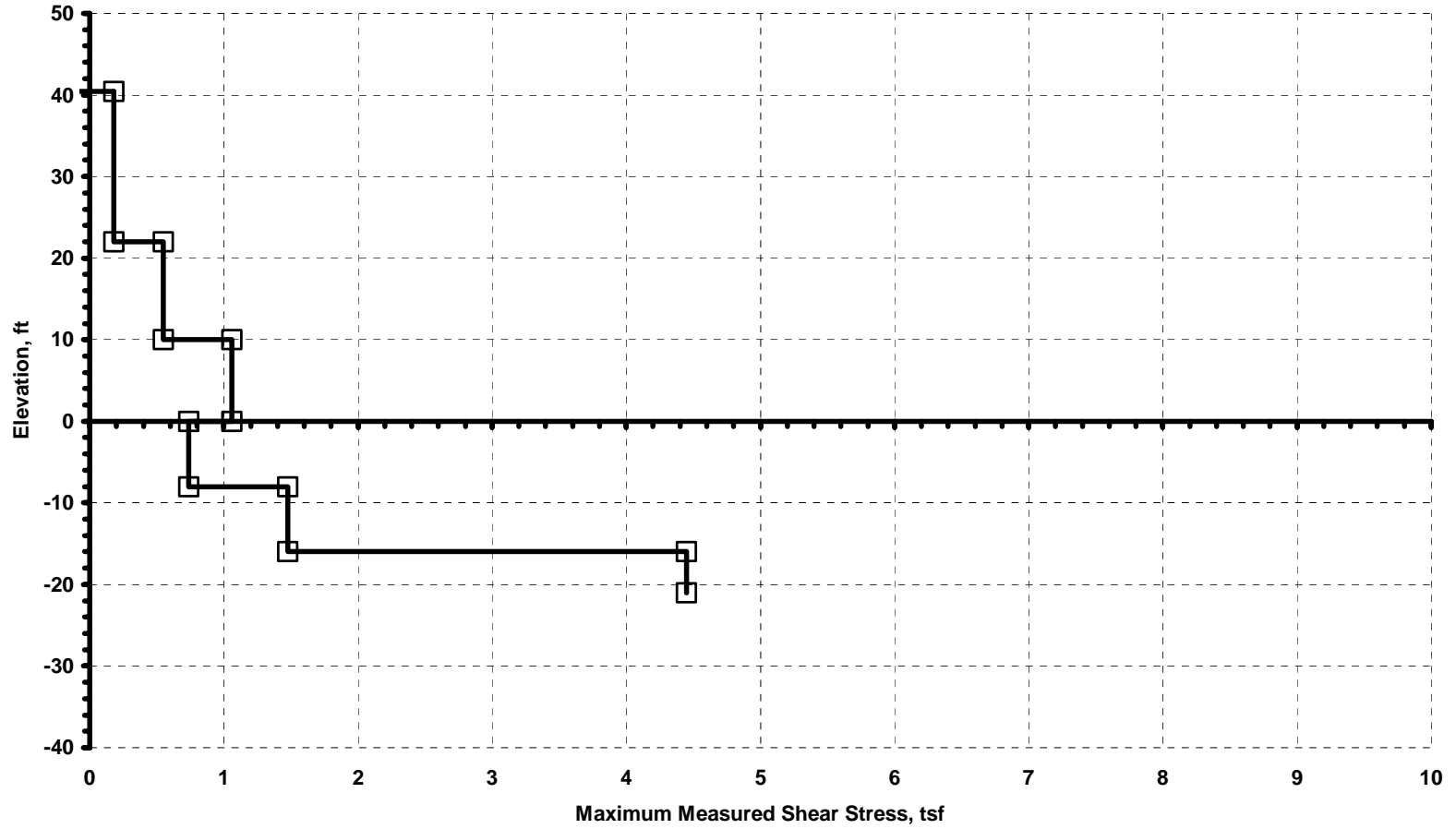


Figure D.9 Top of Shaft Indicators vs Survey Level, Stage 3 - Shaft 11 - 2002

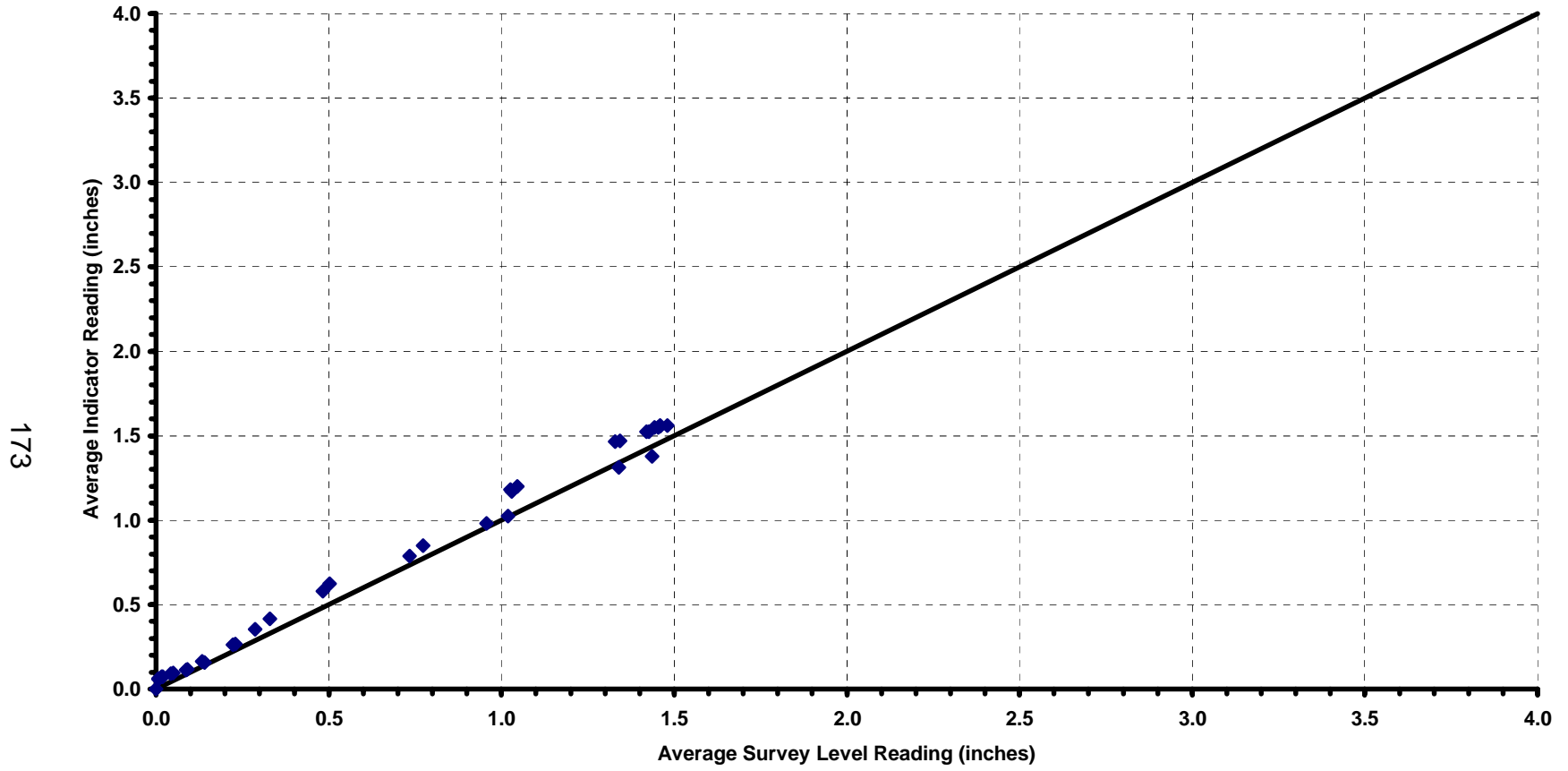


Figure D.10 Average Compression vs Load, Stage 3 - Shaft 11 - 2002

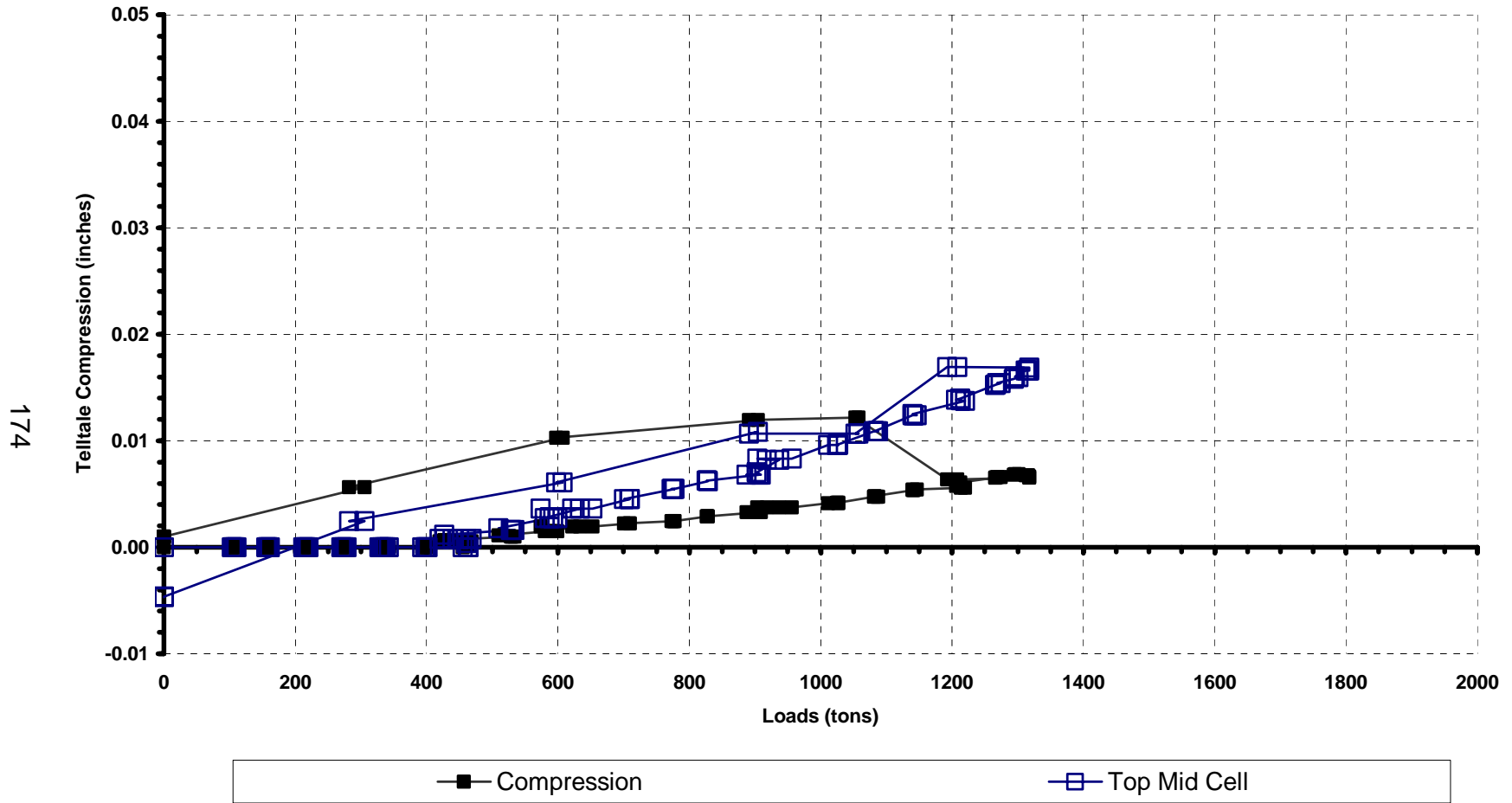


Figure D.11 Mid Cell Movement, Stage 3 - Shaft 11 - 2002

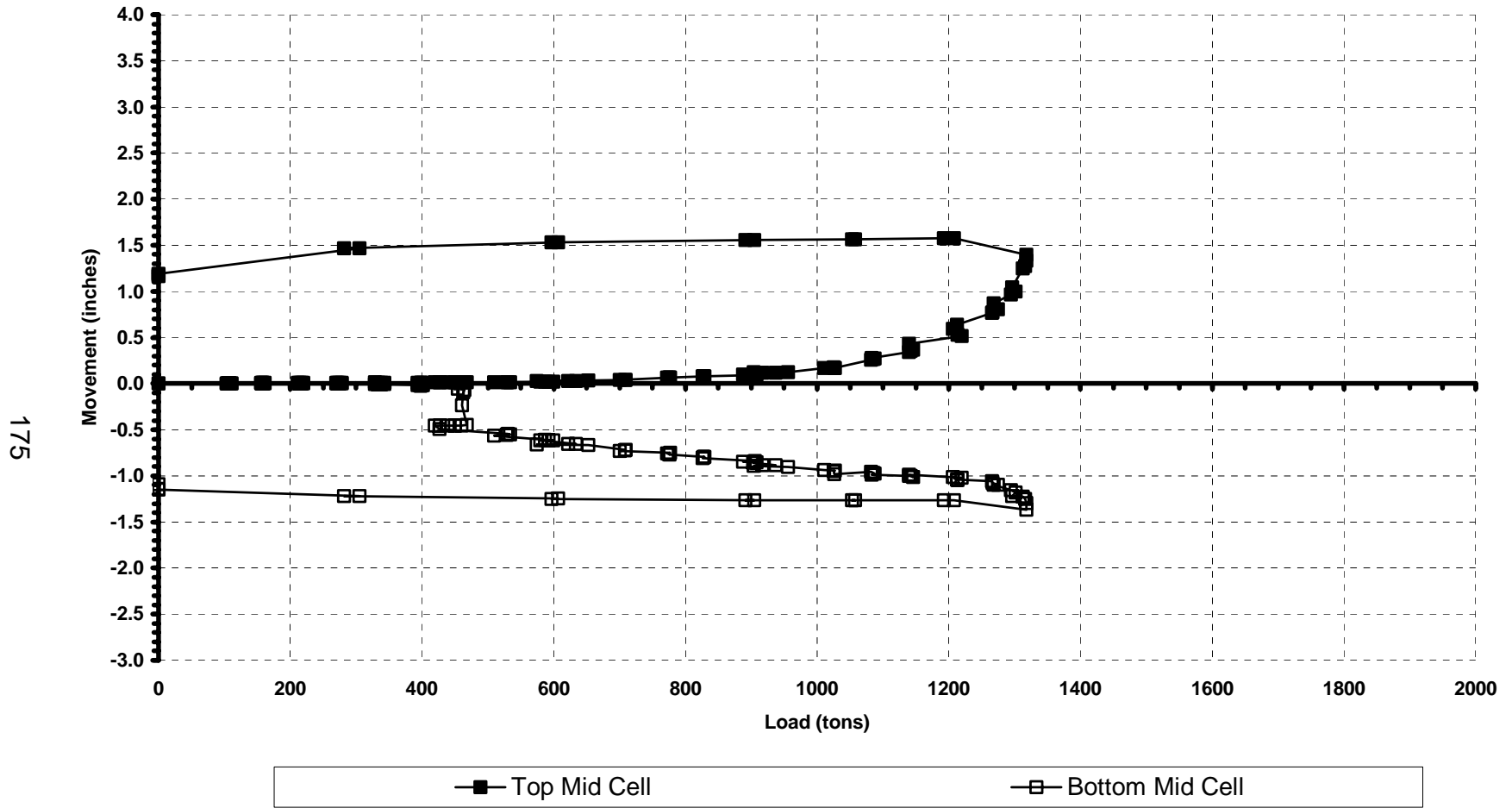


Figure D.12 Bottom Cell Movement, Stage 3 - Shaft 11 - 2002

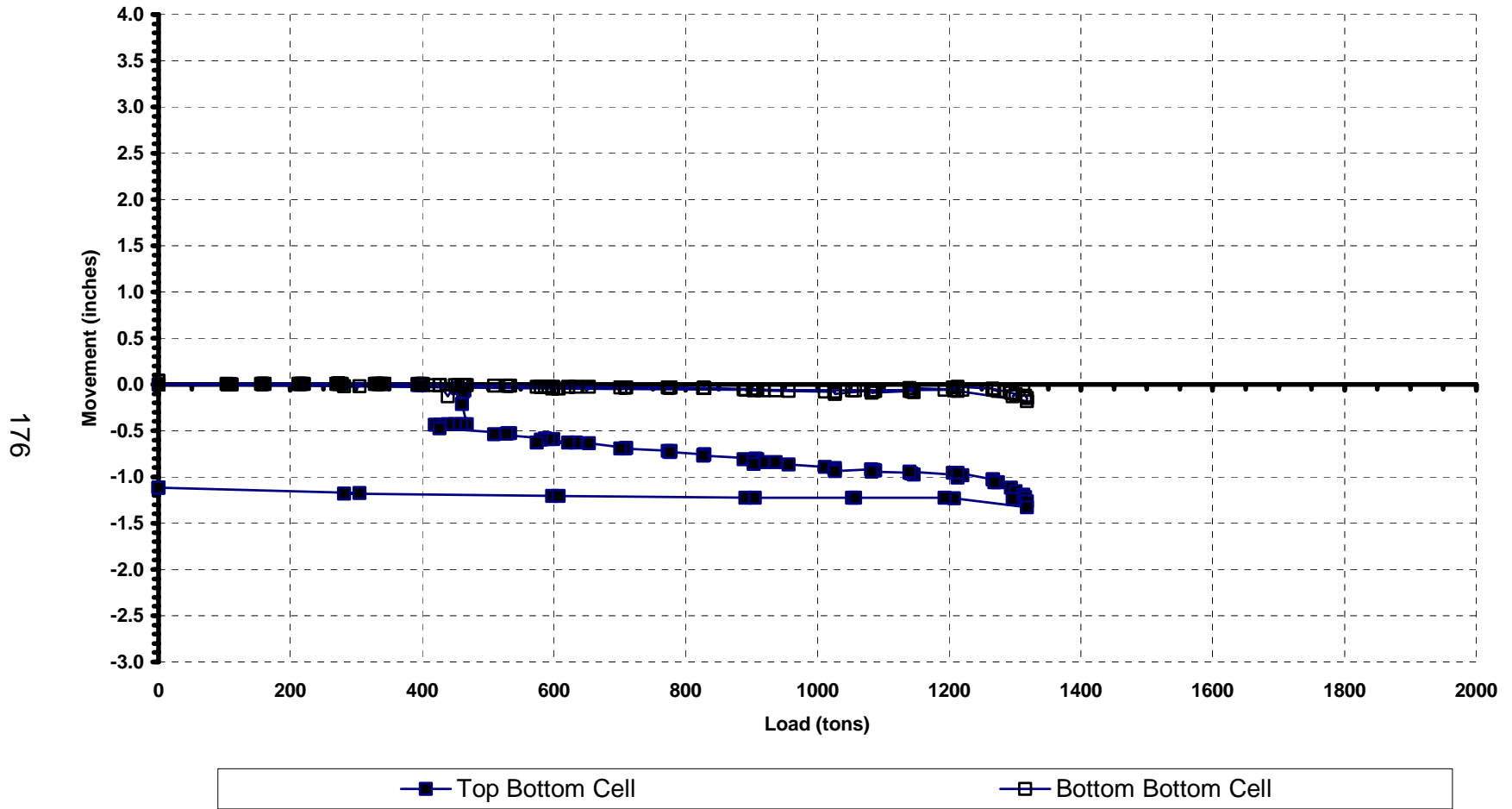
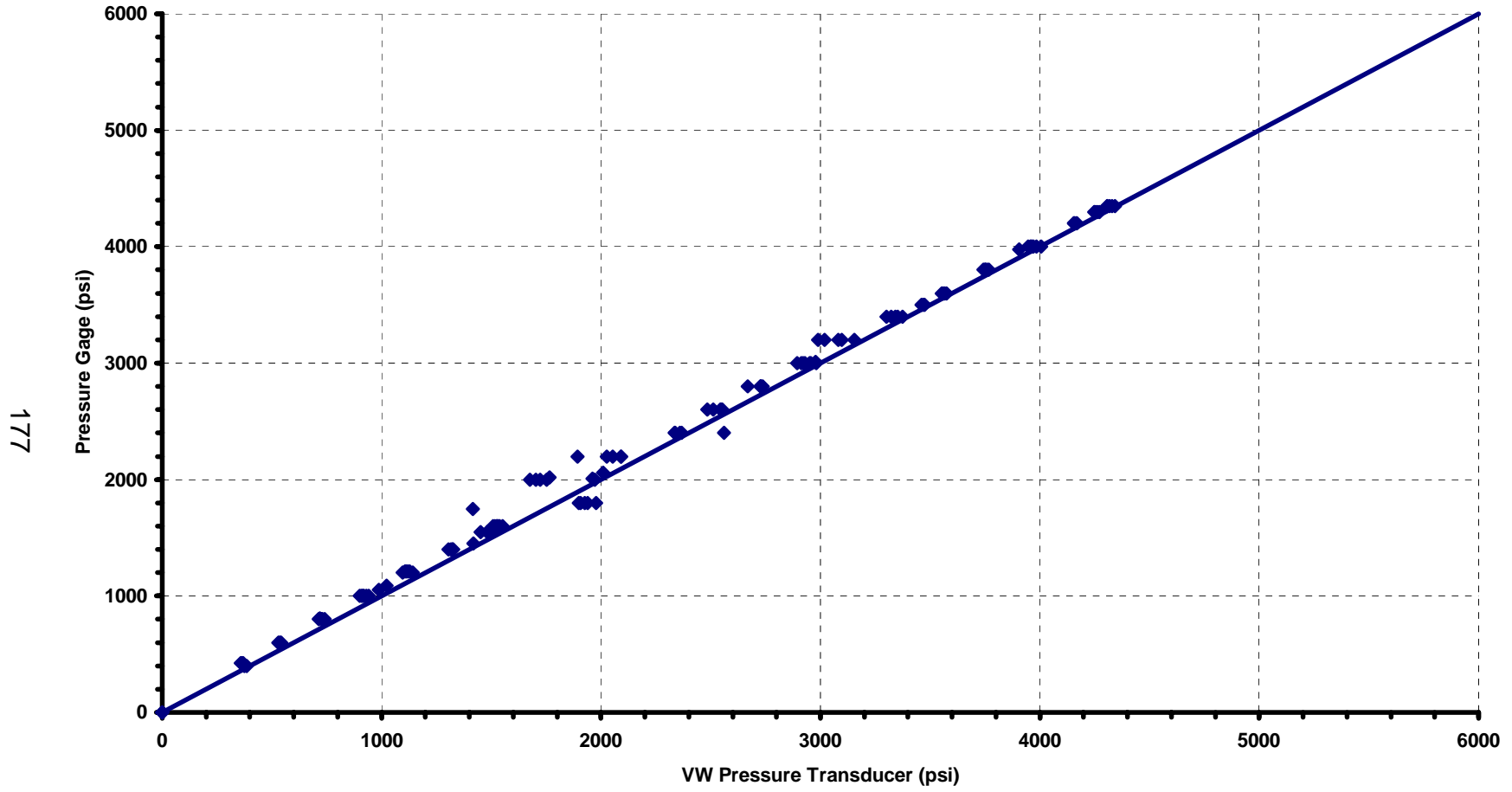


Figure D.13 VW Pressure Transducer vs Pressure Gage - Mid Cell - Stage 3 - Shaft 11 - 2002



**APPENDIX E
TEST SHAFT 2 – ANALYSIS OF 1996 TEST**

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement			Compression		
				DG-G (inches)	DG-H (inches)	Average (inches)	9753 (inches)	9750 (inches)	Avg. Rdg (inches)
L0	0:00:00	-	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	-	155.6	0.0034	0.0031	0.0033	0.0001	-0.0002	0.0000
L1	0:01:00	-	162.0	0.0036	0.0035	0.0036	0.0001	-0.0003	-0.0001
L1	0:02:00	-	152.6	0.0042	0.0042	0.0042	0.0001	-0.0005	-0.0002
L1	0:04:00	-	152.2	0.0047	0.0048	0.0048	0.0001	-0.0001	0.0000
L2	0:00:30	-	303.8	0.0116	0.0122	0.0119	0.0002	0.0003	0.0002
L2	0:01:00	-	292.5	0.0120	0.0124	0.0122	0.0003	0.0001	0.0002
L2	0:02:00	-	287.6	0.0124	0.0125	0.0125	0.0002	0.0003	0.0002
L2	0:04:00	-	284.6	0.0129	0.0129	0.0129	0.0001	-0.0004	-0.0001
L3	0:00:30	-	445.7	0.0248	0.0255	0.0252	0.0005	0.0003	0.0004
L3	0:01:00	-	455.0	0.0268	0.0260	0.0264	0.0005	0.0008	0.0007
L3	0:02:00	-	451.1	0.0281	0.0268	0.0275	0.0005	0.0005	0.0005
L3	0:04:00	-	438.7	0.0286	0.0277	0.0282	0.0005	0.0006	0.0006
L4	0:00:30	-	600.3	0.0490	0.0470	0.0480	0.0010	0.0027	0.0019
L4	0:01:00	-	603.2	0.0511	0.0489	0.0500	0.0010	0.0025	0.0018
L4	0:02:00	-	591.4	0.0523	0.0501	0.0512	0.0010	0.0026	0.0018
L4	0:04:00	-	599.3	0.0541	0.0518	0.0530	0.0012	0.0026	0.0019
L5	0:00:30	-	741.6	0.0853	0.0832	0.0843	0.0018	0.0044	0.0031
L5	0:01:00	-	755.3	0.0927	0.0901	0.0914	0.0018	0.0044	0.0031
L5	0:02:00	-	757.8	0.0988	0.0963	0.0976	0.0018	0.0045	0.0031
L5	0:04:00	-	742.1	0.1020	0.0992	0.1006	0.0019	0.0045	0.0032
L6	0:00:30	-	903.1	0.1622	0.1584	0.1603	0.0025	0.0060	0.0043
L6	0:01:00	-	913.9	0.1678	0.1642	0.1660	0.0028	0.0062	0.0045
L6	0:02:00	-	911.9	0.1742	0.1724	0.1733	0.0027	0.0061	0.0044
L6	0:04:00	-	913.0	0.1812	0.1792	0.1802	0.0027	0.0062	0.0045
L6	0:08:00	-	919.8	0.1884	0.1868	0.1876	0.0029	0.0061	0.0045
L7	0:00:30	-	978.4	0.2078	0.2062	0.2070	0.0029	0.0061	0.0045
L7	0:01:00	-	982.9	0.2125	0.2104	0.2115	0.0030	0.0063	0.0046
L7	0:02:00	-	990.2	0.2196	0.2176	0.2186	0.0033	0.0065	0.0049
L7	0:04:00	-	985.8	0.2259	0.2237	0.2248	0.0033	0.0067	0.0050
L8	0:00:30	-	1052.3	0.2450	0.2432	0.2441	0.0035	0.0070	0.0052
L8	0:01:00	-	1048.8	0.2539	0.2524	0.2532	0.0034	0.0070	0.0052
L8	0:02:00	-	1069.0	0.2656	0.2642	0.2649	0.0036	0.0074	0.0055
L8	0:04:00	-	1061.7	0.2774	0.2754	0.2764	0.0039	0.0074	0.0057
L8	0:08:00	-	1070.6	0.2903	0.2853	0.2878	0.0040	0.0078	0.0059
L9	0:00:30	-	1140.0	0.3135	0.3096	0.3116	0.0044	0.0078	0.0061
L9	0:01:00	-	1140.0	0.3201	0.3160	0.3181	0.0045	0.0080	0.0062
L9	0:02:00	-	1136.0	0.3268	0.3227	0.3248	0.0044	0.0083	0.0064
L9	0:04:00	-	1144.4	0.3353	0.3309	0.3331	0.0045	0.0081	0.0063
L10	0:00:30	-	1210.9	0.3691	0.3650	0.3671	0.0047	0.0089	0.0068
L10	0:01:00	-	1208.4	0.3766	0.3724	0.3745	0.0047	0.0089	0.0068
L10	0:02:00	-	1213.8	0.3853	0.3810	0.3832	0.0046	0.0089	0.0067

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement			Compression		
				DG-G (inches)	DG-H (inches)	Average (inches)	9753 (inches)	9750 (inches)	Avg. Rdg (inches)
L10	0:04:00	-	1215.7	0.3967	0.3926	0.3947	0.0047	0.0090	0.0068
L11	0:00:30	-	1287.1	0.4311	0.4282	0.4297	0.0046	0.0092	0.0069
L11	0:01:00	-	1297.0	0.4404	0.4371	0.4388	0.0048	0.0094	0.0071
L11	0:02:00	-	1278.7	0.4507	0.4473	0.4490	0.0046	0.0095	0.0070
L11	0:04:00	-	1288.6	0.4587	0.4552	0.4570	0.0047	0.0095	0.0071
L12	0:00:30	-	1358.0	0.4935	0.4900	0.4918	0.0048	0.0097	0.0073
L12	0:01:00	-	1366.9	0.5042	0.5011	0.5027	0.0046	0.0098	0.0072
L12	0:02:00	-	1373.8	0.5181	0.5161	0.5171	0.0048	0.0099	0.0073
L12	0:04:00	-	1365.4	0.5336	0.5313	0.5325	0.0048	0.0098	0.0073
L13	0:00:30	-	1439.3	0.5604	0.5580	0.5592	0.0050	0.0101	0.0075
L13	0:01:00	-	1440.8	0.5755	0.5731	0.5743	0.0049	0.0103	0.0076
L13	0:02:00	-	1452.6	0.5955	0.5936	0.5946	0.0051	0.0104	0.0078
L13	0:04:00	-	1451.6	0.6156	0.6136	0.6146	0.0050	0.0106	0.0078
L14	0:00:30	-	1516.6	0.6643	0.6624	0.6634	0.0057	0.0109	0.0083
L14	0:01:00	-	1518.1	0.6757	0.6725	0.6741	0.0057	0.0110	0.0084
L14	0:02:00	-	1515.2	0.6940	0.6876	0.6908	0.0056	0.0111	0.0084
L14	0:04:00	-	1527.5	0.7102	0.7028	0.7065	0.0059	0.0112	0.0085
L14	0:08:00	-	1527.9	0.6980	0.7232	0.7106	0.0059	0.0114	0.0086
L15	0:00:30	-	1597.4	0.7352	0.7597	0.7475	0.0061	0.0116	0.0088
L15	0:01:00	-	1595.0	0.7461	0.7705	0.7583	0.0062	0.0118	0.0090
L15	0:02:00	-	1597.0	0.7613	0.7857	0.7735	0.0062	0.0117	0.0089
L15	0:04:00	-	1591.6	0.7777	0.8021	0.7899	0.0063	0.0119	0.0091
L16	0:00:30	-	1670.3	0.8416	0.8682	0.8549	0.0069	0.0123	0.0096
L16	0:01:00	-	1666.9	0.8547	0.8821	0.8684	0.0069	0.0124	0.0097
L16	0:02:00	-	1678.2	0.8757	0.9033	0.8895	0.0069	0.0124	0.0097
L16	0:04:00	-	1679.7	0.9011	0.9296	0.9154	0.0070	0.0126	0.0098
L16	0:08:00	-	1689.1	0.9244	0.9571	0.9408	0.0071	0.0126	0.0099
L17	0:00:30	-	1741.7	0.9569	0.9907	0.9738	0.0073	0.0128	0.0100
L17	0:01:00	-	1745.1	0.9686	1.0023	0.9855	0.0073	0.0129	0.0101
L17	0:02:00	-	1749.6	0.9874	1.0209	1.0042	0.0074	0.0128	0.0101
L17	0:04:00	-	1752.0	1.0146	1.0494	1.0320	0.0075	0.0130	0.0102
L18	0:00:30	-	1809.2	1.0770	1.1139	1.0955	0.0080	0.0135	0.0107
L18	0:01:00	-	1820.5	1.1058	1.1428	1.1243	0.0079	0.0136	0.0107
L18	0:02:00	-	1838.3	1.1546	1.1935	1.1741	0.0080	0.0136	0.0108
L18	0:04:00	-	1840.3	1.2025	1.2435	1.2230	0.0082	0.0137	0.0109
L19	0:00:30	-	1888.0	1.2825	1.3234	1.3030	0.0083	0.0136	0.0110
L19	0:01:00	-	1895.9	1.3098	1.3515	1.3307	0.0084	0.0137	0.0110
L19	0:02:00	-	1898.9	1.3481	1.3908	1.3695	0.0084	0.0136	0.0110
L19	0:04:00	-	1891.4	1.3955	1.4393	1.4174	0.0087	0.0139	0.0113
L19	0:08:00	-	1913.1	1.4553	1.4899	1.4726	0.0085	0.0140	0.0112
L20	0:00:30	-	1960.8	1.5264	1.5686	1.5475	0.0087	0.0139	0.0113
L20	0:01:00	-	1966.2	1.5542	1.5963	1.5753	0.0087	0.0139	0.0113

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement			Compression		
				DG-G (inches)	DG-H (inches)	Average (inches)	9753 (inches)	9750 (inches)	Avg. Rdg (inches)
L20	0:02:00	-	1975.1	1.6035	1.6457	1.6246	0.0088	0.0140	0.0114
L20	0:04:00	-	1992.4	1.6944	1.7379	1.7162	0.0088	0.0140	0.0114
L21	0:00:30	-	2049.0	1.8889	1.9383	1.9136	0.0093	0.0139	0.0116
L21	0:01:00	-	2049.5	1.9610	2.0112	1.9861	0.0092	0.0140	0.0116
L21	0:02:00	-	2068.3	2.0980	2.1510	2.1245	0.0095	0.0140	0.0118
L21	0:04:00	-	1990.9	2.2852	2.3415	2.3134	0.0097	0.0138	0.0117
U1	0:00:30	-	1835.3	2.2873	2.3430	2.3152	0.0096	0.0137	0.0117
U1	0:03:00	-	1832.3	2.2891	2.3445	2.3168	0.0095	0.0135	0.0115
U2	0:00:30	-	1214.8	2.2872	2.3420	2.3146	0.0092	0.0133	0.0112
U2	0:02:30	-	1220.7	2.2880	2.3417	2.3149	0.0089	0.0130	0.0109
U3	0:00:30	-	616.0	2.2779	2.3253	2.3016	0.0084	0.0124	0.0104
U3	0:03:00	-	631.3	2.2772	2.3243	2.3008	0.0082	0.0126	0.0104
U4	0:00:30	-	0.0	2.1601	2.2019	2.1810	0.0056	0.0112	0.0084
U4	0:03:00	-	13.8	2.1471	2.1890	2.1681	0.0054	0.0109	0.0081
U5	0:00:30	-	0.0	2.1372	2.1789	2.1581	0.0050	0.0104	0.0077
U5	0:03:00	-	0.0	2.1271	2.1686	2.1479	0.0046	0.0103	0.0075
U5	0:06:00	-	0.0	2.1180	2.1603	2.1392	0.0043	0.0101	0.0072
U5	0:12:00	-	0.0	2.1094	2.1500	2.1297	0.0039	0.0097	0.0068
U5	0:24:00	-	0.0	2.1016	2.1403	2.1210	0.0033	0.0093	0.0063
U5	0:47:30	-	0.0	2.0977	2.1362	2.1170	0.0028	0.0087	0.0058

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		TT-E (inches)	TT-F (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-C (inches)	TT-D (inches)	Mvmt. (inches)	9751 (inches)	9752 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-A (inches)	TT-B (inches)	Mvmt. (inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0008	0.0005	0.0007	0.0039	0.0028	0.0050	0.0039	0.0005	0.0004	0.0004	0.0037	-0.0227	-0.0126	-0.0177
L1	0:01:00	0.0010	0.0007	0.0009	0.0044	0.0031	0.0059	0.0045	0.0005	0.0005	0.0005	0.0041	-0.0242	-0.0137	-0.0190
L1	0:02:00	0.0011	0.0008	0.0010	0.0052	0.0036	0.0073	0.0055	0.0005	0.0006	0.0006	0.0048	-0.0252	-0.0139	-0.0196
L1	0:04:00	0.0012	0.0008	0.0010	0.0058	0.0045	0.0076	0.0061	0.0005	0.0008	0.0006	0.0054	-0.0252	-0.0149	-0.0201
L2	0:00:30	0.0042	0.0035	0.0039	0.0158	0.0133	0.0186	0.0160	0.0020	0.0054	0.0037	0.0156	-0.0369	-0.0243	-0.0306
L2	0:01:00	0.0043	0.0036	0.0040	0.0162	0.0140	0.0186	0.0163	0.0019	0.0055	0.0037	0.0159	-0.0369	-0.0246	-0.0308
L2	0:02:00	0.0043	0.0036	0.0040	0.0164	0.0146	0.0187	0.0167	0.0019	0.0058	0.0038	0.0163	-0.0369	-0.0252	-0.0311
L2	0:04:00	0.0045	0.0038	0.0042	0.0171	0.0152	0.0191	0.0172	0.0019	0.0061	0.0040	0.0169	-0.0369	-0.0257	-0.0313
L3	0:00:30	0.0086	0.0073	0.0080	0.0331	0.0297	0.0361	0.0329	0.0042	0.0106	0.0074	0.0326	-0.0518	-0.0373	-0.0446
L3	0:01:00	0.0092	0.0077	0.0085	0.0349	0.0322	0.0361	0.0342	0.0052	0.0113	0.0083	0.0347	-0.0518	-0.0400	-0.0459
L3	0:02:00	0.0095	0.0078	0.0087	0.0361	0.0341	0.0369	0.0355	0.0056	0.0110	0.0083	0.0357	-0.0520	-0.0413	-0.0467
L3	0:04:00	0.0095	0.0079	0.0087	0.0369	0.0344	0.0389	0.0367	0.0058	0.0111	0.0084	0.0366	-0.0528	-0.0411	-0.0470
L4	0:00:30	0.0140	0.0117	0.0129	0.0609	0.0580	0.0618	0.0599	0.0107	0.0169	0.0138	0.0618	-0.0686	-0.0565	-0.0626
L4	0:01:00	0.0142	0.0120	0.0131	0.0631	0.0607	0.0638	0.0623	0.0110	0.0169	0.0140	0.0640	-0.0697	-0.0578	-0.0638
L4	0:02:00	0.0143	0.0121	0.0132	0.0644	0.0619	0.0655	0.0637	0.0112	0.0173	0.0143	0.0655	-0.0705	-0.0584	-0.0645
L4	0:04:00	0.0144	0.0122	0.0133	0.0663	0.0637	0.0675	0.0656	0.0115	0.0171	0.0143	0.0673	-0.0722	-0.0594	-0.0658
L5	0:00:30	0.0178	0.0154	0.0166	0.1009	0.0975	0.1013	0.0994	0.0164	0.0223	0.0193	0.1036	-0.0871	-0.0726	-0.0799
L5	0:01:00	0.0182	0.0158	0.0170	0.1084	0.1059	0.1094	0.1077	0.0169	0.0231	0.0200	0.1114	-0.0901	-0.0752	-0.0827
L5	0:02:00	0.0184	0.0161	0.0173	0.1148	0.1125	0.1166	0.1146	0.0172	0.0231	0.0202	0.1177	-0.0930	-0.0771	-0.0851
L5	0:04:00	0.0185	0.0162	0.0174	0.1180	0.1156	0.1198	0.1177	0.0175	0.0231	0.0203	0.1209	-0.0934	-0.0775	-0.0855
L6	0:00:30	0.0212	0.0190	0.0201	0.1804	0.1776	0.1831	0.1804	0.0221	0.0265	0.0243	0.1846	-0.1127	-0.0931	-0.1029
L6	0:01:00	0.0214	0.0192	0.0203	0.1863	0.1837	0.1892	0.1865	0.0226	0.0272	0.0249	0.1909	-0.1147	-0.0946	-0.1047
L6	0:02:00	0.0215	0.0194	0.0205	0.1938	0.1903	0.1962	0.1933	0.0228	0.0274	0.0251	0.1984	-0.1170	-0.0959	-0.1065
L6	0:04:00	0.0215	0.0195	0.0205	0.2007	0.1976	0.2034	0.2005	0.0230	0.0274	0.0252	0.2054	-0.1191	-0.0976	-0.1084
L6	0:08:00	0.0216	0.0197	0.0207	0.2083	0.2043	0.2116	0.2080	0.0233	0.0272	0.0252	0.2128	-0.1232	-0.0992	-0.1112
L7	0:00:30	0.0226	0.0206	0.0216	0.2286	0.2247	0.2309	0.2278	0.0242	0.0288	0.0265	0.2335	-0.1281	-0.1048	-0.1165
L7	0:01:00	0.0226	0.0207	0.0217	0.2331	0.2293	0.2352	0.2323	0.0245	0.0288	0.0267	0.2381	-0.1292	-0.1061	-0.1177
L7	0:02:00	0.0227	0.0209	0.0218	0.2404	0.2366	0.2426	0.2396	0.0249	0.0290	0.0269	0.2455	-0.1314	-0.1078	-0.1196
L7	0:04:00	0.0227	0.0210	0.0219	0.2467	0.2432	0.2495	0.2464	0.0251	0.0295	0.0273	0.2521	-0.1335	-0.1092	-0.1214
L8	0:00:30	0.0236	0.0218	0.0227	0.2668	0.2619	0.2689	0.2654	0.0267	0.0305	0.0286	0.2727	-0.1395	-0.1146	-0.1271
L8	0:01:00	0.0238	0.0220	0.0229	0.2761	0.2721	0.2790	0.2756	0.0270	0.0308	0.0289	0.2820	-0.1423	-0.1167	-0.1295
L8	0:02:00	0.0238	0.0223	0.0231	0.2880	0.2838	0.2913	0.2876	0.0276	0.0311	0.0294	0.2943	-0.1471	-0.1204	-0.1338
L8	0:04:00	0.0240	0.0224	0.0232	0.2996	0.2965	0.3032	0.2999	0.0278	0.0314	0.0296	0.3060	-0.1516	-0.1246	-0.1381
L8	0:08:00	0.0240	0.0225	0.0233	0.3111	0.3120	0.3124	0.3122	0.0284	0.0310	0.0297	0.3175	-0.1495	-0.1312	-0.1404
L9	0:00:30	0.0248	0.0236	0.0242	0.3358	0.3335	0.3371	0.3353	0.0303	0.0330	0.0316	0.3432	-0.1603	-0.1376	-0.1490
L9	0:01:00	0.0249	0.0236	0.0243	0.3423	0.3404	0.3438	0.3421	0.0304	0.0331	0.0317	0.3498	-0.1623	-0.1393	-0.1508
L9	0:02:00	0.0249	0.0237	0.0243	0.3491	0.3477	0.3509	0.3493	0.0306	0.0333	0.0319	0.3567	-0.1647	-0.1416	-0.1532
L9	0:04:00	0.0249	0.0238	0.0244	0.3575	0.3564	0.3594	0.3579	0.0310	0.0333	0.0321	0.3652	-0.1691	-0.1462	-0.1577
L10	0:00:30	0.0258	0.0249	0.0254	0.3924	0.3908	0.3943	0.3926	0.0328	0.0343	0.0336	0.4006	-0.1802	-0.1581	-0.1692
L10	0:01:00	0.0258	0.0250	0.0254	0.3999	0.3989	0.4025	0.4007	0.0328	0.0348	0.0338	0.4083	-0.1825	-0.1608	-0.1717
L10	0:02:00	0.0258	0.0250	0.0254	0.4086	0.4080	0.4114	0.4097	0.0328	0.0348	0.0338	0.4169	-0.1858	-0.1650	-0.1754

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		TT-E (inches)	TT-F (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-C (inches)	TT-D (inches)	Mvmt. (inches)	9751 (inches)	9752 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-A (inches)	TT-B (inches)	Mvmt. (inches)
L10	0:04:00	0.0258	0.0253	0.0256	0.4202	0.4196	0.4233	0.4215	0.0324	0.0348	0.0336	0.4282	-0.1906	-0.1708	-0.1807
L11	0:00:30	0.0266	0.0263	0.0265	0.4561	0.4536	0.4596	0.4566	0.0341	0.0367	0.0354	0.4650	-0.2032	-0.1832	-0.1932
L11	0:01:00	0.0266	0.0265	0.0266	0.4653	0.4632	0.4691	0.4662	0.0341	0.0369	0.0355	0.4742	-0.2067	-0.1872	-0.1970
L11	0:02:00	0.0266	0.0266	0.0266	0.4756	0.4735	0.4795	0.4765	0.0340	0.0372	0.0356	0.4846	-0.2107	-0.1919	-0.2013
L11	0:04:00	0.0267	0.0266	0.0267	0.4836	0.4815	0.4876	0.4846	0.0341	0.0371	0.0356	0.4925	-0.2168	-0.1975	-0.2072
L12	0:00:30	0.0273	0.0277	0.0275	0.5193	0.5154	0.5226	0.5190	0.0350	0.0383	0.0367	0.5284	-0.2308	-0.2118	-0.2213
L12	0:01:00	0.0274	0.0278	0.0276	0.5303	0.5261	0.5343	0.5302	0.0352	0.0386	0.0369	0.5396	-0.2359	-0.2166	-0.2263
L12	0:02:00	0.0274	0.0280	0.0277	0.5448	0.5415	0.5494	0.5455	0.0355	0.0385	0.0370	0.5541	-0.2439	-0.2250	-0.2345
L12	0:04:00	0.0274	0.0281	0.0278	0.5602	0.5574	0.5649	0.5612	0.0354	0.0389	0.0372	0.5696	-0.2531	-0.2361	-0.2446
L13	0:00:30	0.0278	0.0290	0.0284	0.5876	0.5824	0.5911	0.5868	0.0365	0.0401	0.0383	0.5975	-0.2651	-0.2495	-0.2573
L13	0:01:00	0.0279	0.0292	0.0286	0.6029	0.5986	0.6072	0.6029	0.0369	0.0403	0.0386	0.6129	-0.2713	-0.2557	-0.2635
L13	0:02:00	0.0280	0.0294	0.0287	0.6233	0.6191	0.6276	0.6234	0.0373	0.0405	0.0389	0.6334	-0.2811	-0.2665	-0.2738
L13	0:04:00	0.0280	0.0299	0.0290	0.6436	0.6387	0.6486	0.6437	0.0376	0.0412	0.0394	0.6540	-0.2957	-0.2825	-0.2891
L14	0:00:30	0.0287	0.0308	0.0298	0.6931	0.6877	0.6979	0.6928	0.0394	0.0427	0.0410	0.7044	-0.3208	-0.3078	-0.3143
L14	0:01:00	0.0288	0.0309	0.0299	0.7040	0.7003	0.7105	0.7054	0.0391	0.0426	0.0408	0.7149	-0.3278	-0.3166	-0.3222
L14	0:02:00	0.0288	0.0311	0.0300	0.7208	0.7182	0.7284	0.7233	0.0398	0.0427	0.0413	0.7321	-0.3411	-0.3329	-0.3370
L14	0:04:00	0.0288	0.0312	0.0300	0.7365	0.7354	0.7456	0.7405	0.0393	0.0427	0.0410	0.7475	-0.3603	-0.3556	-0.3580
L14	0:08:00	0.0288	0.0314	0.0301	0.7407	0.7540	0.7642	0.7591	0.0394	0.0434	0.0414	0.7520	-0.3867	-0.3861	-0.3864
L15	0:00:30	0.0293	0.0326	0.0310	0.7784	0.7907	0.8009	0.7958	0.0414	0.0449	0.0432	0.7906	-0.4156	-0.4143	-0.4150
L15	0:01:00	0.0293	0.0327	0.0310	0.7893	0.8024	0.8126	0.8075	0.0413	0.0449	0.0431	0.8014	-0.4233	-0.4217	-0.4225
L15	0:02:00	0.0294	0.0328	0.0311	0.8046	0.8182	0.8284	0.8233	0.0417	0.0451	0.0434	0.8169	-0.4374	-0.4353	-0.4364
L15	0:04:00	0.0294	0.0330	0.0312	0.8211	0.8343	0.8445	0.8394	0.0424	0.0455	0.0439	0.8338	-0.4601	-0.4580	-0.4591
L16	0:00:30	0.0299	0.0342	0.0321	0.8870	0.8975	0.9077	0.9026	0.0433	0.0468	0.0451	0.9000	-0.5046	-0.5019	-0.5033
L16	0:01:00	0.0299	0.0343	0.0321	0.9005	0.9101	0.9203	0.9152	0.0439	0.0469	0.0454	0.9138	-0.5188	-0.5151	-0.5170
L16	0:02:00	0.0299	0.0346	0.0323	0.9218	0.9323	0.9425	0.9374	0.0443	0.0469	0.0456	0.9351	-0.5449	-0.5414	-0.5432
L16	0:04:00	0.0299	0.0350	0.0325	0.9478	0.9578	0.9680	0.9629	0.0441	0.0478	0.0459	0.9613	-0.5894	-0.5846	-0.5870
L16	0:08:00	0.0299	0.0354	0.0327	0.9734	0.9826	0.9899	0.9863	0.0446	0.0476	0.0461	0.9868	-0.6583	-0.6461	-0.6522
L17	0:00:30	0.0300	0.0362	0.0331	1.0069	1.0131	1.0245	1.0188	0.0461	0.0484	0.0472	1.0210	-0.7276	-0.7101	-0.7189
L17	0:01:00	0.0301	0.0363	0.0332	1.0187	1.0265	1.0371	1.0318	0.0462	0.0486	0.0474	1.0329	-0.7438	-0.7260	-0.7349
L17	0:02:00	0.0301	0.0365	0.0333	1.0375	1.0450	1.0575	1.0513	0.0466	0.0485	0.0476	1.0517	-0.7779	-0.7572	-0.7676
L17	0:04:00	0.0302	0.0368	0.0335	1.0655	1.0716	1.0859	1.0788	0.0468	0.0490	0.0479	1.0799	-0.8421	-0.8169	-0.8295
L18	0:00:30	0.0307	0.0377	0.0342	1.1297	1.1331	1.1501	1.1416	0.0484	0.0501	0.0492	1.1447	-0.9156	-0.8863	-0.9010
L18	0:01:00	0.0307	0.0378	0.0343	1.1586	1.1623	1.1799	1.1711	0.0489	0.0501	0.0495	1.1738	-0.9462	-0.9155	-0.9309
L18	0:02:00	0.0309	0.0381	0.0345	1.2086	1.2117	1.2321	1.2219	0.0496	0.0503	0.0499	1.2240	-1.0084	-0.9733	-0.9909
L18	0:04:00	0.0309	0.0384	0.0347	1.2577	1.2607	1.2831	1.2719	0.0504	0.0503	0.0504	1.2734	-1.1027	-1.0593	-1.0810
L19	0:00:30	0.0314	0.0391	0.0353	1.3382	1.3377	1.3651	1.3514	0.0519	0.0504	0.0511	1.3541	-1.2206	-1.1635	-1.1921
L19	0:01:00	0.0314	0.0391	0.0353	1.3659	1.3671	1.3936	1.3804	0.0526	0.0507	0.0516	1.3823	-1.2479	-1.1881	-1.2180
L19	0:02:00	0.0315	0.0392	0.0354	1.4048	1.4062	1.4339	1.4201	0.0526	0.0507	0.0517	1.4211	-1.2978	-1.2330	-1.2654
L19	0:04:00	0.0316	0.0393	0.0355	1.4529	1.4541	1.4818	1.4680	0.0535	0.0509	0.0522	1.4696	-1.3797	-1.3083	-1.3440
L19	0:08:00	0.0317	0.0395	0.0356	1.5082	1.5114	1.5416	1.5265	0.0539	0.0509	0.0524	1.5250	-1.5035	-1.4314	-1.4675
L20	0:00:30	0.0323	0.0400	0.0362	1.5837	1.5869	1.6171	1.6020	0.0553	0.0509	0.0531	1.6006	-1.6249	-1.5437	-1.5843
L20	0:01:00	0.0324	0.0400	0.0362	1.6115	1.6147	1.6449	1.6298	0.0555	0.0509	0.0532	1.6285	-1.6478	-1.5648	-1.6063

Table E.1 Adjusted Indicator Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		TT-E (inches)	TT-F (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-C (inches)	TT-D (inches)	Mvmt. (inches)	9751 (inches)	9752 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT-A (inches)	TT-B (inches)	Mvmt. (inches)
L20	0:02:00	0.0325	0.0401	0.0363	1.6609	1.6641	1.6943	1.6792	0.0557	0.0509	0.0533	1.6779	-1.6921	-1.6063	-1.6492
L20	0:04:00	0.0328	0.0401	0.0365	1.7526	1.7558	1.7860	1.7709	0.0562	0.0509	0.0535	1.7697	-1.7841	-1.6900	-1.7371
L21	0:00:30	0.0334	0.0405	0.0370	1.9506	1.9538	1.9840	1.9689	0.0578	0.0509	0.0544	1.9680	-1.8945	-1.7853	-1.8399
L21	0:01:00	0.0336	0.0405	0.0371	2.0232	2.0264	2.0566	2.0415	0.0581	0.0509	0.0545	2.0406	-1.9262	-1.8115	-1.8689
L21	0:02:00	0.0337	0.0405	0.0371	2.1616	2.1648	2.1950	2.1799	0.0592	0.0511	0.0551	2.1796	-1.9896	-1.8671	-1.9284
L21	0:04:00	0.0337	0.0405	0.0371	2.3505	2.3537	2.3839	2.3688	0.0596	0.0507	0.0551	2.3685	-2.0987	-1.9598	-2.0293
U1	0:00:30	0.0337	0.0401	0.0369	2.3521	2.3553	2.3855	2.3704	0.0593	0.0507	0.0550	2.3702	-2.1044	-1.9668	-2.0356
U1	0:03:00	0.0334	0.0399	0.0367	2.3535	2.3567	2.3869	2.3718	0.0591	0.0502	0.0546	2.3714	-2.1044	-1.9718	-2.0381
U2	0:00:30	0.0312	0.0380	0.0346	2.3492	2.3524	2.3826	2.3675	0.0581	0.0494	0.0538	2.3684	-2.0772	-1.9547	-2.0160
U2	0:02:30	0.0310	0.0378	0.0344	2.3493	2.3525	2.3827	2.3676	0.0572	0.0489	0.0530	2.3679	-2.0703	-1.9516	-2.0110
U3	0:00:30	0.0271	0.0344	0.0308	2.3324	2.3356	2.3658	2.3507	0.0541	0.0463	0.0502	2.3518	-2.0181	-1.9164	-1.9673
U3	0:03:00	0.0270	0.0344	0.0307	2.3315	2.3347	2.3649	2.3498	0.0535	0.0459	0.0497	2.3504	-2.0123	-1.9058	-1.9591
U4	0:00:30	0.0142	0.0213	0.0178	2.1988	2.2020	2.2322	2.2171	0.0322	0.0294	0.0308	2.2118	-1.8036	-1.7250	-1.7643
U4	0:03:00	0.0138	0.0208	0.0173	2.1854	2.1886	2.2188	2.2037	0.0315	0.0289	0.0302	2.1982	-1.7810	-1.7002	-1.7406
U5	0:00:30	0.0130	0.0199	0.0165	2.1745	2.1777	2.2079	2.1928	0.0304	0.0285	0.0294	2.1875	-1.7520	-1.6733	-1.7127
U5	0:03:00	0.0127	0.0193	0.0160	2.1639	2.1671	2.1973	2.1822	0.0286	0.0271	0.0279	2.1757	-1.7381	-1.6594	-1.6988
U5	0:06:00	0.0122	0.0188	0.0155	2.1547	2.1579	2.1881	2.1730	0.0278	0.0265	0.0271	2.1663	-1.7319	-1.6491	-1.6905
U5	0:12:00	0.0121	0.0184	0.0153	2.1450	2.1482	2.1784	2.1633	0.0269	0.0260	0.0265	2.1562	-1.7250	-1.6462	-1.6856
U5	0:24:00	0.0114	0.0180	0.0147	2.1357	2.1389	2.1691	2.1540	0.0265	0.0253	0.0259	2.1468	-1.7169	-1.6418	-1.6794
U5	0:47:30	0.0111	0.0178	0.0145	2.1314	2.1346	2.1648	2.1497	0.0258	0.0247	0.0253	2.1422	-1.7169	-1.6401	-1.6785

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L0	0:00:00		-10.45	-9.17	-6.40	-16.36	-14.43	-22.56	-51.32	-43.91	-29.57	-32.04	-23.79	-36.98	-16.85	-27.01
L0	0:00:30		-10.80	-8.70	-6.04	-15.93	-13.48	-21.60	-49.48	-42.10	-27.24	-29.27	-17.16	-30.63	-7.35	-23.05
L1	0:00:00		-10.45	-7.88	-5.31	-15.96	-12.85	-20.92	-46.77	-40.52	-24.95	-26.78	-13.99	-27.39	-4.10	-17.57
L1	0:00:30		-9.69	-7.70	-5.16	-15.46	-12.33	-20.82	-47.24	-39.94	-25.06	-26.20	-13.70	-27.10	-3.82	-16.10
L1	0:01:00		-10.20	-8.31	-5.38	-15.24	-12.47	-20.71	-45.94	-39.72	-24.25	-25.70	-12.98	-24.64	-2.82	-15.56
L1	0:01:30		-10.16	-8.27	-5.31	-15.10	-12.40	-20.60	-45.84	-39.54	-24.15	-25.41	-12.54	-24.20	-2.68	-15.27
L1	0:02:00		-10.16	-8.27	-5.31	-15.06	-12.36	-20.60	-45.69	-39.47	-24.40	-25.30	-12.83	-24.31	-2.64	-15.27
L1	0:02:30		-9.59	-7.74	-4.98	-15.06	-12.36	-20.60	-46.23	-39.43	-24.29	-25.37	-12.80	-24.35	-2.61	-15.41
L1	0:03:00		-10.23	-7.74	-5.23	-15.10	-12.33	-20.60	-45.62	-39.51	-24.36	-25.26	-12.76	-24.27	-2.61	-15.23
L1	0:03:30		-10.20	-7.74	-5.23	-15.03	-12.15	-20.49	-46.38	-39.29	-24.00	-25.26	-12.40	-24.24	-2.57	-15.20
L1	0:04:00		-9.55	-8.27	-4.90	-15.03	-12.33	-20.49	-45.62	-39.33	-23.93	-25.26	-12.44	-24.16	-2.61	-15.20
L1	0:04:30		-9.55	-7.66	-4.98	-15.03	-12.12	-20.53	-45.62	-39.33	-24.29	-25.26	-12.33	-24.05	-2.57	-15.20
L1	0:05:00		-9.52	-7.31	-4.28	-14.63	-11.49	-19.71	-43.89	-37.70	-22.40	-23.28	-9.16	-20.64	2.21	-11.60
L1	0:05:30		-8.76	-7.38	-3.66	-13.62	-10.33	-18.61	-40.90	-34.60	-18.35	-20.51	-5.19	-14.95	7.14	-7.42
L2	0:00:00		-8.26	-7.06	-3.07	-13.08	-9.53	-18.04	-38.15	-33.19	-17.30	-18.38	-2.63	-12.34	10.53	-4.97
L2	0:00:30		-8.12	-6.59	-2.93	-13.51	-9.25	-17.54	-37.61	-32.29	-16.93	-17.84	-1.66	-11.35	11.56	-4.25
L2	0:01:00		-8.12	-6.59	-2.89	-12.83	-9.17	-17.47	-37.14	-32.07	-16.86	-17.59	-1.84	-12.34	10.99	-3.49
L2	0:01:30		-8.08	-6.95	-3.04	-12.83	-9.17	-17.43	-37.33	-32.51	-16.86	-17.59	-1.87	-12.37	11.10	-4.39
L2	0:02:00		-8.23	-6.95	-3.00	-12.79	-9.10	-17.57	-37.25	-32.00	-16.86	-17.48	-1.84	-12.23	11.35	-4.39
L2	0:02:30		-8.08	-6.95	-2.85	-13.73	-9.10	-17.39	-37.22	-32.33	-16.28	-17.44	-1.80	-12.19	10.99	-4.21
L2	0:03:00		-8.08	-6.91	-2.85	-13.08	-9.10	-17.39	-36.78	-32.29	-16.28	-17.48	-1.80	-12.19	11.31	-4.07
L2	0:03:30		-8.19	-6.91	-2.85	-13.01	-8.86	-17.64	-37.11	-31.86	-16.53	-17.34	-1.77	-12.19	10.99	-4.39
L2	0:04:00		-8.05	-6.73	-3.00	-13.37	-8.86	-17.61	-36.96	-32.36	-16.79	-17.34	-1.80	-12.15	10.81	-4.29
L2	0:04:30		-7.98	-6.84	-2.89	-12.94	-9.00	-17.50	-36.86	-32.07	-16.02	-17.23	-0.97	-11.64	11.89	-3.39
L2	0:05:00		-7.37	-6.16	-2.20	-12.36	-7.95	-16.43	-33.79	-28.97	-14.09	-14.88	2.34	-8.01	16.31	0.18
L2	0:05:30		-6.47	-5.80	-0.99	-11.13	-6.41	-15.01	-30.18	-25.43	-11.40	-11.64	6.49	-3.82	21.63	4.43
L3	0:00:00		-5.83	-5.37	-0.18	-11.60	-5.64	-13.87	-25.89	-22.48	-9.18	-8.90	9.26	-1.10	24.66	6.84
L3	0:00:30		-5.47	-5.30	0.22	-11.24	-4.94	-13.29	-24.45	-20.89	-8.38	-7.53	10.74	0.44	26.73	7.85
L3	0:01:00		-5.19	-5.23	0.40	-10.13	-4.55	-13.01	-23.55	-19.84	-7.28	-6.81	11.61	1.32	27.55	9.36
L3	0:01:30		-5.12	-5.09	0.55	-11.24	-4.31	-12.83	-22.76	-19.63	-8.34	-6.63	11.93	1.76	27.45	9.44
L3	0:02:00		-5.12	-5.09	0.59	-10.02	-4.24	-12.76	-22.68	-19.34	-7.54	-6.56	11.89	1.73	27.70	9.08
L3	0:02:30		-5.08	-5.12	0.62	-11.24	-4.17	-12.69	-22.43	-19.34	-8.30	-6.52	11.79	1.58	27.77	9.15
L3	0:03:00		-4.94	-5.09	0.66	-11.24	-4.17	-12.69	-22.50	-19.34	-7.57	-6.31	12.11	1.91	27.27	8.86
L3	0:03:30		-4.94	-5.19	0.62	-9.87	-4.17	-12.69	-22.50	-18.80	-8.30	-6.52	11.68	1.47	27.02	9.00
L3	0:04:00		-5.04	-5.01	0.66	-9.98	-4.13	-12.69	-22.29	-18.72	-7.54	-6.16	11.68	1.40	27.66	8.97
L3	0:04:30		-5.08	-5.09	0.66	-10.16	-4.13	-12.69	-22.43	-18.69	-7.57	-6.52	11.75	1.47	27.38	8.90
L3	0:05:00		-4.83	-4.91	0.88	-9.80	-3.92	-12.48	-21.85	-18.94	-8.01	-6.31	12.40	2.13	29.20	9.80
L3	0:05:30		-3.00	-4.05	3.11	-8.40	-0.70	-9.62	-14.10	-11.51	-2.22	-0.07	20.80	9.62	37.55	16.75
L4	0:00:00		-2.15	-3.65	3.95	-7.93	0.84	-8.41	-10.67	-8.30	-0.22	2.52	22.49	12.19	42.19	19.12
L4	0:00:30		-1.90	-3.62	4.36	-7.17	0.95	-7.84	-8.91	-6.78	0.47	3.50	24.01	13.55	43.04	20.38
L4	0:01:00		-1.72	-3.44	4.54	-7.17	1.75	-7.63	-7.93	-6.21	0.76	3.82	24.87	13.29	44.47	20.35
L4	0:01:30		-1.57	-3.69	4.54	-7.13	1.47	-7.59	-7.75	-6.03	1.38	3.82	24.33	13.59	43.97	20.28

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L4	0:02:00		-1.65	-3.58	4.76	-7.13	1.40	-7.56	-7.61	-5.88	0.80	4.11	24.80	13.18	43.47	20.17
L4	0:02:30		-1.61	-3.51	4.50	-7.06	1.47	-7.49	-7.36	-5.59	1.57	4.25	24.98	13.44	44.12	20.42
L4	0:03:00		-1.40	-3.55	4.72	-6.99	1.86	-7.41	-7.21	-5.48	1.68	4.47	25.30	13.70	44.86	20.56
L4	0:03:30		-1.50	-3.55	4.79	-6.95	2.07	-7.34	-6.92	-5.23	1.75	4.07	25.38	14.65	44.15	20.53
L4	0:04:00		-1.40	-3.44	4.83	-6.92	1.72	-7.20	-6.89	-5.09	1.09	4.65	25.66	13.88	44.54	20.71
L4	0:04:30		-1.25	-3.44	4.72	-6.88	2.21	-7.13	-6.56	-5.27	1.17	4.83	25.81	14.32	44.54	20.82
L5	0:00:00		1.14	-2.44	7.36	-5.26	4.76	-3.78	1.62	2.31	7.47	10.63	35.11	22.29	55.64	28.38
L5	0:00:30		1.93	-2.29	8.05	-4.32	5.43	-3.21	4.58	5.01	7.47	12.97	37.16	24.53	58.18	30.39
L5	0:01:00		2.15	-2.11	8.09	-4.11	6.27	-2.78	5.55	6.06	9.10	13.12	39.87	24.60	59.53	31.62
L5	0:01:30		2.43	-2.11	7.98	-4.00	6.62	-2.50	6.20	6.89	9.32	13.70	38.71	25.63	60.57	31.69
L5	0:02:00		2.54	-2.11	8.09	-3.89	6.86	-2.42	6.82	7.18	8.45	14.85	39.11	26.15	60.43	31.91
L5	0:02:30		2.54	-2.18	8.09	-4.61	6.83	-2.42	6.92	7.32	8.30	14.06	40.30	25.81	60.50	31.87
L5	0:03:00		2.11	-2.29	8.56	-4.61	6.62	-2.46	6.89	7.43	9.21	13.88	38.71	24.53	60.32	31.15
L5	0:03:30		2.36	-2.26	8.31	-3.96	6.93	-2.50	6.85	7.36	9.14	14.60	38.64	25.30	59.43	31.04
L5	0:04:00		2.43	-2.22	8.53	-4.54	6.69	-1.64	6.78	7.43	8.16	14.78	39.94	25.89	60.21	31.98
L5	0:04:30		2.61	-2.11	8.23	-4.54	6.83	-1.53	7.25	7.79	8.41	14.38	39.43	26.26	60.85	32.30
L5	0:05:00		3.76	-1.79	9.33	-3.10	8.19	-0.68	10.71	11.08	11.91	17.23	26.46	31.07	66.60	36.91
L5	0:05:30		4.44	-1.58	10.06	-3.24	8.82	0.39	13.63	14.36	14.42	19.93	47.47	33.97	70.38	40.62
L6	0:00:00		4.65	-1.50	10.39	-2.99	9.21	1.10	15.18	15.98	15.26	21.08	49.27	35.66	72.88	43.11
L6	0:00:30		4.90	-1.58	10.50	-2.85	9.74	1.25	15.83	17.17	15.30	21.34	50.17	36.57	71.49	41.70
L6	0:01:00		5.01	-1.58	10.58	-2.27	9.91	1.57	16.30	17.75	15.77	22.13	50.82	37.01	72.35	42.57
L6	0:01:30		5.04	-1.40	10.61	-2.27	9.63	1.50	16.48	17.79	15.84	22.24	51.26	37.46	73.31	43.54
L6	0:02:00		5.12	-1.61	10.69	-2.23	9.56	1.68	16.63	18.22	15.73	22.31	51.08	37.27	75.35	43.72
L6	0:02:30		5.01	-1.61	10.72	-2.23	10.12	1.82	16.84	18.44	15.73	22.27	52.12	37.49	75.74	43.47
L6	0:03:00		5.19	-1.43	10.72	-2.85	10.30	1.71	16.99	18.62	15.99	22.60	52.12	37.49	75.67	43.40
L6	0:03:30		5.19	-1.65	10.76	-2.20	10.16	1.78	16.99	18.76	15.88	22.85	52.55	37.60	76.42	44.15
L6	0:04:00		5.22	-1.61	10.76	-2.20	10.19	1.85	17.13	18.90	15.88	22.92	52.55	37.60	76.35	44.08
L6	0:04:30		5.12	-1.61	10.65	-2.81	10.02	1.96	17.24	18.94	15.91	22.92	52.48	37.53	76.42	44.15
L6	0:05:00		5.12	-1.61	10.69	-2.16	10.44	1.92	17.20	19.16	15.91	23.03	52.91	37.38	76.20	43.94
L6	0:05:30		5.26	-1.61	10.83	-2.81	10.02	2.21	17.31	19.23	16.13	23.17	53.31	37.79	76.49	43.94
L6	0:06:00		5.19	-1.61	10.83	-2.16	10.30	2.07	17.42	19.37	15.99	23.25	53.85	38.34	76.88	44.33
L6	0:06:30		5.19	-1.54	10.83	-2.13	10.30	2.07	17.49	19.41	16.10	23.35	53.49	37.97	76.92	44.51
L6	0:07:00		5.33	-1.47	10.91	-2.13	10.26	2.14	17.63	19.52	16.32	23.53	53.63	38.08	77.09	44.69
L6	0:07:30		5.22	-1.54	10.76	-2.13	10.26	2.17	17.71	19.88	15.81	23.53	53.67	38.15	77.27	44.76
L6	0:08:00		5.33	-1.61	10.94	-2.63	10.58	2.10	17.71	19.70	16.21	23.61	53.60	38.08	77.17	44.66
L6	0:08:30		5.29	-1.61	10.87	-2.13	9.84	2.00	17.63	19.81	16.28	23.64	53.89	38.37	76.84	44.33
L6	0:09:00		5.19	-1.65	10.87	-2.13	10.33	2.03	17.53	19.81	16.21	22.85	53.27	38.56	76.67	45.05
L6	0:09:30		5.19	-1.65	10.91	-2.16	9.81	2.10	17.60	19.73	16.13	23.21	53.13	37.53	76.45	43.54
L6	0:10:00		5.69	-1.40	11.31	-1.80	10.96	2.78	18.79	21.00	17.15	24.90	56.59	41.05	80.06	46.89
L7	0:00:00		5.94	-1.29	11.60	-1.55	11.42	3.49	20.23	22.37	18.06	26.13	57.13	41.90	81.38	48.44
L7	0:00:30		5.90	-1.29	11.71	-1.55	11.42	3.39	20.59	22.80	18.25	26.31	57.46	42.82	81.56	48.94
L7	0:01:00		5.94	-1.18	11.67	-1.95	11.63	3.53	20.77	23.16	18.43	26.56	57.96	43.26	82.41	49.23

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L7	0:01:30		5.97	-1.36	11.75	-1.51	11.59	3.46	21.10	23.45	18.79	26.78	58.21	43.15	82.23	49.59
L7	0:02:00		6.08	-1.36	11.86	-1.44	12.26	3.81	21.24	23.74	18.68	26.92	58.65	43.15	82.63	49.99
L7	0:02:30		6.05	-1.40	11.75	-1.48	11.87	3.67	21.21	23.85	18.39	26.17	58.43	42.93	82.88	49.70
L7	0:03:00		6.15	-1.43	11.75	-1.51	11.73	3.56	21.28	23.92	18.76	26.02	58.50	42.96	84.16	50.99
L7	0:03:30		6.19	-1.43	11.67	-1.51	11.77	3.67	21.24	23.85	18.76	27.25	58.61	43.07	83.02	49.84
L7	0:04:00		6.19	-1.40	11.75	-1.48	11.84	3.74	21.35	24.10	18.54	26.96	58.72	42.63	84.45	51.28
L8	0:00:00		6.51	-1.11	12.22	-1.12	12.54	4.53	23.12	25.76	20.61	28.40	61.60	45.97	86.84	52.65
L8	0:00:30		6.80	-1.11	12.41	-0.97	12.96	4.88	24.13	26.77	21.56	29.48	62.11	48.03	88.41	54.52
L8	0:01:00		6.83	-1.25	12.44	-0.97	13.03	4.74	24.34	27.31	21.63	29.23	63.04	47.55	88.59	54.96
L8	0:01:30		6.80	-1.22	12.52	-0.90	13.17	4.92	24.67	27.71	21.49	29.91	63.62	48.03	89.23	55.60
L8	0:02:00		6.94	-1.15	12.48	-1.44	13.38	5.45	24.81	28.32	22.29	30.02	64.20	48.62	90.30	56.47
L8	0:02:30		6.94	-1.22	12.37	-0.86	13.31	5.17	25.14	28.47	22.18	29.95	64.12	48.55	89.80	56.32
L8	0:03:00		7.05	-1.25	12.52	-0.86	13.20	5.49	24.85	28.61	21.78	30.31	64.20	48.62	90.12	56.65
L8	0:03:30		6.90	-1.29	12.48	-0.90	13.20	5.24	24.85	28.57	21.78	29.95	63.94	48.36	89.66	56.18
L8	0:04:00		6.90	-1.29	12.59	-0.90	13.20	5.52	24.85	28.61	21.56	29.91	64.27	48.32	89.62	56.07
L8	0:04:30		6.98	-1.25	12.52	-1.30	13.13	5.13	24.85	28.68	22.03	30.20	64.30	48.36	89.91	56.18
L8	0:05:00		7.08	-1.33	12.48	-1.44	13.24	5.17	24.78	28.75	21.78	30.24	64.56	49.50	90.05	56.29
L8	0:05:30		7.01	-1.29	12.48	-0.90	13.34	5.52	24.81	28.86	21.85	30.31	64.63	49.57	90.69	56.43
L8	0:06:00		6.94	-1.22	12.63	-1.48	13.20	5.24	24.85	28.93	21.89	30.09	63.69	48.62	92.09	57.84
L8	0:06:30		6.90	-1.29	12.44	-0.90	12.50	5.67	24.99	29.04	22.14	30.17	64.77	49.72	90.80	56.58
L8	0:07:00		7.01	-1.25	12.55	-0.83	13.31	5.31	24.96	29.08	21.85	30.35	63.84	48.77	91.51	56.61
L8	0:07:30		6.94	-1.22	12.55	-1.44	13.24	5.67	25.24	29.19	22.00	30.42	64.95	48.77	91.05	56.72
L8	0:08:00		7.05	-1.22	12.59	-0.83	13.24	5.77	25.06	29.26	22.40	30.49	65.10	48.91	91.16	56.83
L8	0:08:30		7.01	-1.29	12.59	-0.83	13.41	5.45	25.14	29.37	22.40	30.60	65.10	48.91	91.51	57.19
L8	0:09:00		7.01	-1.22	12.55	-0.83	13.41	5.42	25.17	29.40	22.14	30.56	65.13	48.95	91.44	56.94
L8	0:09:30		6.94	-1.22	12.52	-0.83	12.78	5.85	25.14	29.40	22.11	30.60	65.21	48.84	91.51	57.01
L8	0:10:00		6.98	-1.25	12.48	-1.41	13.41	5.49	25.14	29.40	22.32	30.53	65.21	48.88	91.34	56.86
L8	0:10:30		7.12	-1.15	12.63	-0.72	13.38	5.95	25.21	29.55	22.29	30.60	65.28	48.95	91.16	56.90
L9	0:00:00		7.58	-0.97	13.21	-0.29	14.04	6.59	27.62	31.82	24.22	32.76	69.03	53.25	96.40	61.22
L9	0:00:30		7.62	-1.00	13.25	-0.58	14.18	6.70	28.02	32.36	23.74	33.05	69.39	53.98	96.76	61.69
L9	0:01:00		7.62	-0.93	13.25	-0.79	14.43	7.38	28.63	32.69	24.47	33.23	69.82	53.54	97.30	62.23
L9	0:01:30		7.62	-0.97	13.29	-0.22	13.83	7.06	27.98	32.65	24.33	32.91	70.25	53.98	96.55	63.02
L9	0:02:00		7.58	-1.00	13.25	-0.22	14.22	7.38	28.09	32.83	23.67	33.12	70.36	54.09	97.05	62.05
L9	0:02:30		7.62	-0.97	13.18	-0.83	14.22	7.41	28.06	32.87	23.60	33.01	69.89	53.61	97.44	63.49
L9	0:03:00		7.62	-0.97	13.18	-0.76	14.22	7.45	28.38	32.98	24.40	33.12	70.07	54.46	96.87	62.37
L9	0:03:30		7.62	-0.97	13.14	-0.86	14.43	7.52	28.49	33.16	24.47	33.27	70.29	54.68	97.12	62.63
L9	0:04:00		7.62	-0.97	13.25	-0.76	14.29	7.06	28.42	33.30	24.55	33.37	70.50	54.75	97.55	62.88
L9	0:04:30		7.62	-0.93	13.25	-0.14	13.83	7.59	28.27	33.37	24.47	33.45	69.46	53.69	97.23	63.82
L9	0:05:00		8.01	-0.93	13.72	0.25	14.95	7.84	29.68	34.63	25.82	35.00	72.27	56.55	100.54	67.16
L10	0:00:00		8.16	-0.64	13.80	-0.11	14.92	8.77	31.34	35.90	26.95	35.64	74.11	58.42	100.94	69.69
L10	0:00:30		8.19	-0.68	13.87	0.68	15.09	8.80	31.12	36.33	26.84	35.86	74.36	58.68	103.69	68.42
L10	0:01:00		8.12	-0.72	13.72	0.54	14.88	8.38	31.56	36.51	26.77	35.79	73.82	58.75	101.90	68.68

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L10	0:01:30		8.12	-0.50	13.76	0.61	14.88	8.41	31.63	36.69	26.66	35.75	74.00	59.52	101.26	68.03
L10	0:02:00		8.16	-0.61	13.69	0.25	15.30	8.52	31.70	36.91	26.77	35.90	74.14	59.67	102.22	69.00
L10	0:02:30		8.12	-0.68	13.76	0.65	14.85	8.73	31.34	37.09	26.88	36.04	74.32	59.97	103.86	69.87
L10	0:03:00		8.19	-0.82	13.72	0.14	15.41	8.66	31.52	37.30	27.06	36.19	74.51	60.30	102.01	67.99
L10	0:03:30		8.19	-0.68	13.76	0.32	14.95	8.66	31.52	37.41	27.02	36.51	74.40	60.22	102.15	68.14
L10	0:04:00		8.12	-0.72	13.87	0.11	15.37	8.84	31.77	37.49	26.84	36.44	74.47	60.30	102.69	70.44
L10	0:04:30		8.19	-0.64	13.72	0.65	15.37	8.70	31.48	37.52	26.77	36.51	74.40	60.48	102.69	70.44
L10	0:05:00		8.51	-0.50	14.13	1.30	15.55	9.37	32.93	39.07	28.37	38.10	76.78	63.20	106.11	73.36
L11	0:00:00		8.62	-0.47	14.31	1.51	16.18	9.73	33.94	40.01	28.95	38.64	77.82	64.48	106.36	74.98
L11	0:00:30		8.66	-0.32	14.31	1.62	16.25	10.27	34.12	40.41	28.92	39.32	78.11	65.25	106.90	76.06
L11	0:01:00		8.69	-0.29	14.35	1.55	16.32	10.41	34.33	40.88	28.95	39.39	77.97	66.39	106.75	77.18
L11	0:01:30		8.59	-0.32	14.20	1.62	15.93	10.05	34.19	41.06	28.73	39.18	77.32	65.47	106.40	76.24
L11	0:02:00		8.55	-0.47	14.16	1.08	16.07	10.69	33.75	40.95	28.73	39.00	77.21	65.95	107.50	76.28
L11	0:02:30		8.59	-0.36	14.24	1.41	15.83	10.37	33.97	41.06	28.48	39.07	77.82	65.55	106.54	76.46
L11	0:03:00		8.55	-0.43	14.16	1.44	15.58	10.09	34.01	41.16	28.52	39.18	77.57	65.69	106.75	76.60
L11	0:03:30		8.59	-0.36	14.16	1.51	15.62	10.12	34.01	41.24	28.55	39.65	78.22	65.99	108.47	77.21
L11	0:04:00		8.59	-0.43	14.27	1.30	16.14	10.19	34.15	41.45	28.70	39.46	78.33	66.61	107.18	77.07
L11	0:04:30		8.66	-0.25	14.20	1.30	16.21	10.51	34.19	41.56	28.73	39.61	78.04	66.32	107.40	77.64
L12	0:00:00		9.09	-0.07	14.64	2.34	16.98	11.37	36.10	43.76	30.70	41.99	80.81	70.28	111.61	82.00
L12	0:00:30		9.09	0.00	14.75	2.52	17.16	11.66	36.46	44.52	30.88	42.17	82.00	71.50	111.82	82.22
L12	0:01:00		9.09	0.00	14.64	2.59	16.95	11.94	36.68	44.99	30.92	42.46	82.25	71.75	112.18	82.58
L12	0:01:30		9.12	-0.11	14.71	2.49	17.19	11.98	36.78	45.21	30.92	42.56	81.39	72.01	113.18	84.38
L12	0:02:00		9.16	0.04	14.68	2.38	17.23	13.05	37.07	45.57	30.99	42.53	81.75	72.38	113.79	85.03
L12	0:02:30		9.09	-0.07	14.68	2.27	16.88	12.26	36.82	45.53	30.96	42.89	81.64	73.26	113.82	85.06
L12	0:03:00		9.16	-0.11	14.82	2.59	16.88	12.37	37.00	45.71	31.25	43.03	81.89	72.74	112.89	85.49
L12	0:03:30		9.19	0.00	14.60	2.74	16.81	12.30	36.75	46.07	30.81	42.92	81.68	72.52	112.68	85.28
L12	0:04:00		9.05	0.00	14.57	2.59	17.05	13.26	36.68	45.78	30.66	42.82	81.53	72.49	113.86	86.47
L12	0:04:30		9.05	0.00	14.71	2.70	16.98	12.33	36.57	46.07	30.70	42.89	81.93	72.89	113.93	86.54
L13	0:00:00		9.48	0.07	15.04	3.10	17.40	14.54	38.44	47.62	32.48	44.55	84.38	75.83	116.46	88.16
L13	0:00:30		9.52	0.18	15.26	3.35	18.03	13.87	39.13	48.63	32.81	45.56	85.39	77.33	118.35	90.21
L13	0:01:00		9.52	0.21	15.11	3.57	18.07	15.11	39.31	49.03	33.07	45.52	85.57	77.92	118.85	90.64
L13	0:01:30		9.52	0.36	15.08	3.60	18.03	15.15	39.42	49.46	32.89	45.63	85.50	78.40	118.21	91.18
L13	0:02:00		9.55	0.25	15.11	3.64	18.10	14.58	39.53	49.79	32.99	45.88	85.97	78.91	119.46	92.05
L13	0:02:30		9.52	0.25	15.15	3.64	18.00	15.33	39.74	49.82	32.81	45.74	85.46	78.91	119.00	91.83
L13	0:03:00		9.48	0.39	15.04	3.68	17.40	14.76	39.81	50.00	32.85	45.95	85.79	79.13	118.60	92.41
L13	0:03:30		9.59	0.25	15.04	3.78	17.61	15.47	39.92	50.26	32.92	46.13	86.04	79.54	119.60	92.70
L13	0:04:00		9.52	0.25	15.04	3.71	18.07	15.54	39.74	50.44	32.99	46.20	85.97	79.98	119.71	93.02
L13	0:04:30		9.55	0.29	15.08	3.82	18.10	15.11	39.85	50.65	33.03	46.56	86.11	80.09	120.07	93.35
L13	0:05:00		9.87	0.43	15.55	4.22	18.21	15.97	41.40	52.10	34.42	47.86	88.45	82.55	123.24	96.77
L14	0:00:00		10.02	0.50	15.48	4.00	18.81	16.61	42.12	53.03	34.82	48.51	88.92	83.69	123.96	97.49
L14	0:00:30		9.91	0.57	15.44	4.00	19.12	16.75	42.37	53.54	34.92	48.69	89.03	84.27	124.17	97.70
L14	0:01:00		9.94	0.64	15.41	4.58	18.28	16.97	42.01	53.90	35.14	48.55	89.18	84.97	123.57	97.09

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L14	0:01:30	10.05	0.64	15.44	4.65	18.95	17.04	42.52	54.33	35.47	49.12	89.21	85.60	124.39	100.26	
L14	0:02:00	9.87	0.47	15.30	4.04	18.81	16.97	41.98	54.26	34.78	48.87	89.00	85.49	124.46	99.00	
L14	0:02:30	9.87	0.79	15.52	4.65	18.81	17.04	42.52	54.44	35.11	49.02	89.43	85.93	123.53	99.54	
L14	0:03:00	9.91	0.82	15.33	4.72	18.88	17.29	42.05	54.62	35.00	49.20	89.82	86.33	124.32	100.15	
L14	0:03:30	9.91	0.50	15.37	4.72	18.88	17.22	42.66	54.80	34.92	49.41	89.25	86.51	124.67	101.30	
L14	0:04:00	9.98	0.64	15.41	4.72	18.84	17.32	42.81	55.02	35.00	49.52	89.32	86.81	124.10	103.21	
L14	0:04:30	9.98	0.64	15.37	4.79	18.91	17.14	42.55	55.24	35.07	49.70	89.39	87.10	124.24	101.95	
L14	0:05:00	9.91	0.64	15.37	4.76	18.84	17.25	42.81	55.24	34.85	49.56	88.63	87.10	124.39	101.77	
L14	0:05:30	9.87	0.50	15.30	4.76	18.84	17.54	42.16	55.52	34.82	49.23	88.56	87.03	123.49	101.34	
L14	0:06:00	9.94	0.61	15.33	4.79	18.84	17.47	42.41	55.34	35.07	49.34	88.89	87.36	124.32	101.45	
L14	0:06:30	9.91	0.47	15.48	4.83	18.84	17.43	42.16	55.45	34.78	49.41	88.92	87.32	124.28	101.63	
L14	0:07:00	9.94	0.82	15.33	4.79	18.31	17.64	42.59	55.52	34.82	49.77	89.14	87.54	124.46	102.49	
L14	0:07:30	9.91	0.64	15.37	4.58	18.31	17.50	42.23	55.60	34.82	49.88	88.60	87.62	123.92	102.67	
L14	0:08:00	9.98	0.79	15.37	4.83	18.35	17.57	42.88	55.70	35.07	49.56	89.07	88.09	123.57	102.89	
L14	0:08:30	9.94	0.64	15.33	4.86	18.91	17.61	42.30	55.81	35.00	50.02	89.25	88.28	124.49	102.42	
L14	0:09:00	9.94	0.64	15.37	4.90	18.91	17.68	42.30	55.81	34.82	49.74	89.03	88.06	124.53	103.29	
L14	0:09:30	9.94	0.82	15.41	4.65	18.38	17.86	43.06	55.99	35.07	50.17	89.25	88.20	124.39	102.82	
L14	0:10:00	9.94	0.64	15.37	4.90	18.91	17.75	43.10	56.10	35.25	50.24	89.72	88.68	124.39	103.61	
L14	0:10:30	10.23	1.04	15.77	5.26	19.44	18.39	43.89	56.93	36.27	51.21	91.73	90.55	127.71	105.99	
L15	0:00:00	10.41	0.90	15.88	5.48	19.12	18.86	44.54	58.12	36.96	52.48	92.06	92.10	128.38	107.68	
L15	0:00:30	10.37	1.11	15.88	5.41	19.82	19.21	44.54	59.13	37.11	52.69	92.31	92.61	128.60	108.47	
L15	0:01:00	10.41	1.04	15.85	5.62	19.19	19.39	44.61	59.28	37.07	52.62	91.95	93.12	127.56	108.51	
L15	0:01:30	10.45	1.18	15.81	5.62	19.79	19.53	44.43	59.06	36.96	52.84	92.24	93.34	128.63	109.52	
L15	0:02:00	10.48	1.25	15.74	5.48	19.19	19.50	44.79	59.64	36.86	52.84	92.09	93.64	128.56	109.88	
L15	0:02:30	10.37	1.04	15.77	5.41	19.75	19.39	44.83	59.31	36.89	53.02	92.13	94.01	128.60	110.20	
L15	0:03:00	10.41	0.93	15.88	5.69	19.09	19.75	44.65	59.71	36.86	52.91	92.13	94.34	128.74	110.78	
L15	0:03:30	10.41	1.04	15.70	5.66	19.68	19.60	44.50	59.96	36.82	52.80	91.55	94.30	128.46	110.67	
L15	0:04:00	10.59	1.15	15.88	5.84	19.30	19.64	44.93	60.50	36.86	53.23	92.31	95.62	128.74	111.68	
L15	0:04:30	10.80	1.36	16.18	5.04	20.00	20.46	46.81	62.63	38.57	55.47	94.11	98.34	132.60	115.35	
L16	0:00:00	10.73	1.43	16.07	6.27	20.07	20.96	46.99	62.67	38.53	55.32	95.16	99.40	131.74	115.75	
L16	0:00:30	10.77	1.75	15.96	6.38	20.10	21.10	47.17	63.14	38.79	55.65	95.92	100.17	132.77	117.19	
L16	0:01:00	10.80	1.54	15.96	6.92	20.63	21.10	47.28	63.39	38.64	55.97	96.60	100.87	132.42	117.69	
L16	0:01:30	10.77	1.58	15.92	5.84	20.56	21.53	47.57	63.71	38.79	56.04	97.50	101.79	132.67	119.20	
L16	0:02:00	10.80	1.61	15.99	6.59	20.73	21.67	47.57	64.00	38.75	56.44	98.22	102.53	133.24	119.89	
L16	0:02:30	10.80	1.72	15.92	6.63	20.77	21.56	47.82	64.22	38.79	56.66	94.26	103.08	133.24	120.18	
L16	0:03:00	10.73	1.65	15.88	5.98	20.10	21.71	47.53	64.11	38.57	56.51	94.15	102.97	132.85	121.08	
L16	0:03:30	10.87	1.86	15.85	6.59	20.07	21.81	47.49	64.36	38.49	56.62	94.37	103.19	132.77	120.54	
L16	0:04:00	10.77	1.58	16.14	6.63	20.63	21.92	47.68	64.47	38.49	56.62	94.47	103.30	133.24	121.44	
L16	0:04:30	10.70	1.65	15.88	6.67	20.49	21.96	47.57	64.62	38.60	56.69	94.08	103.44	133.49	120.75	
L16	0:05:00	10.73	1.65	15.88	6.63	20.66	22.10	48.04	64.69	38.49	56.80	94.22	103.59	133.13	121.69	
L16	0:05:30	10.70	1.90	15.92	6.63	20.10	22.17	47.82	64.76	38.60	56.91	94.62	103.99	133.67	121.26	
L16	0:06:00	10.73	1.90	15.85	5.84	20.66	22.13	47.86	64.80	38.60	56.98	94.22	104.14	133.81	121.51	

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L16	0:06:30		10.70	1.90	15.74	6.67	20.17	22.24	48.14	64.94	38.60	57.09	94.22	104.43	133.81	121.76
L16	0:07:00		10.70	1.93	15.85	6.74	20.70	22.17	47.57	64.98	38.75	57.16	94.11	104.69	133.95	122.05
L16	0:07:30		10.77	1.72	15.92	6.81	20.59	22.24	47.86	65.16	38.71	57.27	94.22	104.69	133.88	122.23
L16	0:08:00		10.73	1.65	15.92	6.77	20.10	22.06	48.04	65.30	38.60	57.38	94.51	104.99	134.09	122.52
L16	0:08:30		10.62	1.61	15.77	6.81	20.28	22.31	47.68	65.12	38.35	57.02	93.93	104.40	132.95	121.51
L16	0:09:00		10.59	1.68	15.70	6.70	20.45	22.06	47.46	65.12	38.18	56.84	93.50	103.96	132.52	121.00
L16	0:09:30		10.59	1.68	15.70	6.74	20.42	22.06	47.49	64.94	38.02	56.66	93.46	103.92	132.52	121.90
L16	0:10:00		10.55	1.65	15.66	6.09	19.75	22.10	47.31	64.90	37.95	56.66	93.68	103.85	132.63	120.97
L16	0:10:30		10.55	1.68	15.70	6.77	20.28	21.81	47.31	65.27	37.84	56.58	93.83	103.99	132.67	121.08
L16	0:11:00		10.91	1.79	16.14	7.21	21.22	23.17	48.79	66.42	39.59	58.67	95.92	106.97	137.99	124.93
L17	0:00:00		11.09	1.93	16.32	6.77	21.50	23.63	49.73	67.18	40.24	59.29	97.03	108.11	138.81	125.61
L17	0:00:30		11.05	2.36	16.18	7.35	21.01	23.77	50.06	67.83	40.39	59.43	97.79	108.22	139.16	125.04
L17	0:01:00		11.02	2.18	16.10	7.06	21.01	23.85	50.06	68.19	40.42	59.47	97.93	108.62	139.88	126.12
L17	0:01:30		11.20	2.22	16.03	7.46	20.98	24.17	50.27	67.93	40.50	59.50	97.79	109.10	139.70	126.48
L17	0:02:00		11.09	2.29	16.03	7.50	21.71	24.24	50.45	68.12	40.64	59.65	98.08	109.17	139.66	127.52
L17	0:02:30		11.02	2.29	15.99	7.24	21.40	24.38	50.49	68.26	40.79	59.61	98.44	109.58	140.34	127.70
L17	0:03:00		11.13	2.36	15.96	7.68	21.54	24.42	50.45	68.80	40.64	59.58	98.73	109.83	140.23	127.20
L17	0:03:30		11.05	2.51	15.96	7.75	21.19	24.52	50.67	68.91	40.82	59.79	98.51	110.13	139.91	127.70
L17	0:04:00		11.09	2.36	16.14	7.39	21.19	24.70	50.45	69.20	41.04	59.86	99.09	110.60	140.91	127.92
L17	0:04:30		11.23	2.51	16.18	7.89	22.03	24.84	51.50	69.74	41.48	60.69	100.46	111.93	143.41	129.61
L18	0:00:00		11.45	2.69	16.21	8.04	21.96	25.41	52.07	70.79	42.54	61.34	101.50	113.72	145.12	132.28
L18	0:00:30		11.55	2.97	16.21	8.14	22.48	26.13	52.40	70.93	42.97	61.45	102.15	114.61	146.05	133.36
L18	0:01:00		11.55	2.72	16.10	8.58	22.17	25.38	53.37	71.22	43.37	61.49	102.51	115.41	147.23	134.08
L18	0:01:30		11.70	2.94	16.25	8.36	22.66	25.59	53.73	71.65	43.77	61.59	103.56	116.11	148.30	134.18
L18	0:02:00		11.63	2.90	16.18	8.29	22.62	25.70	53.88	72.23	43.85	61.34	104.89	116.37	148.44	135.30
L18	0:02:30		11.63	2.94	16.07	8.29	22.20	25.84	54.09	72.19	44.03	61.41	103.85	116.15	149.05	135.44
L18	0:03:00		11.73	2.79	16.14	8.29	22.24	26.87	54.02	71.94	44.07	61.41	104.64	116.48	149.23	135.01
L18	0:03:30		11.66	2.83	15.99	8.36	22.27	27.02	54.42	72.44	44.32	61.52	105.32	116.70	149.76	135.05
L18	0:04:00		11.84	3.01	15.99	8.47	22.80	26.13	54.13	72.59	44.47	61.63	105.58	117.10	150.41	135.48
L18	0:04:30		11.66	3.15	15.96	8.36	22.20	27.09	54.17	72.23	44.43	61.38	105.32	116.85	150.08	135.16
L18	0:05:00		11.70	2.97	15.88	8.43	22.13	26.02	54.31	72.23	44.21	61.13	105.36	116.41	150.33	135.01
L18	0:05:30		12.02	3.33	16.18	8.68	23.18	26.80	55.72	73.35	45.67	62.42	107.92	118.43	153.55	137.50
L19	0:00:00		12.06	3.40	16.10	8.54	22.83	27.20	56.51	73.71	45.67	62.53	110.66	119.38	155.12	138.25
L19	0:00:30		12.16	3.33	16.07	9.01	22.90	27.30	57.30	73.35	47.12	62.35	111.38	119.64	156.33	138.65
L19	0:01:00		12.20	3.40	16.07	9.19	22.94	28.16	57.74	73.85	47.12	62.06	110.23	119.49	157.01	138.94
L19	0:01:30		12.16	3.37	15.88	8.90	22.94	28.19	57.95	73.31	47.27	61.74	111.99	119.53	157.29	138.65
L19	0:02:00		12.23	3.40	15.88	8.94	23.04	28.26	57.99	73.64	47.56	61.67	112.42	119.34	158.26	138.51
L19	0:02:30		12.23	3.55	15.88	8.97	22.97	28.26	58.57	73.42	47.85	61.67	111.99	119.78	158.90	138.76
L19	0:03:00		12.20	3.33	15.70	8.94	23.32	28.16	57.81	73.78	47.89	61.38	113.11	119.31	159.04	138.51
L19	0:03:30		11.91	3.51	15.59	8.76	22.80	28.12	58.24	73.71	47.67	61.23	112.28	119.09	159.36	138.33
L19	0:04:00		11.70	3.58	15.48	9.01	22.80	28.37	57.92	73.49	47.89	61.16	112.68	119.09	160.04	138.43
L19	0:04:30		11.70	3.62	15.48	9.26	22.76	28.30	58.82	73.56	48.11	61.16	113.51	119.31	160.51	138.43

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L19	0:05:00	11.77	3.76	15.41	8.94	23.25	27.87	59.00	73.85	48.47	61.20	113.54	118.90	161.08	138.47	
L19	0:05:30	11.73	3.72	15.44	9.15	23.22	28.59	58.13	73.38	48.40	61.23	114.88	118.94	161.33	138.51	
L19	0:06:00	11.77	3.62	15.41	9.37	23.25	28.66	58.21	74.03	48.69	61.31	114.26	118.98	161.72	138.51	
L19	0:06:30	11.77	3.76	15.37	9.22	23.25	28.05	59.29	73.71	48.98	61.16	114.59	119.27	162.15	139.08	
L19	0:07:00	11.88	3.76	15.41	9.30	23.29	28.76	59.47	74.03	49.06	61.20	114.73	119.45	162.33	138.79	
L19	0:07:30	11.84	3.80	15.37	9.48	23.29	28.76	58.49	73.60	49.16	61.20	115.88	119.45	162.79	139.37	
L19	0:08:00	11.95	3.58	15.37	9.15	23.15	28.98	59.68	73.85	49.31	61.20	115.31	119.64	163.08	139.19	
L19	0:08:30	11.88	3.83	15.33	9.48	23.32	29.12	58.53	73.89	49.46	61.16	114.95	119.67	163.36	139.19	
L19	0:09:00	11.88	3.62	15.33	9.62	23.39	29.19	58.64	74.68	49.56	61.16	115.78	119.34	163.61	139.19	
L19	0:09:30	11.95	3.65	15.30	9.77	22.87	29.08	59.90	73.74	49.71	61.16	115.99	119.64	163.90	139.66	
L19	0:10:00	12.02	3.98	15.22	9.66	23.53	28.91	59.25	74.72	50.62	61.63	117.00	120.63	165.61	140.23	
L19	0:10:30	12.13	3.94	15.37	9.87	23.08	29.30	60.59	75.19	50.91	61.77	117.40	120.70	166.36	141.13	
L20	0:00:00	12.27	4.01	15.33	9.73	23.71	29.98	61.09	74.43	51.60	61.77	119.38	121.58	167.40	141.35	
L20	0:00:30	12.41	4.15	15.26	10.02	23.18	29.69	61.45	74.50	51.97	61.49	119.49	121.55	167.97	142.07	
L20	0:01:00	12.48	4.23	15.30	10.31	23.74	30.26	61.13	74.46	51.97	61.20	119.45	121.66	168.29	142.32	
L20	0:01:30	12.59	4.26	15.08	10.31	23.25	30.33	61.45	74.68	52.84	60.91	119.67	121.66	168.89	142.36	
L20	0:02:00	12.45	4.23	14.97	10.49	23.53	30.37	61.67	73.96	52.84	60.69	119.89	121.62	169.43	142.61	
L20	0:02:30	12.56	4.33	14.90	10.49	23.01	30.62	62.53	74.10	53.06	60.40	121.11	121.69	170.00	142.83	
L20	0:03:00	12.59	4.26	14.79	10.63	23.22	30.69	62.57	73.96	53.35	60.19	121.62	121.91	170.71	143.15	
L20	0:03:30	12.59	4.44	14.75	10.85	23.32	30.87	62.57	74.18	53.64	60.01	121.26	121.77	171.32	143.12	
L20	0:04:00	12.59	4.48	14.49	10.92	23.22	30.72	62.86	73.96	53.94	59.68	123.49	121.62	171.96	143.12	
L20	0:04:30	12.59	4.44	14.49	10.99	23.15	31.15	63.51	73.60	54.26	59.50	122.88	121.55	172.86	143.04	
L20	0:05:00	12.95	4.73	14.38	11.35	22.83	31.12	64.41	73.96	55.32	59.68	124.93	122.76	175.43	144.59	
L21	0:00:00	13.02	4.94	13.98	11.86	22.69	31.22	64.81	72.95	55.90	58.57	125.80	122.68	177.18	145.06	
L21	0:00:30	12.91	5.23	13.65	12.40	22.87	30.51	65.60	72.59	56.48	57.56	125.15	123.20	177.71	145.13	
L21	0:01:00	12.81	5.34	13.50	12.58	23.46	30.01	66.10	71.80	56.94	56.66	125.83	123.09	178.14	145.71	
L21	0:01:30	12.95	5.30	13.43	12.79	23.71	29.26	66.57	71.00	57.39	56.19	125.91	123.38	179.57	146.03	
L21	0:02:00	13.02	5.59	13.32	13.01	23.71	28.91	66.75	70.10	57.81	55.61	126.99	123.38	180.42	146.18	
L21	0:02:30	13.06	5.62	13.18	13.04	23.74	29.23	67.26	69.74	58.23	55.14	127.46	123.46	181.28	147.01	
L21	0:03:00	13.09	5.55	13.14	13.15	23.29	28.94	67.29	70.06	58.60	54.89	127.53	124.15	181.89	147.58	
L21	0:03:30	12.95	5.62	13.07	13.41	23.43	28.76	67.62	69.56	58.60	54.21	127.46	124.45	181.67	148.27	
L21	0:04:00	12.38	5.16	12.66	12.76	22.97	27.69	65.96	67.61	58.60	51.97	124.18	120.30	175.50	142.68	
U1	0:00:00	12.06	5.05	12.37	12.65	22.34	26.80	65.56	67.50	55.28	51.18	121.15	118.39	172.54	139.87	
U1	0:00:30	11.98	4.80	12.15	12.40	22.03	27.16	64.81	66.74	55.28	50.39	119.49	115.52	166.75	137.07	
U1	0:01:00	11.88	4.80	12.19	12.40	22.31	27.12	64.99	66.35	54.81	50.10	117.65	114.35	164.54	135.41	
U1	0:01:30	11.88	5.05	12.11	12.40	21.78	26.02	64.48	66.20	54.81	49.99	117.65	114.42	165.15	134.26	
U1	0:02:00	11.81	4.91	12.15	12.40	22.31	26.06	64.91	66.49	54.81	50.31	119.38	114.86	166.43	135.99	
U1	0:02:30	11.77	4.87	12.19	12.40	21.89	27.02	64.59	66.49	54.74	50.02	118.73	115.12	167.04	136.27	
U1	0:03:00	11.77	4.73	12.15	12.40	22.38	25.98	64.81	66.28	54.66	50.21	118.88	114.86	167.25	135.01	
U1	0:03:30	11.52	4.76	11.93	12.04	21.92	26.52	64.01	65.84	54.08	49.48	116.86	112.55	162.18	131.99	
U1	0:04:00	11.13	4.84	11.24	11.57	20.35	25.91	62.68	64.29	51.97	46.96	107.41	103.00	143.70	118.88	
U2	0:00:00	10.73	4.48	10.87	11.13	20.07	25.06	61.05	62.49	49.16	44.65	97.75	94.15	126.81	106.09	

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
U2	0:00:30	10.73	4.51	10.69	10.99	19.40	24.95	60.01	62.13	49.09	44.51	96.82	93.42	125.10	104.76	
U2	0:01:00	10.70	4.55	10.87	11.06	19.30	24.91	59.97	62.09	49.09	44.47	96.28	93.75	125.10	105.27	
U2	0:01:30	10.77	4.30	10.83	10.88	19.37	24.91	59.94	62.09	49.06	44.44	96.82	93.75	125.10	105.37	
U2	0:02:00	10.66	4.44	10.69	11.03	19.86	24.88	60.73	62.05	48.91	44.40	96.82	93.86	124.99	104.91	
U2	0:02:30	10.55	4.48	10.58	10.70	19.82	24.59	59.76	62.41	49.02	44.29	96.56	93.57	125.03	105.23	
U2	0:03:00	9.34	3.94	8.93	9.33	16.98	21.60	55.50	56.07	42.32	37.45	74.32	70.91	125.03	105.23	
U3	0:00:00	8.91	3.80	8.82	8.97	16.28	20.57	52.58	53.58	39.44	35.46	63.19	63.49	71.71	63.92	
U3	0:00:30	9.01	3.72	8.67	9.01	16.32	20.64	53.05	53.47	39.44	35.79	63.66	64.11	71.71	63.92	
U3	0:01:00	8.98	3.76	8.78	8.83	16.28	20.53	52.36	53.43	39.44	35.82	63.76	63.97	71.88	63.92	
U3	0:01:30	8.98	3.76	8.82	8.61	15.79	20.60	52.94	53.40	39.33	35.75	63.87	64.08	71.96	63.92	
U3	0:02:00	8.94	3.62	8.89	8.61	16.04	20.60	52.36	53.40	39.40	35.86	64.45	64.67	71.99	63.92	
U3	0:02:30	8.98	3.90	8.45	9.01	15.79	20.07	52.36	53.40	39.33	35.82	64.38	64.59	71.99	63.92	
U3	0:03:00	8.73	3.80	8.64	8.65	15.55	20.35	51.97	52.93	39.00	35.21	61.64	62.87	71.13	64.32	
U3	0:03:30	6.58	2.69	5.86	5.91	11.91	15.61	42.01	41.67	28.55	25.55	37.85	40.39	37.26	37.67	
U3	0:04:00	3.86	1.65	2.85	3.93	6.44	8.77	25.14	24.32	15.11	15.03	17.30	20.20	12.96	16.67	
U4	0:00:00	2.40	0.90	1.21	2.20	3.82	5.03	14.71	13.82	7.25	7.78	8.47	10.28	6.21	7.92	
U4	0:00:30	1.90	0.68	0.77	1.59	2.87	3.92	11.04	9.96	6.34	5.87	6.52	7.27	5.00	5.73	
U4	0:01:00	1.82	0.68	0.84	1.15	2.66	3.85	10.06	9.24	6.05	4.90	6.16	6.94	5.18	5.76	
U4	0:01:30	1.86	0.47	0.77	1.48	2.63	3.56	9.74	8.73	5.86	5.37	6.02	6.83	5.21	5.80	
U4	0:02:00	1.86	0.68	0.77	1.08	2.63	3.49	9.56	8.73	5.79	5.05	5.98	6.76	5.21	5.76	
U4	0:02:30	1.82	0.68	0.81	1.44	2.63	3.49	9.45	8.59	5.75	4.83	5.84	6.68	5.07	5.73	
U4	0:03:00	1.61	0.36	0.81	1.41	2.21	3.42	9.38	8.51	5.72	5.23	5.59	6.61	5.10	5.62	
U4	0:03:30	1.57	0.50	0.84	1.41	2.63	3.42	9.34	8.37	5.35	5.08	5.77	6.54	5.07	5.47	
U4	0:04:00	1.61	0.50	0.88	1.05	2.31	3.42	9.30	8.44	5.64	5.15	5.70	6.50	5.07	5.51	
U4	0:04:30	1.32	0.68	0.88	1.08	2.31	3.64	9.20	8.51	5.64	5.15	5.59	6.43	4.82	5.47	
U4	0:05:00	1.82	0.68	0.91	1.41	2.59	3.28	9.20	8.23	4.55	4.76	5.51	6.39	4.75	5.47	
U4	0:05:30	1.65	0.61	0.70	1.26	2.24	2.99	8.73	7.61	4.81	4.07	4.18	5.03	3.25	3.67	
U5	0:00:00	1.32	0.32	0.48	0.50	1.96	2.60	7.36	6.21	4.12	3.71	3.68	4.33	3.07	3.06	
U5	0:00:30	1.11	0.25	0.33	1.01	1.79	2.25	6.49	5.74	3.71	3.35	3.42	4.19	2.75	2.95	
U5	0:01:00	0.72	0.21	0.26	0.76	1.23	2.00	6.20	5.16	3.42	3.06	3.10	3.71	2.64	3.10	
U5	0:01:30	1.00	0.14	0.15	0.65	1.09	1.82	5.81	4.73	3.10	2.81	2.88	3.49	2.71	2.66	
U5	0:02:00	0.93	0.25	0.18	0.07	1.02	1.85	5.12	4.33	2.04	2.59	2.74	3.27	2.53	2.48	
U5	0:02:30	0.79	-0.07	0.18	0.68	1.26	1.57	4.80	4.00	1.86	2.27	2.74	3.08	2.43	2.38	
U5	0:03:00	0.79	0.18	0.11	0.61	1.16	1.46	4.76	3.68	1.68	2.23	2.60	2.94	2.36	2.48	
U5	0:03:30	0.75	0.14	0.07	-0.14	1.12	1.32	4.18	3.39	1.53	2.09	2.45	2.79	2.28	2.34	
U5	0:04:00	0.68	-0.11	0.07	-0.22	1.02	1.28	3.97	3.28	1.38	1.95	2.20	2.64	2.21	2.27	
U5	0:04:30	0.64	0.11	0.07	-0.22	0.98	1.14	3.97	2.89	1.27	1.80	2.23	2.50	2.14	2.16	
U5	0:05:00	0.61	0.11	0.04	-0.29	0.91	1.07	3.75	2.78	1.17	1.69	1.98	2.24	2.07	2.05	
U5	0:05:30	0.57	0.07	0.04	-0.32	0.84	1.00	3.53	2.56	1.06	1.59	1.87	2.13	1.96	1.98	
U5	0:06:00	0.36	-0.18	0.00	-0.36	0.81	0.96	3.35	2.35	0.95	1.44	1.80	2.13	1.93	1.91	
U5	0:06:30	0.50	-0.21	-0.11	0.32	0.74	0.86	3.17	2.20	0.87	1.37	1.69	2.02	1.86	1.87	
U5	0:07:00	0.47	0.04	-0.04	0.32	0.70	0.82	2.99	2.06	0.76	1.26	1.66	1.91	1.78	1.80	

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
U5	0:07:30		0.43	0.04	-0.11	-0.43	0.67	0.75	2.81	1.91	0.69	1.19	1.69	1.80	1.75	1.73
U5	0:08:00		0.39	-0.25	-0.04	-0.43	0.63	0.82	2.67	1.80	0.66	1.08	1.48	1.58	1.68	1.69
U5	0:08:30		0.36	-0.25	-0.04	0.25	0.60	0.64	2.52	1.70	0.58	1.01	1.41	1.51	1.61	1.62
U5	0:09:00		0.36	0.00	-0.07	-0.50	0.56	0.57	2.27	1.26	0.51	0.94	1.33	1.54	1.57	1.58
U5	0:09:30		0.32	0.00	-0.07	-0.50	0.53	0.53	2.27	1.12	0.44	0.86	1.41	1.43	1.50	1.55
U5	0:10:00		0.29	0.00	-0.18	-0.54	0.49	0.50	2.13	1.41	0.40	0.79	1.19	1.36	1.43	1.48
U5	0:10:30		0.25	-0.04	-0.07	0.18	0.46	0.46	2.02	1.33	0.33	0.72	1.30	1.29	1.39	1.44
U5	0:11:00		0.25	-0.04	-0.07	-0.58	0.42	0.39	1.88	0.76	0.29	0.65	1.08	1.21	1.32	1.01
U5	0:11:30		0.21	-0.04	-0.18	0.11	0.35	0.39	1.73	1.19	0.25	0.61	1.19	1.14	1.28	1.40
U5	0:12:00		0.00	-0.04	-0.04	0.11	0.53	0.39	1.66	0.51	0.76	0.50	0.97	0.92	1.18	1.37
U5	0:12:30		-0.04	-0.04	0.11	0.00	0.18	0.36	1.55	1.05	0.15	0.47	1.01	0.95	1.04	0.90
U5	0:13:00		-0.04	-0.04	-0.04	-0.58	0.04	0.39	1.44	0.97	0.73	0.40	0.90	0.84	1.00	0.86
U5	0:13:30		0.18	-0.18	-0.11	-0.61	0.14	0.36	1.41	0.87	0.69	0.40	0.97	0.77	1.11	0.83
U5	0:14:00		0.14	-0.14	-0.18	-0.61	0.25	0.21	1.33	0.22	0.58	0.36	0.94	0.84	1.07	1.26
U5	0:14:30		0.14	-0.07	-0.11	-0.65	0.25	0.21	1.23	0.07	0.00	0.32	0.76	0.81	1.00	0.76
U5	0:15:00		0.11	-0.07	-0.11	-0.65	0.25	0.18	1.19	0.04	-0.04	0.25	0.72	0.73	0.96	1.22
U5	0:15:30		0.11	-0.07	-0.11	-0.65	0.21	0.14	1.08	-0.04	-0.07	0.25	0.68	0.70	0.93	1.19
U5	0:16:00		0.07	-0.32	-0.22	-0.68	0.21	0.14	1.01	0.69	-0.07	0.18	0.76	0.66	0.89	1.19
U5	0:16:30		0.07	-0.32	-0.22	-0.68	0.18	0.11	0.94	0.65	-0.11	0.18	0.61	0.62	0.86	1.15
U5	0:17:00		0.07	-0.32	-0.11	-0.68	0.18	0.11	0.90	-0.22	-0.15	0.14	0.58	0.55	0.82	1.12
U5	0:17:30		0.04	-0.32	-0.11	-0.65	0.14	0.11	0.83	-0.25	-0.18	0.04	0.54	0.51	0.79	1.12
U5	0:18:00		0.04	-0.32	-0.11	-0.68	0.14	0.11	0.76	-0.32	-0.22	0.07	0.50	0.48	0.75	1.12
U5	0:18:30		0.04	-0.32	-0.11	-0.72	0.14	0.04	0.83	-0.36	-0.22	0.04	0.47	0.44	0.71	0.50
U5	0:19:00		0.04	-0.07	-0.11	-0.04	0.14	0.00	0.65	0.43	-0.25	0.00	0.43	0.40	0.68	1.04
U5	0:19:30		0.04	-0.32	-0.11	-0.72	0.11	0.04	0.58	-0.47	-0.29	-0.04	0.40	0.37	0.68	1.01
U5	0:20:00		0.00	-0.32	-0.11	-0.68	0.11	0.04	0.69	-0.51	-0.33	-0.04	0.40	0.33	0.61	1.04
U5	0:20:30		0.00	-0.32	-0.11	-0.72	0.07	-0.04	0.50	-0.54	-0.33	-0.07	0.36	0.33	0.61	1.04
U5	0:21:00		0.00	-0.07	-0.11	-0.72	0.07	0.00	0.47	-0.58	-0.36	-0.07	0.36	0.29	0.57	1.01
U5	0:21:30		0.00	-0.32	-0.11	-0.68	0.07	0.00	0.43	-0.58	-0.36	-0.14	0.32	0.26	0.57	1.01
U5	0:22:00		0.00	-0.07	-0.18	-0.72	0.07	-0.07	0.40	0.25	-0.36	-0.11	0.40	0.26	0.57	1.01
U5	0:22:30		0.00	-0.32	-0.07	-0.04	0.07	-0.07	0.36	0.22	-0.40	-0.11	0.36	0.26	0.54	1.01
U5	0:23:00		-0.04	-0.07	-0.07	-0.04	0.04	-0.07	0.32	0.22	-0.40	-0.11	0.29	0.26	0.50	1.01
U5	0:23:30		0.00	-0.32	-0.07	-0.72	0.07	-0.07	0.32	-0.69	-0.40	-0.22	0.25	0.22	0.46	1.01
U5	0:24:00		-0.04	-0.32	-0.07	-0.72	0.07	-0.11	0.47	-0.72	-0.44	-0.14	0.25	0.18	0.50	0.97
U5	0:24:30		-0.04	-0.32	-0.07	-0.72	0.07	-0.11	0.25	-0.72	-0.47	-0.14	0.22	0.18	0.43	0.94
U5	0:25:00		-0.04	-0.07	-0.07	-0.04	0.07	-0.11	0.25	0.14	-0.44	-0.14	0.29	0.18	0.46	0.94
U5	0:25:30		-0.04	-0.29	-0.07	-0.72	0.04	0.07	0.22	-0.76	-0.44	-0.22	0.22	0.11	0.43	0.97
U5	0:26:00		-0.04	-0.32	-0.07	-0.68	0.07	-0.07	0.40	-0.76	-0.47	-0.14	0.18	0.15	0.43	0.29
U5	0:26:30		-0.04	-0.32	-0.15	-0.72	0.04	-0.07	0.40	0.11	-0.47	-0.18	0.18	0.15	0.43	0.94
U5	0:27:00		-0.04	-0.07	-0.15	-0.76	0.07	-0.11	0.36	0.11	-0.47	-0.18	0.18	0.15	0.39	0.94
U5	0:27:30		-0.04	-0.29	-0.04	-0.72	0.07	-0.11	0.18	-0.79	-0.47	-0.14	0.18	0.15	0.36	0.97
U5	0:28:00		-0.04	-0.04	-0.04	-0.72	0.04	-0.11	0.36	0.07	-0.51	-0.14	0.14	0.15	0.36	0.94

Table E.2 Calculated Strain, Shaft 2 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
U5	0:28:30		-0.04	-0.29	-0.04	-0.72	0.04	-0.11	0.14	-0.79	-0.47	-0.18	0.14	0.15	0.36	0.90
U5	0:29:00		-0.04	-0.29	-0.04	-0.72	0.07	-0.11	0.14	-0.79	-0.51	-0.22	0.22	0.22	0.32	0.25
U5	0:29:30		-0.18	-0.04	-0.11	-0.79	-0.21	-0.11	0.32	-0.79	-0.07	-0.14	0.22	0.22	0.32	0.22
U5	0:30:00		-0.21	-0.29	-0.04	-0.79	0.25	0.04	0.32	0.04	-0.55	-0.14	0.14	0.15	0.32	0.22
U5	0:30:30		-0.04	-0.04	-0.04	0.00	-0.07	-0.07	0.25	-0.87	-0.76	-0.22	0.11	-0.07	0.21	0.22
U5	0:31:00		-0.04	0.00	-0.04	0.00	0.07	-0.11	0.11	0.07	-0.51	-0.14	0.11	0.11	0.29	0.90
U5	0:31:30		-0.04	0.00	-0.04	-0.65	0.07	-0.07	0.11	-0.83	-0.51	-0.22	0.18	0.18	0.29	0.90
U5	0:32:00		-0.04	-0.25	0.00	-0.65	0.07	-0.07	0.11	-0.83	-0.51	-0.14	0.18	0.18	0.29	0.90
U5	0:32:30		-0.04	-0.25	0.00	-0.68	0.07	-0.11	0.07	-0.83	-0.51	-0.14	0.07	0.07	0.29	0.90
U5	0:33:00		-0.04	0.00	0.00	-0.72	0.07	-0.11	0.07	-0.83	-0.55	-0.14	0.07	0.11	0.25	0.90
U5	0:33:30		-0.04	0.00	0.00	-0.68	0.07	-0.11	0.29	-0.83	-0.51	-0.14	0.14	0.07	0.25	0.90
U5	0:34:00		-0.04	-0.11	0.00	-0.68	0.07	-0.11	0.07	0.04	-0.55	-0.14	0.07	0.07	0.25	0.86
U5	0:34:30		-0.04	0.00	0.00	-0.68	0.07	-0.11	0.07	-0.83	-0.51	-0.14	0.07	0.07	0.21	0.86
U5	0:35:00		-0.04	-0.25	0.00	-0.68	0.07	-0.11	0.07	-0.83	-0.55	-0.14	0.11	0.11	0.18	0.86
U5	0:35:30		0.00	-0.25	0.00	-0.68	0.11	-0.04	0.07	-0.83	-0.51	-0.11	0.04	0.04	0.21	0.86
U5	0:36:00		0.00	-0.21	0.00	-0.61	0.11	-0.07	0.29	-0.83	-0.51	-0.11	0.04	0.07	0.18	0.86
U5	0:36:30		0.00	0.04	-0.07	-0.61	0.11	-0.11	0.07	0.04	-0.55	-0.11	0.04	0.07	0.21	0.86
U5	0:37:00		0.00	0.04	0.00	-0.68	0.11	-0.11	0.07	-0.83	-0.55	-0.11	0.04	0.07	0.21	0.86
U5	0:37:30		0.00	0.04	0.04	-0.61	0.11	-0.04	0.07	-0.83	-0.55	-0.18	0.11	0.15	0.18	0.83
U5	0:38:00		0.00	0.04	0.04	-0.61	0.11	-0.04	0.07	-0.87	-0.55	-0.11	0.07	0.11	0.14	0.83
U5	0:38:30		0.00	-0.21	0.04	-0.65	0.11	-0.04	0.07	-0.87	-0.55	-0.11	0.00	0.07	0.14	0.83
U5	0:39:00		0.00	0.04	0.04	-0.65	0.11	-0.11	0.07	-0.87	-0.55	-0.11	0.00	0.04	0.14	0.83
U5	0:39:30		0.00	0.04	0.04	-0.65	0.11	-0.11	0.25	-0.87	-0.55	-0.11	0.00	0.04	0.14	0.83
U5	0:40:00		0.00	-0.18	0.04	-0.65	0.11	-0.11	0.04	-0.87	-0.51	-0.11	0.00	0.04	0.14	0.83
U5	0:40:30		0.00	-0.21	0.04	-0.65	0.11	-0.11	0.04	-0.87	-0.51	-0.07	0.04	0.07	0.14	0.83
U5	0:41:00		0.00	-0.04	0.04	-0.65	0.11	-0.07	0.04	-0.87	-0.51	-0.07	0.04	0.07	0.11	0.83
U5	0:41:30		0.00	-0.21	0.04	-0.61	0.11	-0.04	0.04	-0.87	-0.51	-0.14	0.00	0.04	0.11	0.83
U5	0:42:00		0.00	0.07	0.04	-0.61	0.11	-0.04	0.04	-0.87	-0.51	-0.07	-0.04	0.00	0.11	0.79
U5	0:42:30		0.00	0.07	-0.04	0.07	0.11	-0.11	0.04	0.04	-0.51	-0.07	-0.04	0.00	0.11	0.79
U5	0:43:00		0.00	0.07	0.04	-0.61	0.14	-0.11	0.25	-0.87	-0.55	-0.07	-0.04	0.04	0.07	0.83
U5	0:43:30		0.00	-0.18	0.04	-0.61	0.11	-0.04	0.04	-0.87	-0.51	-0.04	-0.04	0.04	0.07	0.83
U5	0:44:00		0.00	-0.18	0.07	-0.58	0.14	-0.04	0.22	-0.87	-0.51	-0.04	0.00	0.07	0.07	0.07
U5	0:44:30		0.00	-0.18	0.07	-0.61	0.11	-0.07	0.04	-0.87	-0.51	-0.04	-0.04	0.00	0.07	0.79
U5	0:45:00		0.00	0.07	0.07	-0.61	0.14	-0.07	0.04	-0.87	-0.51	-0.04	-0.04	0.00	0.07	0.79
U5	0:45:30		0.00	0.07	0.07	-0.61	0.14	-0.07	0.00	-0.87	-0.51	-0.04	-0.04	0.00	0.07	0.79
U5	0:46:00		0.00	-0.18	0.07	-0.58	0.14	-0.04	0.25	-0.87	-0.55	-0.04	-0.07	0.00	0.04	0.79
U5	0:46:30		0.00	-0.18	0.00	-0.61	0.14	-0.07	0.22	-0.87	-0.51	-0.04	-0.07	0.00	0.04	0.79
U5	0:47:00		0.00	0.11	0.07	-0.61	0.14	-0.07	0.25	0.04	-0.51	-0.04	-0.07	0.00	0.04	0.76
U5	0:47:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table E.3 Calculated Strain, 4 Minute Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L0	0:00:00		-10.45	-9.17	-6.40	-16.36	-14.43	-22.56	-51.32	-43.91	-29.57	-32.04	-23.79	-36.98	-16.85	-27.01
L1	0:04:00		-9.55	-8.27	-4.90	-15.03	-12.33	-20.49	-45.62	-39.33	-23.93	-25.26	-12.44	-24.16	-2.61	-15.20
L2	0:04:00		-8.05	-6.73	-3.00	-13.37	-8.86	-17.61	-36.96	-32.36	-16.79	-17.34	-1.80	-12.15	10.81	-4.29
L3	0:04:00		-5.04	-5.01	0.66	-9.98	-4.13	-12.69	-22.29	-18.72	-7.54	-6.16	11.68	1.40	27.66	8.97
L4	0:04:00		-1.40	-3.44	4.83	-6.92	1.72	-7.20	-6.89	-5.09	1.09	4.65	25.66	13.88	44.54	20.71
L5	0:04:00		2.43	-2.22	8.53	-4.54	6.69	-1.64	6.78	7.43	8.16	14.78	39.94	25.89	60.21	31.98
L6	0:04:00		5.22	-1.61	10.76	-2.20	10.19	1.85	17.13	18.90	15.88	22.92	52.55	37.60	76.35	44.08
L6	0:08:00		5.33	-1.61	10.94	-2.63	10.58	2.10	17.71	19.70	16.21	23.61	53.60	38.08	77.17	44.66
L7	0:04:00		6.19	-1.40	11.75	-1.48	11.84	3.74	21.35	24.10	18.54	26.96	58.72	42.63	84.45	51.28
L8	0:04:00		6.90	-1.29	12.59	-0.90	13.20	5.52	24.85	28.61	21.56	29.91	64.27	48.32	89.62	56.07
L8	0:08:00		7.05	-1.22	12.59	-0.83	13.24	5.77	25.06	29.26	22.40	30.49	65.10	48.91	91.16	56.83
L9	0:04:00		7.62	-0.97	13.25	-0.76	14.29	7.06	28.42	33.30	24.55	33.37	70.50	54.75	97.55	62.88
L10	0:04:00		8.12	-0.72	13.87	0.11	15.37	8.84	31.77	37.49	26.84	36.44	74.47	60.30	102.69	70.44
L11	0:04:00		8.59	-0.43	14.27	1.30	16.14	10.19	34.15	41.45	28.70	39.46	78.33	66.61	107.18	77.07
L12	0:04:00		9.05	0.00	14.57	2.59	17.05	13.26	36.68	45.78	30.66	42.82	81.53	72.49	113.86	86.47
L13	0:04:00		9.52	0.25	15.04	3.71	18.07	15.54	39.74	50.44	32.99	46.20	85.97	79.98	119.71	93.02
L14	0:04:00		9.98	0.64	15.41	4.72	18.84	17.32	42.81	55.02	35.00	49.52	89.32	86.81	124.10	103.21
L14	0:08:00		9.98	0.79	15.37	4.83	18.35	17.57	42.88	55.70	35.07	49.56	89.07	88.09	123.57	102.89
L15	0:04:00		10.59	1.15	15.88	5.84	19.30	19.64	44.93	60.50	36.86	53.23	92.31	95.62	128.74	111.68
L16	0:04:00		10.77	1.58	16.14	6.63	20.63	21.92	47.68	64.47	38.49	56.62	94.47	103.30	133.24	121.44
L16	0:08:00		10.73	1.65	15.92	6.77	20.10	22.06	48.04	65.30	38.60	57.38	94.51	104.99	134.09	122.52
L17	0:04:00		11.09	2.36	16.14	7.39	21.19	24.70	50.45	69.20	41.04	59.86	99.09	110.60	140.91	127.92
L18	0:04:00		11.84	3.01	15.99	8.47	22.80	26.13	54.13	72.59	44.47	61.63	105.58	117.10	150.41	135.48
L19	0:04:00		11.70	3.58	15.48	9.01	22.80	28.37	57.92	73.49	47.89	61.16	112.68	119.09	160.04	138.43
L19	0:08:00		11.95	3.58	15.37	9.15	23.15	28.98	59.68	73.85	49.31	61.20	115.31	119.64	163.08	139.19
L20	0:04:00		12.59	4.48	14.49	10.92	23.22	30.72	62.86	73.96	53.94	59.68	123.49	121.62	171.96	143.12
L21	0:04:00		12.38	5.16	12.66	12.76	22.97	27.69	65.96	67.61	58.60	51.97	124.18	120.30	175.50	142.68
U1	0:03:00		11.77	4.73	12.15	12.40	22.38	25.98	64.81	66.28	54.66	50.21	118.88	114.86	167.25	135.01
U2	0:02:30		10.55	4.48	10.58	10.70	19.82	24.59	59.76	62.41	49.02	44.29	96.56	93.57	125.03	105.23
U3	0:03:00		8.73	3.80	8.64	8.65	15.55	20.35	51.97	52.93	39.00	35.21	61.64	62.87	71.13	64.32
U4	0:03:00		1.61	0.36	0.81	1.41	2.21	3.42	9.38	8.51	5.72	5.23	5.59	6.61	5.10	5.62
U5	0:03:00		0.79	0.18	0.11	0.61	1.16	1.46	4.76	3.68	1.68	2.23	2.60	2.94	2.36	2.48
U5	0:06:00		0.36	-0.18	0.00	-0.36	0.81	0.96	3.35	2.35	0.95	1.44	1.80	2.13	1.93	1.91
U5	0:12:00		0.00	-0.04	-0.04	0.11	0.53	0.39	1.66	0.51	0.76	0.50	0.97	0.92	1.18	1.37
U5	0:24:00		-0.04	-0.32	-0.07	-0.72	0.07	-0.11	0.47	-0.72	-0.44	-0.14	0.25	0.18	0.50	0.97
U5	0:47:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table E.4 Average Calculated Strain, 4 Minute Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev. +46.30	Elev. +24.40	Elev. +14.40	Elev. +4.40	Elev. -5.60	Elev. -15.60	Elev. -27.60	Elev. -32.60	Elev. -38.6
L0	0:00:00	0.00	-9.81	-11.38	-18.49	-24.65	-30.81	-30.38	-21.93	0.00
L1	0:04:00	0.00	-8.91	-9.97	-16.41	-20.50	-24.60	-18.30	-8.90	17.65
L2	0:04:00	0.00	-7.39	-8.19	-13.23	-15.15	-17.06	-6.98	3.26	33.02
L3	0:04:00	0.00	-5.03	-4.66	-8.41	-7.63	-6.85	6.54	18.31	50.89
L4	0:04:00	0.00	-2.42	-1.04	-2.74	0.06	2.87	19.77	32.63	69.51
L5	0:04:00	0.00	0.11	1.99	2.52	7.00	11.47	32.91	46.10	86.08
L6	0:04:00	0.00	1.81	4.28	6.02	12.71	19.40	45.08	60.21	105.90
L6	0:08:00	0.00	1.86	4.16	6.34	13.12	19.91	45.84	60.91	106.70
L7	0:04:00	0.00	2.40	5.14	7.79	15.27	22.75	50.68	67.86	114.35
L8	0:04:00	0.00	2.81	5.84	9.36	17.55	25.74	56.30	72.85	123.15
L8	0:08:00	0.00	2.91	5.88	9.51	17.97	26.44	57.00	73.99	124.18
L9	0:04:00	0.00	3.33	6.25	10.67	19.82	28.96	62.63	80.21	132.75
L10	0:04:00	0.00	3.70	6.99	12.11	21.87	31.64	67.38	86.56	141.02
L11	0:04:00	0.00	4.08	7.79	13.17	23.62	34.08	72.47	92.13	149.47
L12	0:04:00	0.00	4.53	8.58	15.16	25.95	36.74	77.01	100.16	158.38
L13	0:04:00	0.00	4.88	9.38	16.81	28.20	39.60	82.97	106.37	168.39
L14	0:04:00	0.00	5.31	10.06	18.08	30.17	42.26	88.06	113.66	177.18
L14	0:08:00	0.00	5.38	10.10	17.96	30.14	42.31	88.58	113.23	177.24
L15	0:04:00	0.00	5.87	10.86	19.47	32.26	45.04	93.97	120.21	184.61
L16	0:04:00	0.00	6.17	11.39	21.27	34.42	47.56	98.89	127.34	194.83
L16	0:08:00	0.00	6.19	11.35	21.08	34.54	47.99	99.75	128.31	195.92
L17	0:04:00	0.00	6.73	11.76	22.94	36.70	50.45	104.85	134.42	203.23
L18	0:04:00	0.00	7.42	12.23	24.46	38.76	53.05	111.34	142.94	213.47
L19	0:04:00	0.00	7.64	12.24	25.58	40.06	54.53	115.88	149.24	219.40
L19	0:08:00	0.00	7.76	12.26	26.06	40.66	55.25	117.47	151.13	221.91
L20	0:04:00	0.00	8.53	12.71	26.97	41.89	56.81	122.56	157.54	231.11
L21	0:04:00	0.00	8.77	12.71	25.33	40.31	55.28	122.24	159.09	230.94
U1	0:03:00	0.00	8.25	12.27	24.18	38.31	52.43	116.87	151.13	212.54
U2	0:02:30	0.00	7.52	10.64	22.21	34.43	46.66	95.06	115.13	141.60
U3	0:03:00	0.00	6.26	8.64	17.95	27.53	37.11	62.25	67.73	73.23
U4	0:03:00	0.00	0.98	1.11	2.81	4.14	5.47	6.10	5.36	1.60
U5	0:03:00	0.00	0.48	0.36	1.31	1.63	1.95	2.77	2.42	0.00
U5	0:06:00	0.00	0.09	-0.18	0.88	1.04	1.19	1.97	1.92	0.00
U5	0:12:00	0.00	-0.02	0.04	0.46	0.55	0.63	0.95	1.27	0.00
U5	0:24:00	0.00	-0.18	-0.40	-0.02	-0.15	-0.29	0.22	0.74	0.00
U5	0:47:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Ground Surface
Top of Rock
Top of Bottom Ocell

Note: Measured strain at Elev. -5.60 reflects an unknown shaft defect and is replaced by interpolation.

Table E.5 Shaft Load, 4 Minute Readings, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Shaft Load, tons								
		Elev. 46.30	Elev. 24.40	Elev. 14.40	Elev. 4.40	Elev. -5.60	Elev. -15.60	Elev. -27.60	Elev. -32.60	Elev. -38.60
L0	0:00:00	0.0	-84.8	-98.4	-159.9	-213.1	-266.0	-261.9	-189.0	0.0
L1	0:04:00	0.0	-77.0	-86.1	-141.9	-177.2	-212.4	-157.8	-76.7	152.2
L2	0:04:00	0.0	-63.9	-70.8	-114.4	-130.9	-147.4	-60.2	28.1	284.6
L3	0:04:00	0.0	-43.5	-40.3	-72.7	-66.0	-59.2	56.4	157.9	438.7
L4	0:04:00	0.0	-20.9	-9.0	-23.7	0.6	24.8	170.5	281.3	599.3
L5	0:04:00	0.0	0.9	17.2	21.8	60.5	99.0	283.7	397.4	742.1
L6	0:04:00	0.0	15.6	37.0	52.1	109.9	167.5	388.6	519.1	913.0
L6	0:08:00	0.0	16.1	35.9	54.8	113.4	171.9	395.2	525.1	919.8
L7	0:04:00	0.0	20.7	44.4	67.3	132.0	196.5	436.9	585.1	985.8
L8	0:04:00	0.0	24.3	50.5	80.9	151.7	222.3	485.3	628.0	1061.7
L8	0:08:00	0.0	25.2	50.8	82.2	155.4	228.4	491.4	637.9	1070.6
L9	0:04:00	0.0	28.8	54.0	92.3	171.3	250.1	539.9	691.5	1144.4
L10	0:04:00	0.0	32.0	60.4	104.7	189.1	273.2	580.9	746.3	1215.7
L11	0:04:00	0.0	35.3	67.3	113.8	204.2	294.3	624.8	794.2	1288.6
L12	0:04:00	0.0	39.1	74.2	131.0	224.3	317.3	663.9	863.5	1365.4
L13	0:04:00	0.0	42.2	81.1	145.3	243.8	342.0	715.3	917.0	1451.6
L14	0:04:00	0.0	45.9	87.0	156.3	260.8	365.0	759.2	979.8	1527.5
L14	0:08:00	0.0	46.5	87.3	155.3	260.5	365.4	763.7	976.1	1527.9
L15	0:04:00	0.0	50.7	93.9	168.3	278.8	389.0	810.1	1036.3	1591.6
L16	0:04:00	0.0	53.4	98.4	183.9	297.5	410.7	852.5	1097.8	1679.7
L16	0:08:00	0.0	53.5	98.1	182.2	298.5	414.4	859.9	1106.1	1689.1
L17	0:04:00	0.0	58.1	101.7	198.3	317.2	435.7	903.9	1158.8	1752.0
L18	0:04:00	0.0	64.2	105.7	211.5	335.0	458.1	959.9	1232.3	1840.3
L19	0:04:00	0.0	66.0	105.9	221.2	346.3	470.9	999.0	1286.6	1891.4
L19	0:08:00	0.0	67.1	106.0	225.3	351.5	477.2	1012.7	1302.9	1913.1
L20	0:04:00	0.0	73.8	109.8	233.1	362.1	490.6	1056.5	1358.1	1992.4
L21	0:04:00	0.0	75.8	109.9	219.0	348.4	477.4	1053.8	1371.5	1990.9
U1	0:03:00	0.0	71.3	106.1	209.0	331.1	452.8	1007.5	1302.9	1832.3
U2	0:02:30	0.0	65.0	92.0	192.0	297.6	402.9	819.6	992.5	1220.7
U3	0:03:00	0.0	54.1	74.7	155.2	238.0	320.5	536.7	583.9	631.3
U4	0:03:00	0.0	8.5	9.6	24.3	35.8	47.3	52.6	46.2	13.8
U5	0:03:00	0.0	4.2	3.1	11.3	14.1	16.9	23.8	20.9	0.0
U5	0:06:00	0.0	0.8	-1.6	7.6	9.0	10.3	16.9	16.5	0.0
U5	0:12:00	0.0	-0.2	0.3	4.0	4.7	5.5	8.2	11.0	0.0
U5	0:24:00	0.0	-1.5	-3.4	-0.2	-1.3	-2.5	1.9	6.3	0.0
U5	0:47:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Modulus, ksi		3998	3998	3998	3998	3998	3994	3987	3987	3987
Diameter, in		74.20	74.20	74.20	74.20	74.20	74.20	74.20	74.20	74.20
		Top of Shaft			Top of Rock			Top Bottom Ocell		

Table E.6 Average Segment Side Shear, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf								
		CL Elev., ft	+35.35	+19.40	+9.40	-0.60	-10.60	-21.60	-30.10	-35.60
		Length, ft	21.90	10.00	10.00	10.00	10.00	12.00	5.00	6.00
L0	0:00:00		-0.27	-0.14	-0.38	-0.34	-0.34	-0.05	0.68	1.55
L1	0:04:00		-0.25	-0.11	-0.35	-0.25	-0.25	0.17	0.77	1.90
L2	0:04:00		-0.22	-0.10	-0.29	-0.15	-0.15	0.31	0.84	2.13
L3	0:04:00		-0.17	-0.05	-0.23	-0.03	-0.03	0.43	0.98	2.34
L4	0:04:00		-0.12	-0.01	-0.14	0.06	0.06	0.56	1.07	2.66
L5	0:04:00		-0.07	0.02	-0.04	0.13	0.13	0.72	1.10	2.89
L6	0:04:00		-0.03	0.04	0.01	0.23	0.23	0.88	1.28	3.31
L6	0:08:00		-0.03	0.03	0.03	0.23	0.23	0.89	1.27	3.32
L7	0:04:00		-0.02	0.05	0.05	0.27	0.26	0.96	1.46	3.37
L8	0:04:00		-0.01	0.07	0.09	0.30	0.30	1.06	1.40	3.65
L8	0:08:00		-0.01	0.06	0.09	0.31	0.31	1.06	1.44	3.64
L9	0:04:00		0.00	0.06	0.13	0.34	0.34	1.18	1.49	3.82
L10	0:04:00		0.01	0.08	0.16	0.37	0.37	1.25	1.63	3.96
L11	0:04:00		0.02	0.10	0.17	0.40	0.40	1.35	1.68	4.17
L12	0:04:00		0.02	0.11	0.22	0.41	0.41	1.42	1.99	4.24
L13	0:04:00		0.03	0.13	0.26	0.44	0.44	1.53	2.01	4.52
L14	0:04:00		0.04	0.14	0.29	0.47	0.47	1.62	2.20	4.63
L14	0:08:00		0.04	0.14	0.28	0.47	0.47	1.64	2.12	4.67
L15	0:04:00		0.05	0.15	0.32	0.50	0.50	1.74	2.26	4.70
L16	0:04:00		0.06	0.16	0.37	0.52	0.52	1.83	2.46	4.92
L16	0:08:00		0.06	0.16	0.37	0.53	0.53	1.84	2.47	4.93
L17	0:04:00		0.07	0.16	0.43	0.54	0.54	1.94	2.56	5.02
L18	0:04:00		0.08	0.15	0.48	0.57	0.57	2.08	2.74	5.15
L19	0:04:00		0.09	0.14	0.53	0.58	0.57	2.20	2.89	5.12
L19	0:08:00		0.09	0.13	0.55	0.58	0.58	2.23	2.92	5.17
L20	0:04:00		0.11	0.12	0.57	0.60	0.59	2.36	3.04	5.37
L21	0:04:00		0.11	0.11	0.49	0.60	0.60	2.40	3.20	5.25
U1	0:03:00		0.10	0.11	0.46	0.56	0.56	2.31	2.97	4.47
U2	0:02:30		0.08	0.07	0.45	0.48	0.47	1.72	1.71	1.89
U3	0:03:00		0.06	0.04	0.35	0.36	0.36	0.86	0.42	0.34
U4	0:03:00		-0.05	-0.06	0.01	-0.01	-0.01	-0.04	-0.13	-0.35
U5	0:03:00		-0.06	-0.07	-0.03	-0.05	-0.05	-0.04	-0.10	-0.25
U5	0:06:00		-0.07	-0.08	-0.02	-0.06	-0.06	-0.04	-0.07	-0.21
U5	0:12:00		-0.07	-0.07	-0.05	-0.06	-0.06	-0.06	-0.04	-0.16
U5	0:24:00		-0.07	-0.08	-0.05	-0.07	-0.07	-0.05	-0.02	-0.12
U5	0:47:30		-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
Segment Wt., tons			28.80	13.15	13.15	13.15	13.15	15.78	6.58	7.89
Maximum Shear, tsf			0.11	0.16	0.57	0.60	0.60	2.40	3.20	5.37

Table E.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 2 -1996

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain									Shaft Compression				
		CL Elev., ft	+35.35	+19.40	+9.40	-0.60	-10.60	-21.60	-30.10	-35.60	Strain Gage		TT in	Error in	Error %
		Length, ft	+21.90	+10.00	+10.00	+10.00	+10.00	+12.00	+5.00	+6.00	Net, in	Change, in			
L0	0:00:00		-4.90	-10.59	-14.94	-21.57	-27.73	-30.59	-26.16	-10.96	-0.0170	0.0000	0.0000	0.0000	
L1	0:04:00		-4.46	-9.44	-13.19	-18.46	-22.55	-21.45	-13.60	4.37	-0.0124	0.0046	0.0006	0.0040	617.4%
L2	0:04:00		-3.70	-7.79	-10.71	-14.19	-16.11	-12.02	-1.86	18.14	-0.0074	0.0097	0.0040	0.0057	143.4%
L3	0:04:00		-2.51	-4.85	-6.54	-8.02	-7.24	-0.16	12.43	34.60	-0.0006	0.0164	0.0084	0.0080	94.3%
L4	0:04:00		-1.21	-1.73	-1.89	-1.34	1.47	11.32	26.20	51.07	0.0061	0.0232	0.0143	0.0088	61.8%
L5	0:04:00		0.05	1.05	2.26	4.76	9.23	22.19	39.50	66.09	0.0124	0.0294	0.0203	0.0092	45.1%
L6	0:04:00		0.90	3.04	5.15	9.37	16.06	32.24	52.65	83.06	0.0181	0.0351	0.0252	0.0099	39.1%
L6	0:08:00		0.93	3.01	5.25	9.73	16.51	32.87	53.38	83.80	0.0184	0.0354	0.0252	0.0102	40.2%
L7	0:04:00		1.20	3.77	6.46	11.53	19.01	36.71	59.27	91.11	0.0206	0.0376	0.0273	0.0104	38.0%
L8	0:04:00		1.40	4.33	7.60	13.46	21.64	41.02	64.57	98.00	0.0228	0.0399	0.0296	0.0103	34.9%
L8	0:08:00		1.46	4.40	7.69	13.74	22.21	41.72	65.50	99.09	0.0232	0.0403	0.0297	0.0106	35.5%
L9	0:04:00		1.66	4.79	8.46	15.24	24.39	45.79	71.42	106.48	0.0253	0.0424	0.0321	0.0102	31.9%
L10	0:04:00		1.85	5.35	9.55	16.99	26.76	49.51	76.97	113.79	0.0275	0.0445	0.0336	0.0109	32.6%
L11	0:04:00		2.04	5.93	10.48	18.40	28.85	53.27	82.30	120.80	0.0295	0.0465	0.0356	0.0109	30.7%
L12	0:04:00		2.26	6.55	11.87	20.55	31.34	56.88	88.59	129.27	0.0318	0.0489	0.0372	0.0117	31.5%
L13	0:04:00		2.44	7.13	13.09	22.50	33.90	61.29	94.67	137.38	0.0342	0.0513	0.0394	0.0119	30.1%
L14	0:04:00		2.66	7.69	14.07	24.13	36.21	65.16	100.86	145.42	0.0365	0.0535	0.0410	0.0125	30.4%
L14	0:08:00		2.69	7.74	14.03	24.05	36.23	65.45	100.90	145.23	0.0365	0.0535	0.0414	0.0121	29.3%
L15	0:04:00		2.93	8.36	15.16	25.86	38.65	69.51	107.09	152.41	0.0387	0.0558	0.0439	0.0119	27.0%
L16	0:04:00		3.09	8.78	16.33	27.84	40.99	73.22	113.11	161.09	0.0410	0.0580	0.0459	0.0121	26.3%
L16	0:08:00		3.09	8.77	16.21	27.81	41.26	73.87	114.03	162.11	0.0413	0.0583	0.0461	0.0122	26.5%
L17	0:04:00		3.36	9.25	17.35	29.82	43.58	77.65	119.63	168.82	0.0434	0.0604	0.0479	0.0125	26.2%
L18	0:04:00		3.71	9.83	18.35	31.61	45.90	82.19	127.14	178.20	0.0460	0.0630	0.0504	0.0126	25.1%
L19	0:04:00		3.82	9.94	18.91	32.82	47.29	85.20	132.56	184.32	0.0476	0.0646	0.0522	0.0124	23.7%
L19	0:08:00		3.88	10.01	19.16	33.36	47.96	86.36	134.30	186.52	0.0482	0.0652	0.0524	0.0128	24.4%
L20	0:04:00		4.27	10.62	19.84	34.43	49.35	89.68	140.05	194.32	0.0501	0.0672	0.0535	0.0136	25.5%
L21	0:04:00		4.38	10.74	19.02	32.82	47.80	88.76	140.66	195.01	0.0497	0.0667	0.0551	0.0115	20.9%
U1	0:03:00		4.12	10.26	18.23	31.24	45.37	84.65	134.00	181.84	0.0470	0.0641	0.0546	0.0094	17.2%
U2	0:02:30		3.76	9.08	16.42	28.32	40.54	70.86	105.10	128.36	0.0381	0.0551	0.0530	0.0021	3.9%
U3	0:03:00		3.13	7.45	13.30	22.74	32.32	49.68	64.99	70.48	0.0260	0.0431	0.0497	-0.0066	-13.3%
U4	0:03:00		0.49	1.04	1.96	3.48	4.81	5.79	5.73	3.48	0.0029	0.0199	0.0302	-0.0102	-33.9%
U5	0:03:00		0.24	0.42	0.83	1.47	1.79	2.36	2.59	1.21	0.0012	0.0182	0.0279	-0.0097	-34.6%
U5	0:06:00		0.04	-0.05	0.35	0.96	1.12	1.58	1.94	0.96	0.0007	0.0177	0.0271	-0.0094	-34.6%
U5	0:12:00		-0.01	0.01	0.25	0.50	0.59	0.79	1.11	0.64	0.0004	0.0174	0.0265	-0.0091	-34.2%
U5	0:24:00		-0.09	-0.29	-0.21	-0.09	-0.22	-0.04	0.48	0.37	-0.0001	0.0170	0.0259	-0.0089	-34.4%
U5	0:47:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0170	0.0253	-0.0082	-32.6%

Table E.8 Movement at Segment Centerline, Shaft 2 - 1996

Load Interval	Elapsed Time hhmmss	Segment Movement, in									Bot Cell	
		CL Elev., ft	+35.35	+19.40	+9.40	-0.60	-10.60	-21.60	-30.10	-35.60		-38.60
		Length, ft	21.90	10.00	10.00	10.00	10.00	12.00	5.00	6.00		
L0	0:00:00		0.0164	0.0151	0.0136	0.0114	0.0084	0.0046	0.0016	0.0004	0.0000	
L1	0:04:00		0.0177	0.0165	0.0151	0.0132	0.0108	0.0079	0.0059	0.0057	0.0054	
L2	0:04:00		0.0239	0.0230	0.0219	0.0204	0.0186	0.0167	0.0158	0.0164	0.0169	
L3	0:04:00		0.0344	0.0338	0.0331	0.0322	0.0313	0.0308	0.0312	0.0328	0.0366	
L4	0:04:00		0.0522	0.0519	0.0517	0.0515	0.0515	0.0524	0.0540	0.0567	0.0673	
L5	0:04:00		0.0906	0.0907	0.0909	0.0913	0.0921	0.0943	0.0971	0.1006	0.1209	
L6	0:04:00		0.1576	0.1579	0.1583	0.1592	0.1607	0.1640	0.1679	0.1725	0.2054	
L6	0:08:00		0.1559	0.1562	0.1567	0.1576	0.1591	0.1625	0.1665	0.1711	0.2128	
L7	0:04:00		0.1891	0.1895	0.1901	0.1912	0.1930	0.1968	0.2012	0.2063	0.2521	
L8	0:04:00		0.2333	0.2337	0.2344	0.2357	0.2378	0.2420	0.2469	0.2524	0.3060	
L8	0:08:00		0.2398	0.2402	0.2410	0.2422	0.2444	0.2487	0.2537	0.2592	0.3175	
L9	0:04:00		0.2806	0.2811	0.2819	0.2834	0.2857	0.2905	0.2959	0.3019	0.3652	
L10	0:04:00		0.3324	0.3329	0.3338	0.3354	0.3381	0.3432	0.3491	0.3555	0.4282	
L11	0:04:00		0.3852	0.3858	0.3868	0.3885	0.3914	0.3969	0.4033	0.4101	0.4925	
L12	0:04:00		0.4490	0.4497	0.4508	0.4528	0.4559	0.4619	0.4686	0.4759	0.5696	
L13	0:04:00		0.5185	0.5192	0.5204	0.5226	0.5260	0.5324	0.5397	0.5475	0.6540	
L14	0:04:00		0.5968	0.5976	0.5989	0.6012	0.6048	0.6117	0.6194	0.6276	0.7475	
L14	0:08:00		0.5944	0.5952	0.5965	0.5988	0.6024	0.6093	0.6170	0.6253	0.7520	
L15	0:04:00		0.6681	0.6690	0.6704	0.6729	0.6768	0.6841	0.6923	0.7010	0.8338	
L16	0:04:00		0.7792	0.7801	0.7816	0.7843	0.7884	0.7961	0.8048	0.8140	0.9613	
L16	0:08:00		0.7951	0.7961	0.7976	0.8002	0.8044	0.8122	0.8209	0.8301	0.9868	
L17	0:04:00		0.8788	0.8798	0.8814	0.8842	0.8886	0.8968	0.9060	0.9157	1.0799	
L18	0:04:00		1.0538	1.0549	1.0566	1.0596	1.0642	1.0729	1.0826	1.0928	1.2734	
L19	0:04:00		1.2321	1.2332	1.2350	1.2381	1.2429	1.2518	1.2619	1.2726	1.4696	
L19	0:08:00		1.2778	1.2789	1.2806	1.2838	1.2887	1.2978	1.3080	1.3188	1.5250	
L20	0:04:00		1.5096	1.5108	1.5127	1.5159	1.5209	1.5304	1.5410	1.5522	1.7697	
L21	0:04:00		2.0991	2.1003	2.1021	2.1052	2.1100	2.1193	2.1299	2.1411	2.3685	
U1	0:03:00		2.1187	2.1199	2.1216	2.1246	2.1292	2.1380	2.1481	2.1587	2.3714	
U2	0:02:30		2.1949	2.1959	2.1975	2.2001	2.2043	2.2118	2.2201	2.2278	2.3679	
U3	0:03:00		2.2731	2.2739	2.2752	2.2773	2.2806	2.2862	2.2917	2.2962	2.3504	
U4	0:03:00		2.1940	2.1942	2.1944	2.1947	2.1952	2.1959	2.1965	2.1968	2.1982	
U5	0:03:00		2.1746	2.1746	2.1747	2.1749	2.1751	2.1753	2.1756	2.1757	2.1757	
U5	0:06:00		2.1656	2.1656	2.1656	2.1657	2.1658	2.1660	2.1662	2.1663	2.1663	
U5	0:12:00		2.1558	2.1558	2.1558	2.1559	2.1559	2.1560	2.1561	2.1562	2.1562	
U5	0:24:00		2.1469	2.1469	2.1468	2.1468	2.1468	2.1468	2.1468	2.1468	2.1468	
U5	0:47:30		2.1422	2.1422	2.1422	2.1422	2.1422	2.1422	2.1422	2.1422	2.1422	

Table E.9 Section Properties, Shaft 2 - 1996

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	22	1.561	34.352
3/4" Galvanized Steel Telltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			38.296

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.586
Area of Pipe =			28.354

201

Concrete Modulus 3800 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
+46.30	74.2	4324.12	38.30	28.35	4257.47	3998.26	4PVC pipe, 4hose
+0.50	74.2	4324.12	38.30	28.35	4257.47	3998.26	4PVC pipe, 4hose
-8.70	74.2	4324.12	37.63	28.35	4258.14	3994.38	4PVC pipe, 4hose
-16.00	74.2	4324.12	37.63	28.35	4258.14	3994.38	4PVC pipe, 4hose
-23.60	74.2	4324.12	36.30	27.47	4260.35	3987.40	4PVC pipe, 2hose
-38.60	74.2	4324.12	34.97	26.59	4262.57	3980.41	4PVC pipe, 0hose

Figure E.1 Shaft Top VW Strain, Shaft 2 - 1996

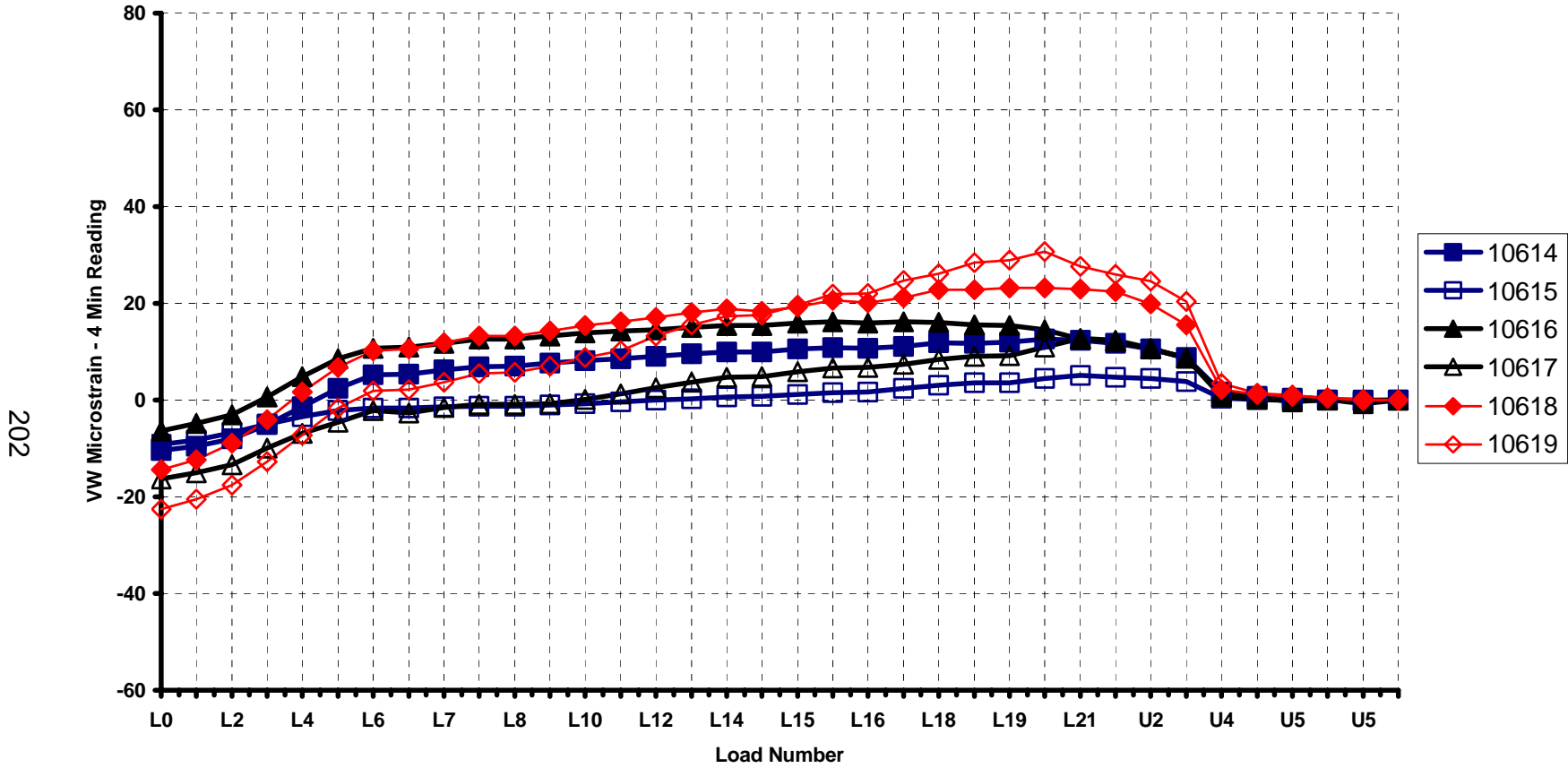


Figure E.2 Shaft Middle VW Strain, Shaft 2 - 1996

203

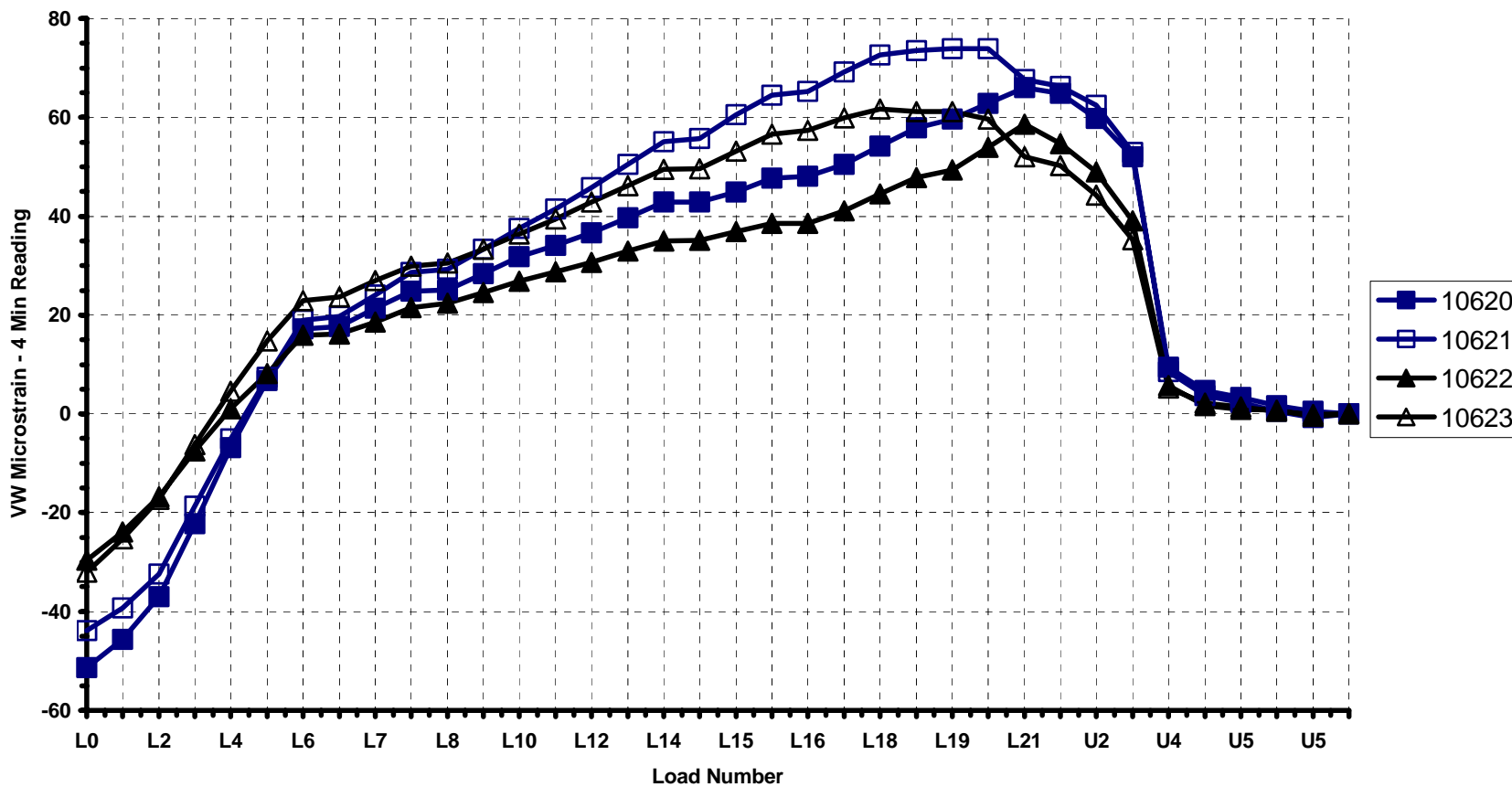


Figure E.3 Shaft Bottom VW Strain, Shaft 2 - 1996

204

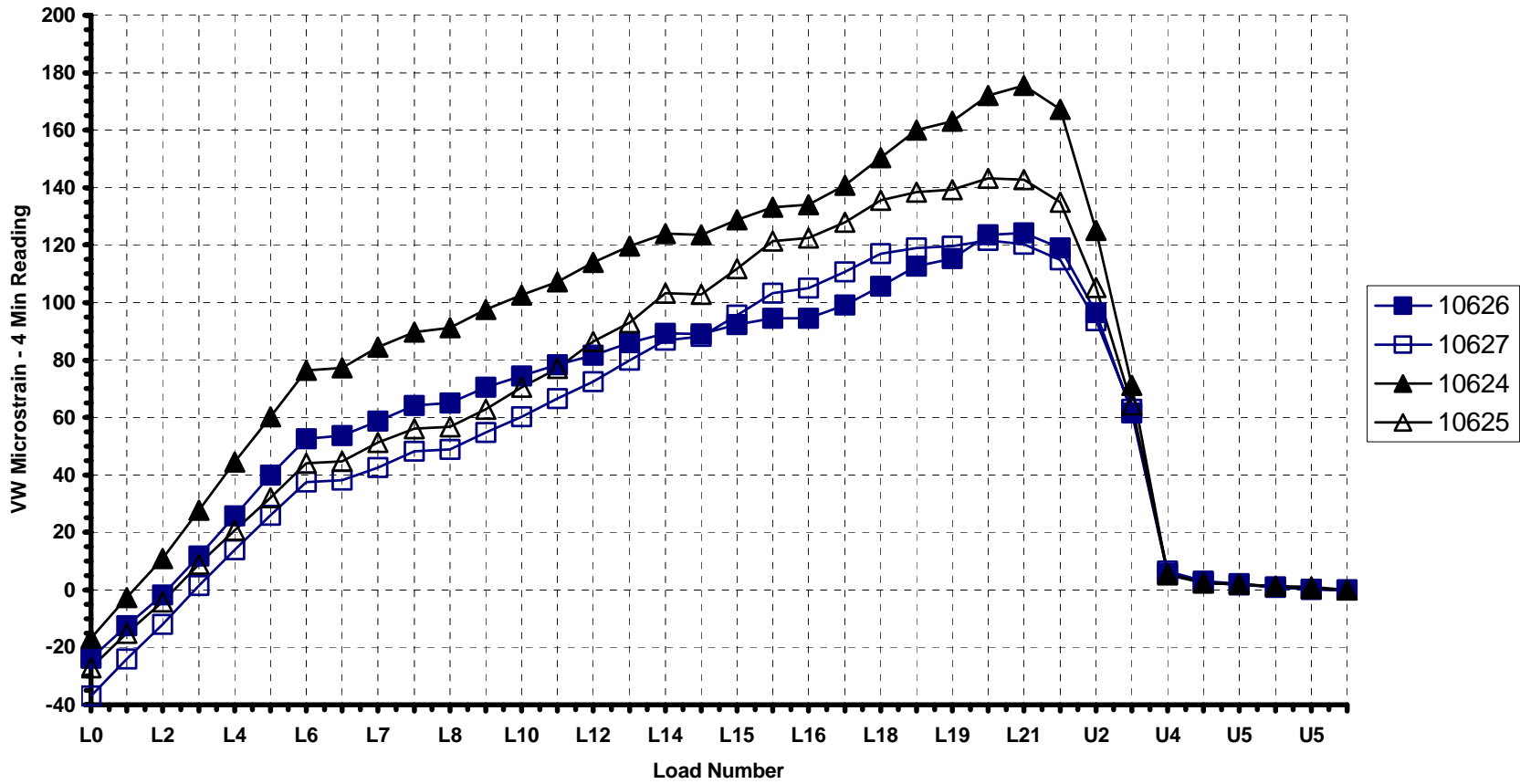


Figure E.4 Shaft Top Shear Stress vs. Movement, Shaft 2 - 1996

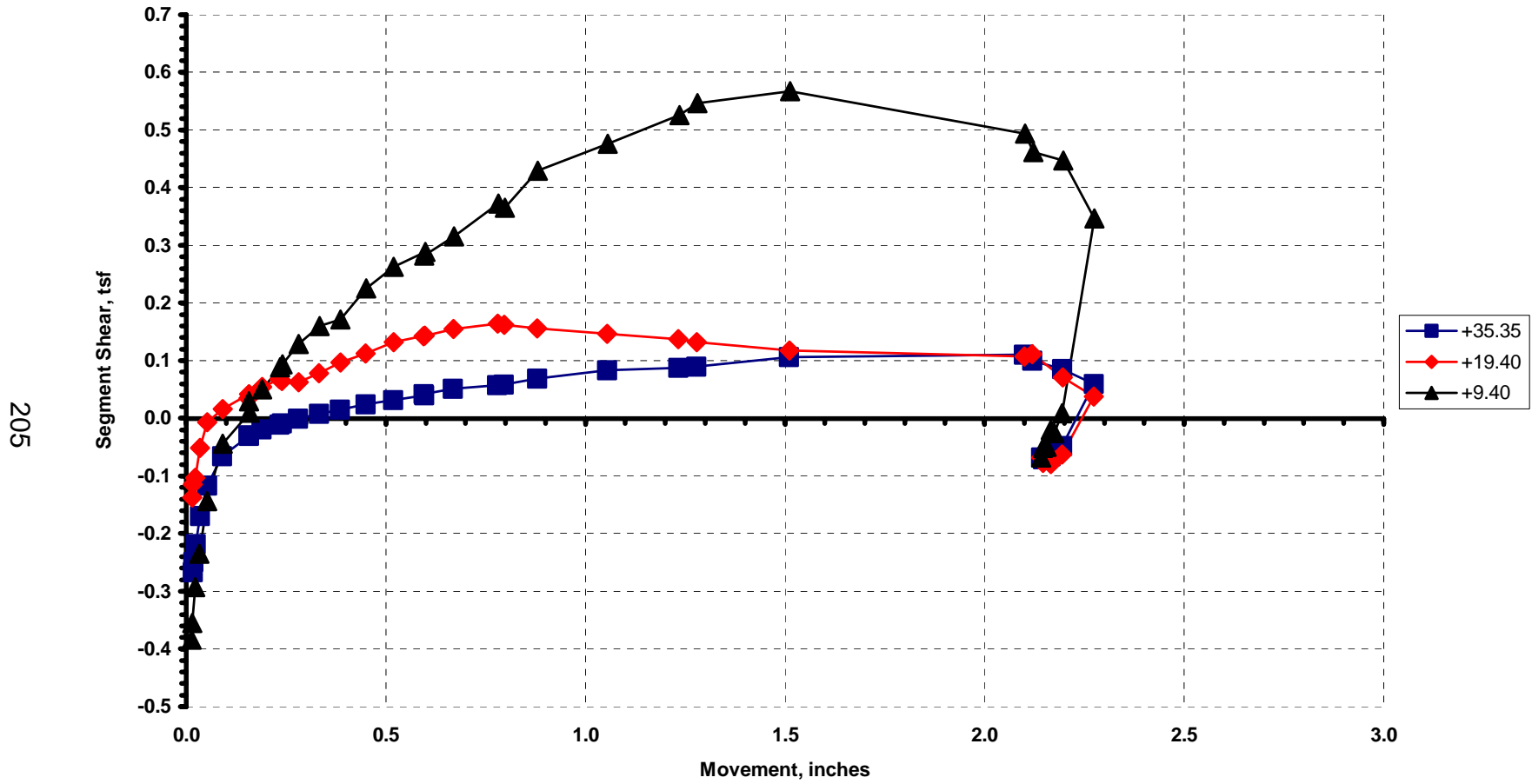
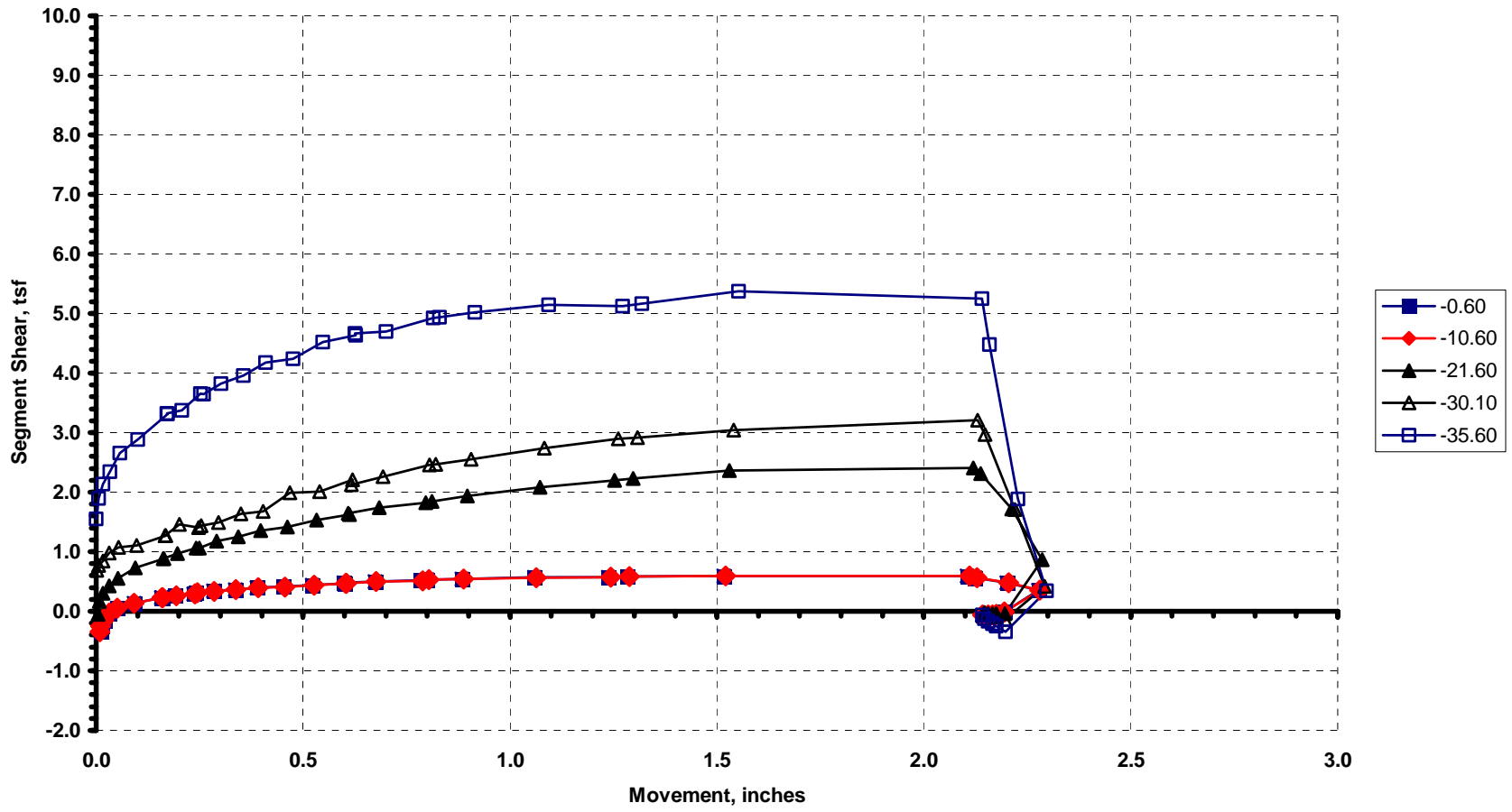


Figure E.5 Shaft Top Shear Stress vs. Movement, Shaft 2 - 1996

206



Figuer E.6 Strain Distribution, Shaft 2 - 1996

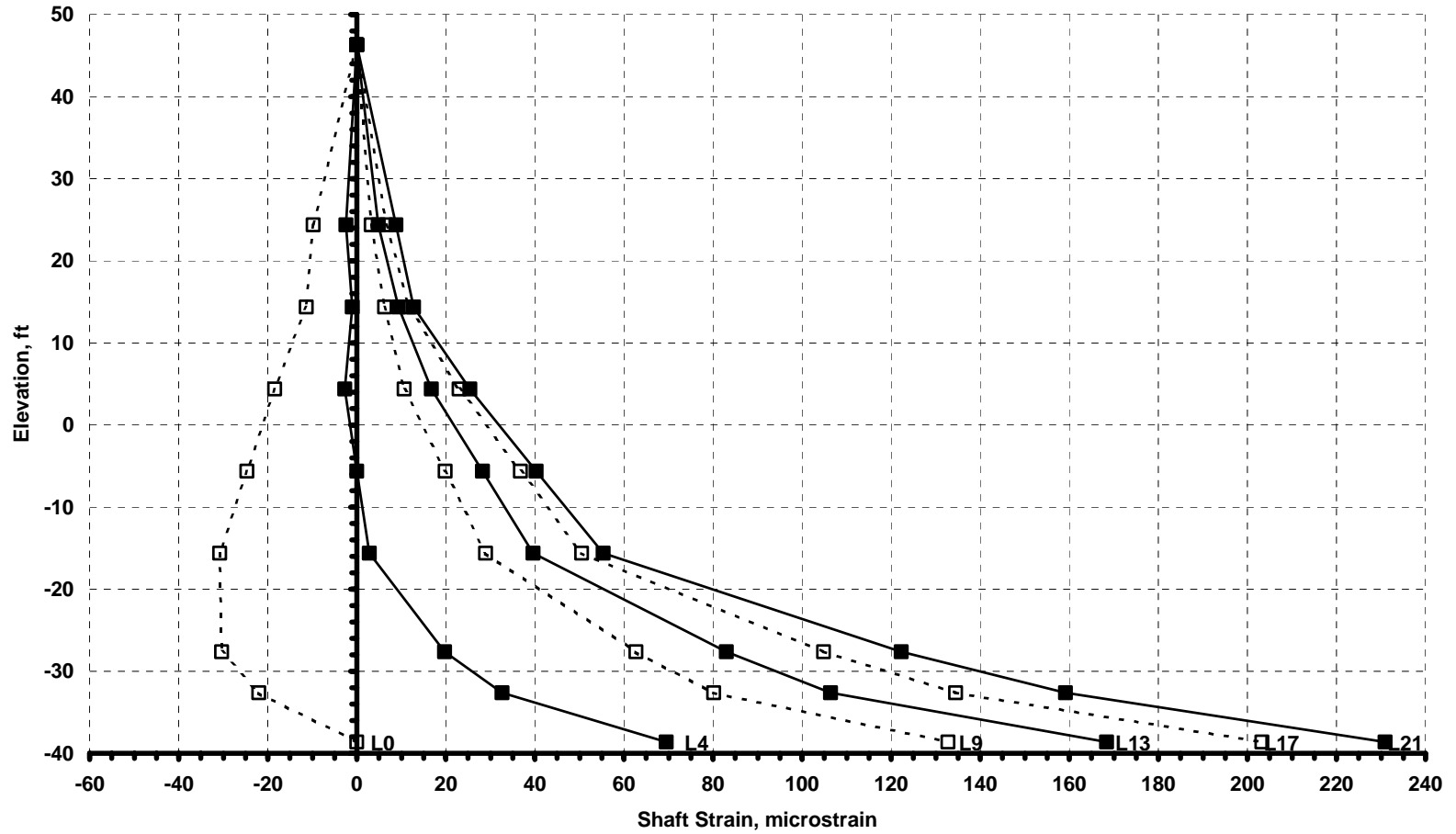


Figure E.7 Load Distribution, Shaft 2 - 1996

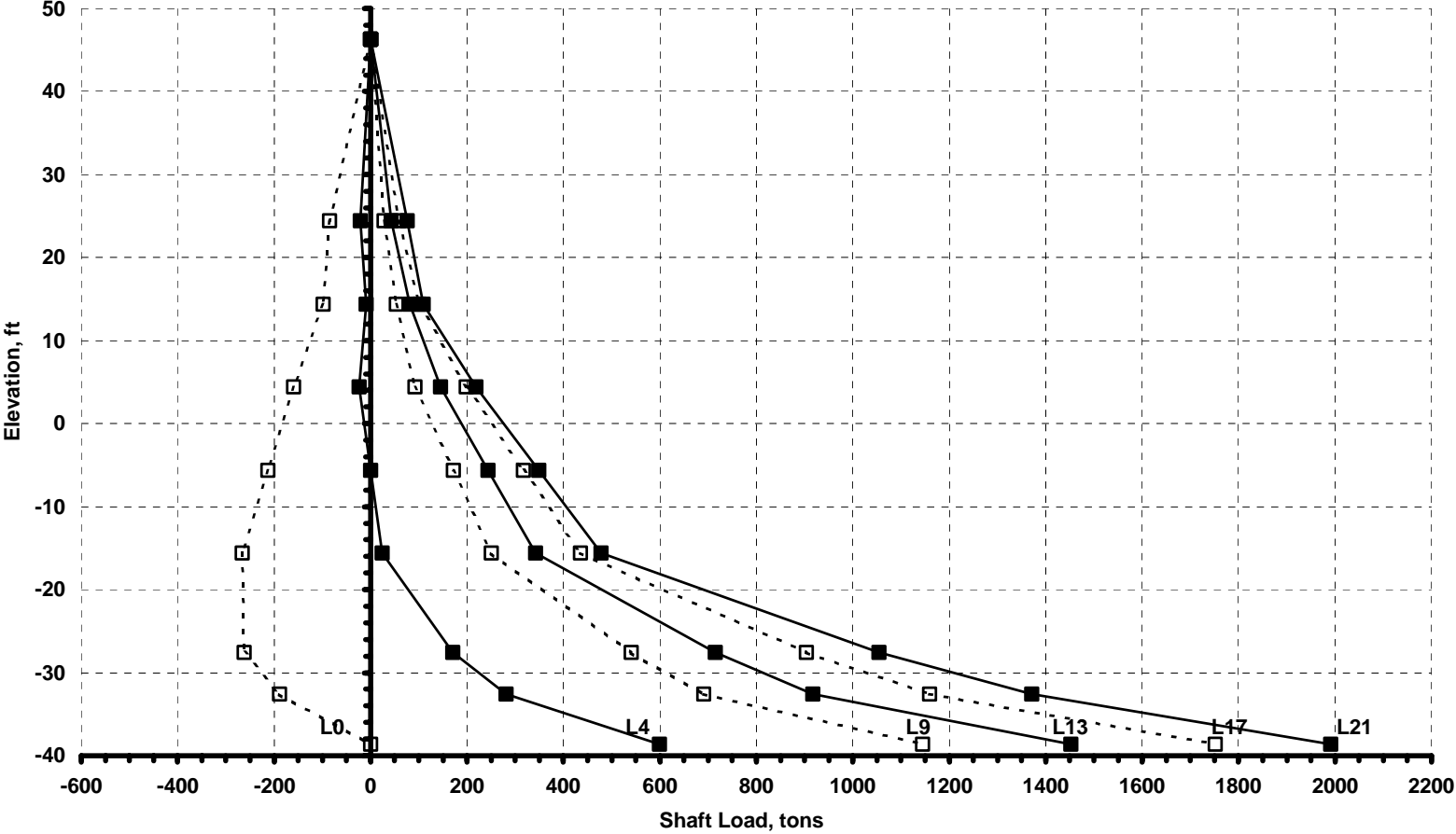


Figure E.8 Shear Stress Distribution, Shaft 2 - 1996

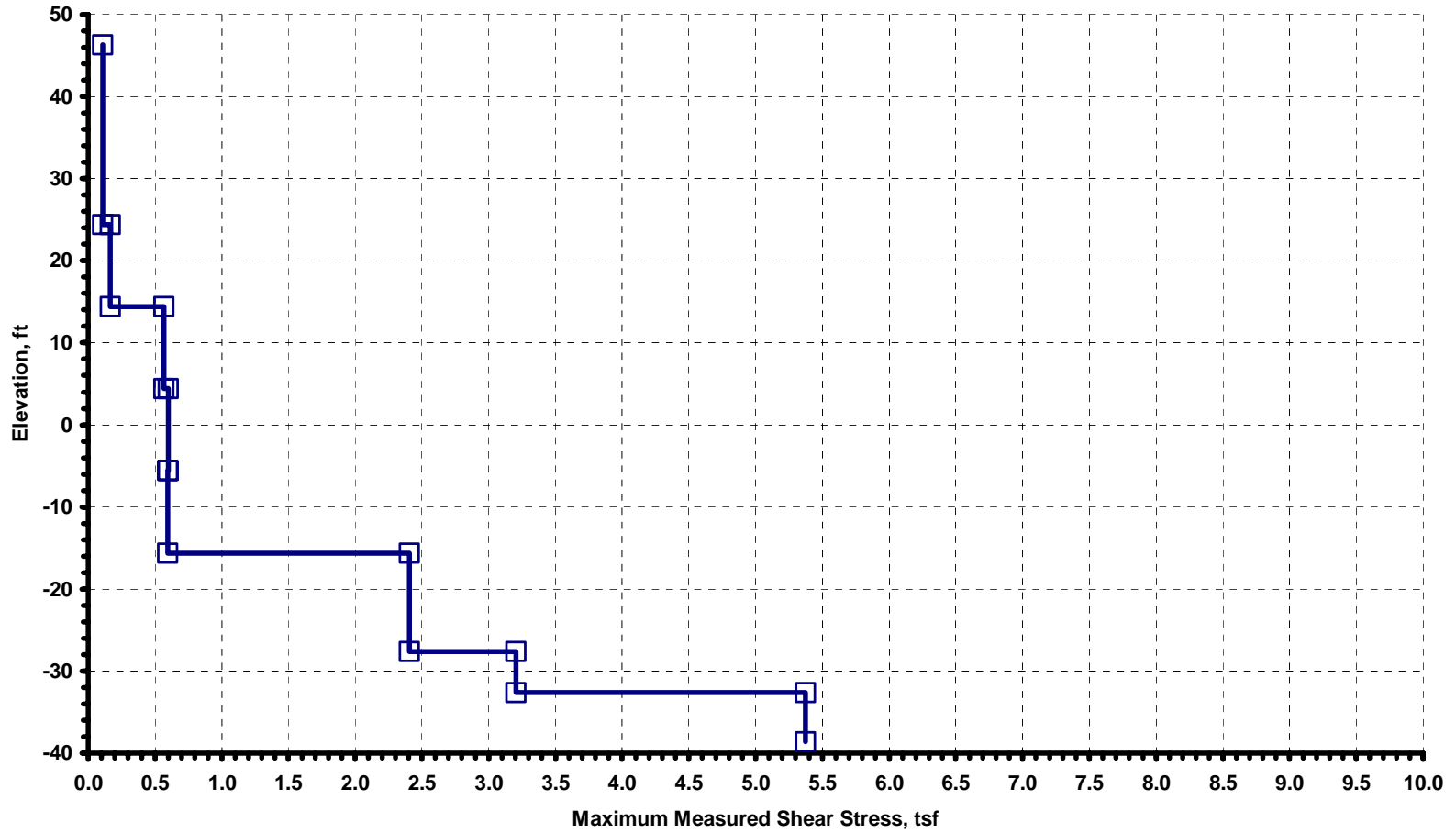


Figure E.9 Average Compression vs Load , Stage 1 - Shaft 2 - 1996

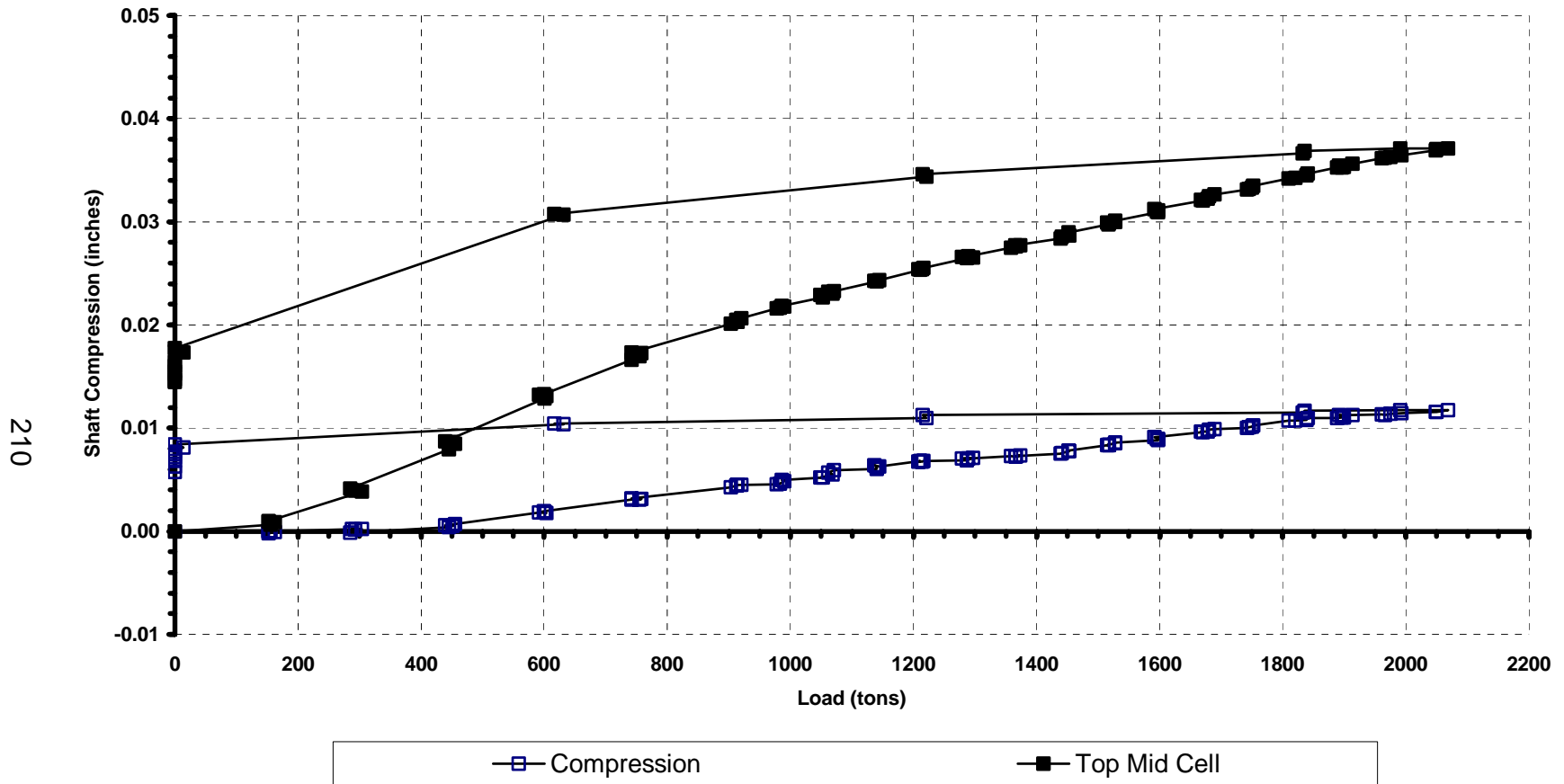


Figure E.10 Bottom Cell Movement, Stage 1 - Shaft 2 - 1996

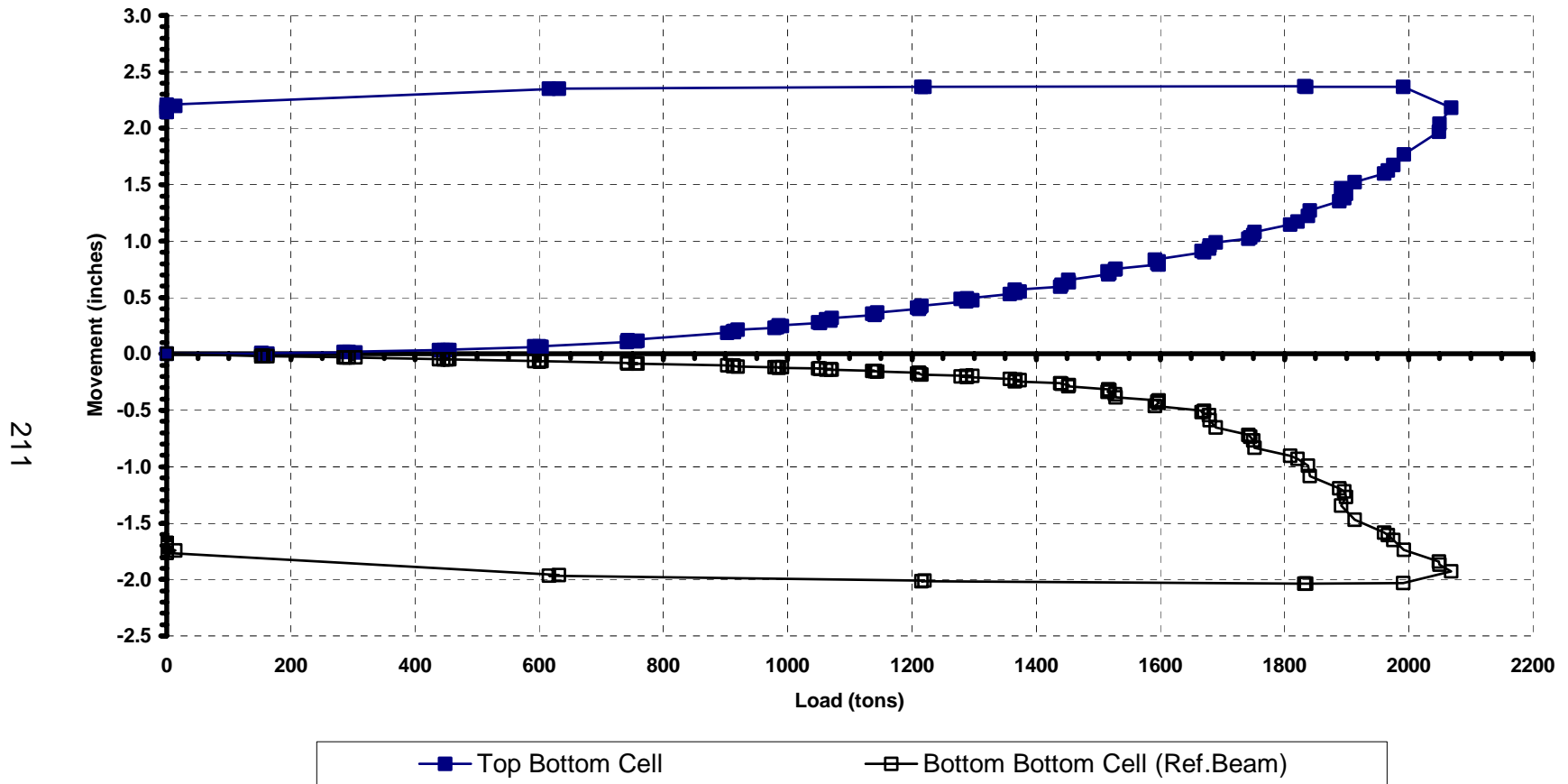
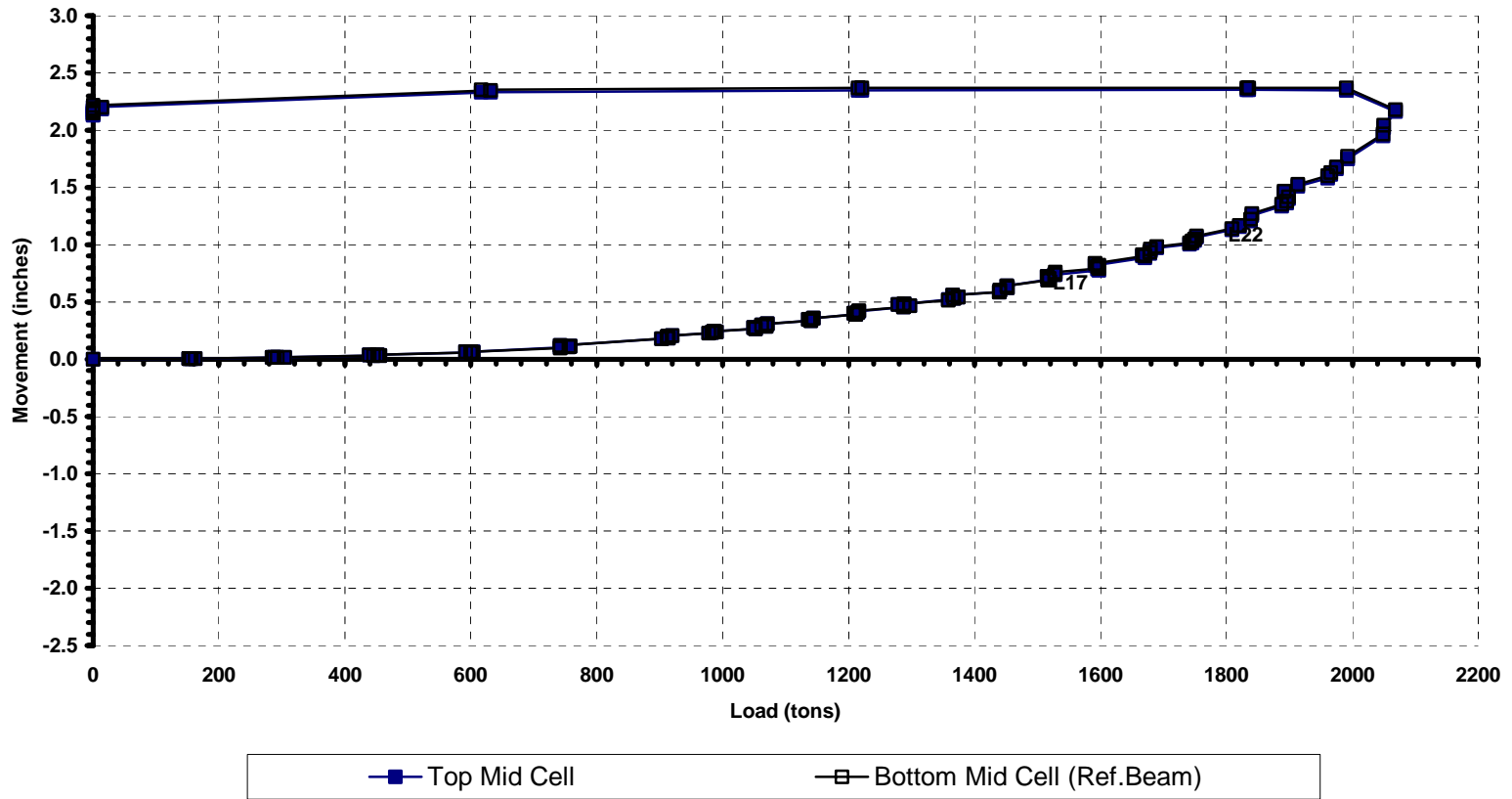


Figure E.11 Mid Cell Movement, Stage 1 - Shaft 2 - 1996



**APPENDIX F
TEST SHAFT 2 – ANALYSIS OF 2002 TEST**

Table F.1 Adjusted Indicator Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Top of Shaft Movement												
		Mid Cell Load (tons)	Bottom Cell Load (tons)	Indicators				Survey Level Readings				Compression		
				DG -11 (inches)	DG -12 (inches)	DG -13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT-5 (inches)	TT-10 (inches)	Avg. Rdg (inches)
L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:00:30	0.0	148.6	0.0181	0.0148	0.0147	0.0159	0.01	0.02	0.02	0.02	0.0012	0.0008	0.0010
L1	0:01:00	0.0	148.6	0.0177	0.0149	0.0147	0.0158					0.0012	0.0008	0.0010
L1	0:02:00	0.0	148.6	0.0188	0.0137	0.0148	0.0158	0.01	0.02	0.02	0.02	0.0012	0.0011	0.0012
L1	0:04:00	0.0	148.6	0.0192	0.0155	0.0151	0.0166	0.03	0.02	0.04	0.03	0.0013	0.0011	0.0012
L2	0:00:30	0.0	301.0	0.0563	0.0496	0.0520	0.0526	0.03	0.06	0.04	0.04	0.0037	0.0028	0.0033
L2	0:01:00	0.0	301.0	0.0583	0.0519	0.0534	0.0545	0.05	0.06	0.06	0.06	0.0037	0.0029	0.0033
L2	0:02:00	0.0	301.0	0.0588	0.0526	0.0538	0.0551					0.0038	0.0029	0.0034
L2	0:04:00	0.0	301.0	0.0609	0.0539	0.0554	0.0567	0.05	0.06	0.06	0.06	0.0039	0.0031	0.0035
L3	0:00:30	113.9	301.0	0.0622	0.0531	0.0549	0.0567	0.05	0.06	0.05	0.05	0.0039	0.0031	0.0035
L3	0:01:00	113.9	293.4	0.0611	0.0530	0.0549	0.0563					0.0039	0.0031	0.0035
L3	0:02:00	113.9	293.4	0.0596	0.0528	0.0549	0.0558	0.05	0.07	0.06	0.06	0.0039	0.0031	0.0035
L3	0:04:00	113.9	285.8	0.0625	0.0523	0.0557	0.0568	0.05	0.07	0.04	0.05	0.0039	0.0031	0.0035
L4	0:00:30	235.9	285.8	0.0653	0.0545	0.0590	0.0596	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L4	0:01:00	235.9	285.8	0.0652	0.0533	0.0583	0.0589					0.0039	0.0031	0.0035
L4	0:02:00	235.9	273.6	0.0644	0.0534	0.0575	0.0584	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L4	0:04:00	235.9	273.6	0.0625	0.0529	0.0571	0.0575	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L5	0:00:30	358.0	270.5	0.0647	0.0547	0.0575	0.0590	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L5	0:01:00	358.0	270.5	0.0651	0.0541	0.0575	0.0589					0.0039	0.0031	0.0035
L5	0:02:00	358.0	270.5	0.0644	0.0546	0.0578	0.0589	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L5	0:04:00	358.0	262.9	0.0648	0.0527	0.0579	0.0585	0.06	0.06	0.06	0.06	0.0039	0.0031	0.0035
L6	0:00:31	373.3	346.7	0.1273	0.1175	0.1194	0.1214	0.13	0.14	0.14	0.14	0.0061	0.0048	0.0055
L6	0:01:00	373.3	346.7	0.1329	0.1242	0.1250	0.1274	0.13	0.16	0.14	0.14	0.0062	0.0049	0.0056
L6	0:02:00	373.3	349.8	0.1444	0.1328	0.1358	0.1377	0.13	0.16	0.14	0.14	0.0064	0.0050	0.0057
L6	0:04:00	373.3	349.8	0.1444	0.1366	0.1377	0.1396	0.15	0.14	0.14	0.14	0.0064	0.0050	0.0057
L7	0:00:30	417.6	390.9	0.1868	0.1763	0.1799	0.1810	0.19	0.19	0.18	0.19	0.0072	0.0058	0.0065
L7	0:01:00	408.2	389.2	0.1923	0.1823	0.1858	0.1868					0.0074	0.0058	0.0066
L7	0:02:00	411.1	389.6	0.1953	0.1838	0.1884	0.1892	0.20	0.20	0.20	0.20	0.0074	0.0058	0.0066
L7	0:04:00	414.8	391.4	0.1991	0.1880	0.1921	0.1931	0.19	0.20	0.20	0.20	0.0074	0.0058	0.0066
L8	0:00:30	483.1	444.2	0.2575	0.2478	0.2509	0.2521	0.26	0.26	0.26	0.26	0.0084	0.0070	0.0077
L8	0:01:00	481.3	444.7	0.2631	0.2533	0.2564	0.2576					0.0084	0.0070	0.0077
L8	0:02:00	471.8	442.2	0.2723	0.2593	0.2640	0.2652	0.26	0.27	0.27	0.27	0.0085	0.0070	0.0078
L8	0:04:00	476.0	444.6	0.2777	0.2644	0.2697	0.2706	0.26	0.28	0.27	0.27	0.0085	0.0070	0.0078
L9	0:00:30	539.8	497.8	0.3295	0.3178	0.3213	0.3229	0.33	0.34	0.34	0.34	0.0095	0.0079	0.0087
L9	0:01:00	538.2	497.4	0.3335	0.3233	0.3255	0.3274	0.33	0.34	0.34	0.34	0.0096	0.0079	0.0088
L9	0:02:00	539.3	499.5	0.3416	0.3303	0.3334	0.3351	0.33	0.35	0.34	0.34	0.0097	0.0080	0.0089
L9	0:04:00	538.2	498.7	0.3471	0.3353	0.3384	0.3403	0.35	0.38	0.34	0.36	0.0097	0.0081	0.0089
L10	0:00:30	587.9	546.2	0.3927	0.3813	0.3843	0.3861	0.39	0.40	0.40	0.40	0.0103	0.0089	0.0096
L10	0:01:00	587.0	547.4	0.3976	0.3864	0.3893	0.3911	0.39	0.40	0.40	0.40	0.0103	0.0089	0.0096
L10	0:02:00	588.4	548.8	0.4046	0.3923	0.3956	0.3975	0.41	0.40	0.40	0.40	0.0104	0.0089	0.0097
L10	0:04:00	588.6	549.2	0.4156	0.3989	0.4047	0.4064	0.41	0.42	0.42	0.42	0.0104	0.0089	0.0097

Table F.1 Adjusted Indicator Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Top of Shaft Movement												
		Mid Cell Load (tons)	Bottom Cell Load (tons)	Indicators				Survey Level Readings				Compression		
				DG -11 (inches)	DG -12 (inches)	DG -13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT-5 (inches)	TT-10 (inches)	Avg. Rdg (inches)
L11	0:00:30	651.7	603.6	0.4633	0.4475	0.4531	0.4546	0.46	0.48	0.47	0.47	0.0110	0.0096	0.0103
L11	0:01:00	649.5	602.6	0.4701	0.4535	0.4590	0.4609	0.47	0.48	0.47	0.47	0.0111	0.0097	0.0104
L11	0:02:00	652.3	606.1	0.4794	0.4594	0.4666	0.4685	0.47	0.48	0.48	0.48	0.0112	0.0097	0.0105
L11	0:04:00	657.3	614.4	0.4904	0.4702	0.4769	0.4792	0.48	0.50	0.48	0.49	0.0112	0.0097	0.0105
L12	0:00:30	713.3	660.5	0.5369	0.5131	0.5221	0.5240	0.53	0.53	0.52	0.53	0.0117	0.0103	0.0110
L12	0:01:00	715.6	662.5	0.5414	0.5196	0.5268	0.5293					0.0117	0.0103	0.0110
L12	0:02:00	711.0	662.9	0.5493	0.5270	0.5352	0.5372	0.53	0.54	0.54	0.54	0.0118	0.0103	0.0111
L12	0:04:00	698.0	650.5	0.5566	0.5325	0.5412	0.5434	0.55	0.56	0.55	0.55	0.0118	0.0103	0.0111
L13	0:00:30	775.9	718.0	0.6049	0.5792	0.5895	0.5912	0.61	0.60	0.60	0.60	0.0123	0.0109	0.0116
L13	0:01:00	777.1	719.1	0.6097	0.5848	0.5948	0.5964	0.61	0.62	0.62	0.62	0.0123	0.0109	0.0116
L13	0:02:00	776.3	720.6	0.6157	0.5916	0.6015	0.6029					0.0124	0.0109	0.0117
L13	0:04:00	777.8	721.0	0.6249	0.5978	0.6093	0.6107	0.63	0.63	0.64	0.63	0.0124	0.0109	0.0117
L14	0:00:30	837.9	778.4	0.6700	0.6425	0.6552	0.6559	0.66	0.66	0.67	0.66	0.0127	0.0112	0.0120
L14	0:01:00	836.0	777.5	0.6764	0.6489	0.6618	0.6624	0.67	0.68	0.68	0.68	0.0127	0.0112	0.0120
L14	0:02:00	837.8	779.6	0.6842	0.6560	0.6689	0.6697	0.69	0.68	0.68	0.68	0.0127	0.0112	0.0120
L14	0:04:00	840.2	781.6	0.6937	0.6651	0.6781	0.6790	0.69	0.68	0.68	0.68	0.0127	0.0112	0.0120
L15	0:00:30	904.5	839.7	0.7417	0.7143	0.7267	0.7276	0.74	0.73	0.72	0.73	0.0130	0.0117	0.0124
L15	0:01:00	898.8	835.3	0.7503	0.7211	0.7350	0.7355					0.0130	0.0117	0.0124
L15	0:02:00	901.8	838.0	0.7588	0.7299	0.7431	0.7439	0.75	0.76	0.76	0.76	0.0130	0.0117	0.0124
L15	0:04:00	900.6	838.2	0.7685	0.7383	0.7525	0.7531	0.76	0.76	0.76	0.76	0.0130	0.0117	0.0124
L16	0:00:30	957.5	891.2	0.8144	0.7838	0.7984	0.7989	0.81	0.80	0.82	0.81	0.0130	0.0120	0.0125
L16	0:01:00	963.1	893.6	0.8238	0.7934	0.8076	0.8083					0.0130	0.0120	0.0125
L16	0:02:00	958.6	893.0	0.8349	0.8059	0.8189	0.8199	0.83	0.83	0.83	0.83	0.0130	0.0120	0.0125
L16	0:04:00	957.0	891.4	0.8466	0.8176	0.8315	0.8319	0.83	0.85	0.84	0.84	0.0130	0.0120	0.0125
L17	0:00:30	1012.7	942.0	0.9108	0.8798	0.8955	0.8954	0.91	0.90	0.90	0.90	0.0131	0.0122	0.0127
L17	0:01:00	1020.2	948.0	0.9232	0.8915	0.9074	0.9074					0.0131	0.0122	0.0127
L17	0:02:00	1023.9	952.0	0.9434	0.9113	0.9278	0.9275	0.91	0.93	0.92	0.92	0.0131	0.0122	0.0127
L17	0:04:00	1019.4	947.5	0.9662	0.9348	0.9509	0.9506	0.96	0.96	0.96	0.96	0.0131	0.0122	0.0127
L18	0:00:30	1077.0	995.9	1.0713	1.0389	1.0562	1.0555	1.05	1.06	1.08	1.06	0.0132	0.0126	0.0129
L18	0:01:00	1075.0	993.1	1.0873	1.0542	1.0719	1.0711	1.09	1.10	1.10	1.10	0.0132	0.0126	0.0129
L18	0:02:00	1079.2	997.8	1.1133	1.0796	1.0976	1.0968	1.09	1.10	1.12	1.10	0.0133	0.0126	0.0130
L18	0:04:00	1083.9	1002.3	1.1648	1.1319	1.1492	1.1486	1.15	1.18	1.17	1.17	0.0133	0.0126	0.0130
L19	0:00:30	1116.1	1022.8	1.2852	1.2525	1.2664	1.2680	1.26	1.29	1.32	1.29	0.0133	0.0130	0.0132
L19	0:01:00	1120.0	1026.2	1.3105	1.2779	1.2920	1.2935					0.0133	0.0130	0.0132
L19	0:02:00	1130.2	1031.1	1.3537	1.3222	1.3360	1.3373	1.39	1.36	1.38	1.38	0.0134	0.0130	0.0132
L19	0:04:00	1113.4	1017.2	1.4162	1.3846	1.4001	1.4003	1.40	1.42	1.42	1.41	0.0134	0.0131	0.0133
L19	0:07:30	1107.8	1007.0	1.4751	1.4417	1.4575	1.4581					0.0135	0.0133	0.0134
L20	0:00:30	1135.4	1016.0	1.6222	1.5897	1.6056	1.6058	1.63	1.62	1.64	1.63	0.0133	0.0125	0.0129
L20	0:01:00	1142.9	1014.3	1.6491	1.6165	1.6326	1.6327	1.65	1.66	1.67	1.66	0.0133	0.0125	0.0129
L20	0:02:00	1147.1	1013.4	1.7040	1.6717	1.6879	1.6879	1.72	1.70	1.68	1.70	0.0133	0.0125	0.0129
L20	0:04:00	1147.6	1004.3	1.8175	1.7851	1.8015	1.8014	1.82	1.84	1.86	1.84	0.0133	0.0126	0.0130

Table F.1 Adjusted Indicator Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement										
				Indicators				Survey Level Readings				Compression		
				DG -11 (inches)	DG -12 (inches)	DG -13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT-5 (inches)	TT-10 (inches)	Avg. Rdg (inches)
U0	0:00:00	970.6	833.0	1.9053	1.8730	1.8910	1.8898	1.89	1.88	1.88	1.88	0.0133	0.0129	0.0131
U1	0:00:30	723.3	585.9	1.8904	1.8590	1.8766	1.8753	1.87	1.88	1.88	1.88	0.0119	0.0126	0.0123
U1	0:03:00	743.5	595.0	1.8896	1.8594	1.8763	1.8751	1.87	1.88	1.88	1.88	0.0119	0.0126	0.0123
U2	0:00:00	612.9	579.2	1.8807	1.8495	1.8671	1.8658	1.86	1.86	1.86	1.86	0.0111	0.0116	0.0114
U2	0:03:00	570.1	569.7	1.8793	1.8489	1.8663	1.8648	1.85	1.86	1.85	1.85	0.0111	0.0116	0.0114
U3	0:00:30	281.7	294.0	1.8260	1.7953	1.8122	1.8112	1.79	1.80	1.80	1.80	0.0081	0.0089	0.0085
U3	0:03:00	274.3	264.6	1.8218	1.7914	1.8082	1.8071	1.79	1.78	1.78	1.78	0.0081	0.0089	0.0085
U4	0:00:30	0.0	0.0	1.5963	1.5645	1.5822	1.5810	1.52	1.54	1.52	1.53	0.0034	0.0031	0.0033
U4	0:03:00	0.0	0.0	1.5511	1.5190	1.5376	1.5359	1.51	1.50	1.50	1.50	0.0029	0.0028	0.0029
U4	0:06:00	0.0	0.0	1.5352	1.5036	1.5223	1.5204	1.49	1.49	1.48	1.49	0.0028	0.0027	0.0028

Table F.1 Adjusted Indicator Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT-1	TT-6	Avg. Rdg	Mvmt.	TT-2	TT-7	Avg. Rdg	Mvmt.	TT-4	TT-9	Avg. Rdg	Mvmt.	TT-3	TT-8	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
U0	0:00:00	0.0229	0.0230	0.0230	1.9127	-3.3302	-3.2342	-3.2822	-1.3924	-3.3392	-3.2495	-3.2944	-1.4046	-2.1583	-2.1612	-2.1598	-0.2700
U1	0:00:30	0.0210	0.0204	0.0207	1.8960	-3.3497	-3.2548	-3.3023	-1.4269	-3.3605	-3.2737	-3.3171	-1.4418	-2.1281	-2.1390	-2.1336	-0.2582
U1	0:03:00	0.0209	0.0203	0.0206	1.8957	-3.3827	-3.2878	-3.3353	-1.4602	-3.3936	-3.3052	-3.3494	-1.4743	-2.1269	-2.1367	-2.1318	-0.2567
U2	0:00:30	0.0193	0.0186	0.0190	1.8847	-3.3775	-3.2854	-3.3315	-1.4657	-3.3940	-3.3056	-3.3498	-1.4840	-2.1112	-2.1223	-2.1168	-0.2510
U2	0:03:00	0.0192	0.0186	0.0189	1.8837	-3.3712	-3.2793	-3.3253	-1.4604	-3.3881	-3.2985	-3.3433	-1.4785	-2.1116	-2.1223	-2.1170	-0.2521
U3	0:00:30	0.0125	0.0132	0.0129	1.8240	-3.2813	-3.1902	-3.2358	-1.4246	-3.3014	-3.2148	-3.2581	-1.4469	-2.0271	-2.0340	-2.0306	-0.2194
U3	0:03:00	0.0122	0.0131	0.0127	1.8198	-3.2848	-3.1927	-3.2388	-1.4316	-3.3019	-3.2148	-3.2584	-1.4512	-2.0188	-2.0239	-2.0214	-0.2142
U4	0:00:30	0.0027	0.0046	0.0037	1.5847	-3.0491	-2.9611	-3.0051	-1.4241	-3.0757	-2.9928	-3.0343	-1.4533	-1.6640	-1.6734	-1.6687	-0.0877
U4	0:03:00	0.0021	0.0040	0.0031	1.5390	-3.0066	-2.9196	-2.9631	-1.4272	-3.0342	-2.9459	-2.9901	-1.4542	-1.5895	-1.5961	-1.5928	-0.0569
U4	0:06:00	0.0018	0.0038	0.0028	1.5232	-2.9907	-2.9047	-2.9477	-1.4273	-3.0191	-2.9307	-2.9749	-1.4545	-1.5624	-1.5695	-1.5660	-0.0456

Table F.2 Calculated Strain, Shaft 2 - 2002

Load Interval	Elapsed Time h:mm:ss	Strain Difference ($\Delta\epsilon$) μstrain														
		Gage # Elev. ft	10614 +24.40	10615 +24.40	10616 +14.40	10617 +14.40	10618 +4.40	10619 +4.40	10620 -5.60	10621 -5.60	10622 -15.60	10623 -15.60	10626 -27.60	10627 -27.60	10624 -32.60	10625 -32.60
L10	0:01:30		11.30	2.26	20.31	11.96	25.18	20.89	45.94	47.05	34.60	42.74	-617.60	38.52	48.29	37.96
L10	0:02:00		11.27	1.90	20.39	11.96	23.92	20.89	46.16	47.19	34.67	42.82	-617.38	38.48	48.47	37.96
L10	0:02:30		11.27	2.08	20.35	12.04	24.58	20.85	45.98	47.37	34.78	42.96	-617.85	38.70	48.65	37.96
L10	0:03:00		10.41	2.18	20.17	12.07	24.27	20.71	46.38	47.55	34.92	43.14	-617.02	38.70	48.65	38.07
L10	0:03:30		11.27	1.97	20.17	12.07	24.76	20.71	46.56	47.59	34.42	43.25	-616.84	38.74	48.65	38.21
L10	0:04:00		11.20	2.26	20.39	12.32	24.65	20.67	46.20	47.59	34.85	42.82	-616.80	38.59	48.65	37.99
L10	0:04:30		10.23	2.22	20.13	11.93	23.78	20.82	46.20	47.51	34.63	42.89	-617.34	38.37	48.51	37.85
L10	0:05:00		11.20	2.22	20.13	12.32	24.69	20.67	46.45	47.77	34.92	43.21	-616.51	38.67	48.76	38.10
L10	0:05:30		10.34	2.08	20.09	11.68	25.21	20.71	46.59	47.80	34.56	43.18	-616.33	38.85	48.93	38.28
L11	0:00:00		12.13	2.33	21.30	13.15	25.53	22.56	49.55	50.44	38.28	46.60	-614.75	42.01	52.47	41.85
L11	0:00:30		11.77	2.15	21.34	12.97	25.67	22.31	50.49	51.09	38.79	47.32	-614.10	42.56	52.47	41.85
L11	0:01:00		10.91	2.26	21.30	12.94	26.44	22.31	50.52	51.16	38.24	47.11	-613.92	42.38	54.32	41.85
L11	0:01:30		11.70	2.26	21.30	13.30	26.40	22.42	50.27	51.74	38.89	47.65	-613.67	42.52	54.32	41.85
L11	0:02:00		10.84	2.01	21.30	12.97	26.47	22.46	50.74	51.84	38.97	47.50	-613.09	42.63	54.54	42.06
L11	0:02:30		11.59	2.11	21.19	12.90	25.56	22.35	50.67	51.88	38.89	47.68	-612.73	42.52	54.54	42.06
L11	0:03:00		10.73	2.22	21.19	12.94	26.33	22.38	50.74	51.84	38.49	47.75	-612.58	42.56	54.54	42.06
L11	0:03:30		11.63	2.18	21.34	13.37	26.51	23.42	50.60	51.92	39.22	48.08	-611.76	42.89	54.97	42.50
L11	0:04:00		11.73	2.22	21.08	13.19	26.05	22.78	51.43	52.53	39.59	48.58	-611.47	43.26	55.43	42.96
L11	0:04:30		11.59	2.15	21.67	12.97	26.16	22.49	51.07	52.20	39.11	48.08	-611.32	42.71	54.79	42.10
L11	0:05:00		11.48	2.11	20.79	12.90	25.60	22.35	50.49	51.70	38.89	47.57	-610.64	42.41	54.36	41.67
L12	0:00:00		11.41	2.33	21.85	14.13	27.63	24.06	54.09	54.59	42.14	51.11	-608.69	46.45	58.39	45.77
L12	0:00:30		12.06	2.47	22.14	14.20	27.88	24.27	54.02	55.09	42.65	51.61	-607.54	46.86	59.28	46.67
L12	0:01:00		11.27	2.47	21.85	14.27	27.84	25.09	54.60	55.20	42.83	51.86	-607.57	47.04	60.18	46.35
L12	0:01:30		11.95	2.26	21.78	13.84	26.89	24.34	54.49	55.27	42.90	52.04	-606.96	47.19	60.32	46.49
L12	0:02:00		11.91	2.47	22.14	13.87	29.28	24.38	54.82	55.38	42.94	52.12	-606.60	47.08	60.46	46.64
L12	0:02:30		11.77	2.04	21.52	13.69	27.59	24.13	54.17	55.27	42.57	51.79	-606.31	46.71	60.46	46.64
L12	0:03:00		11.09	2.29	21.70	14.23	26.82	25.16	54.89	55.52	43.05	52.15	-605.59	47.22	60.00	46.17
L12	0:03:30		11.77	2.26	21.96	13.80	27.67	24.24	54.67	55.49	42.75	51.94	-605.16	46.75	60.00	46.17
L12	0:04:00		10.84	2.18	21.41	13.69	27.45	24.02	54.38	55.27	42.32	51.65	-604.22	46.12	59.25	45.41
L12	0:04:30		11.66	2.22	21.37	14.05	26.51	23.99	54.38	55.27	42.43	51.72	-603.79	46.60	59.75	45.92
L12	0:05:00		11.05	2.47	21.70	14.31	27.81	24.49	55.18	55.96	43.30	52.62	-602.89	47.55	62.18	46.35
L13	0:00:00		11.48	2.44	22.76	14.52	28.02	26.23	57.52	58.16	45.96	55.54	-600.83	50.64	64.60	48.80
L13	0:00:30		12.02	2.51	22.54	15.06	28.93	25.84	57.85	58.45	46.14	55.86	-598.53	51.15	65.46	49.66
L13	0:01:00		11.91	2.65	22.18	14.59	27.91	25.81	57.77	58.48	46.14	56.08	-598.56	50.97	64.67	48.87
L13	0:01:30		11.84	2.54	22.36	14.63	27.81	25.81	57.85	58.55	46.18	56.15	-597.12	50.97	68.24	52.47
L13	0:02:00		10.98	2.51	22.00	15.06	28.75	26.23	57.77	58.55	46.14	56.08	-596.40	51.08	65.82	50.02
L13	0:02:30		11.41	2.44	21.96	15.06	28.72	25.73	57.59	58.63	46.03	55.97	-595.90	50.75	65.42	49.63
L13	0:03:00		10.95	2.51	22.36	14.67	28.51	25.84	57.95	58.84	46.36	56.44	-595.32	51.30	66.24	50.45
L13	0:03:30		11.63	2.44	21.81	14.56	27.56	25.59	57.59	58.52	45.92	56.12	-594.96	50.49	65.07	49.27
L13	0:04:00		11.63	2.33	22.11	15.06	27.63	25.70	57.77	58.73	46.18	56.22	-593.81	51.48	66.03	50.24
L13	0:04:30		11.63	2.51	22.25	14.67	28.68	25.73	57.88	58.81	46.25	56.37	-592.83	50.97	65.96	50.17
L13	0:05:00		10.80	2.72	22.00	15.21	27.88	25.95	58.24	59.20	46.51	57.05	-591.89	52.33	65.96	50.17

Table F.2 Calculated Strain, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L14	0:00:00		11.91	2.79	22.73	15.82	29.84	26.87	60.08	60.90	48.98	59.36	-590.85	55.27	70.21	54.45
L14	0:00:30		11.81	2.79	22.32	15.24	29.80	26.84	60.19	61.08	49.16	60.01	-589.77	55.67	70.78	55.03
L14	0:01:00		10.84	2.87	22.91	15.21	28.47	26.66	60.04	60.86	48.95	59.47	-588.65	55.60	70.63	54.88
L14	0:01:30		11.55	2.79	22.14	15.86	29.49	26.98	60.01	60.86	48.84	59.79	-587.64	55.12	70.56	54.81
L14	0:02:00		10.70	2.90	22.21	15.24	28.58	26.73	59.97	61.12	49.16	60.15	-586.60	55.78	72.45	56.72
L14	0:02:30		11.52	2.97	22.29	15.28	28.54	26.77	60.23	61.26	49.16	59.86	-585.59	55.82	72.31	56.58
L14	0:03:00		10.52	2.79	22.00	15.24	28.30	26.91	59.90	60.97	48.80	59.40	-584.87	55.23	71.78	56.04
L14	0:03:30		11.41	2.65	22.07	15.89	28.37	27.02	59.86	61.15	49.06	59.94	-583.32	55.89	71.31	55.57
L14	0:04:00		10.55	3.04	22.11	15.31	31.69	26.73	60.26	61.33	49.27	60.04	-582.09	56.07	72.81	57.08
L14	0:04:30		11.30	2.79	22.00	15.24	28.23	26.52	59.94	61.04	48.84	59.86	-579.89	55.01	69.99	54.24
L14	0:05:00		10.30	2.83	21.41	15.75	28.93	26.23	59.54	60.65	48.04	58.93	-580.65	53.87	71.31	55.57
L14	0:05:30		11.30	2.90	21.92	15.06	29.21	26.59	60.12	61.26	49.27	59.86	-575.28	56.55	72.63	56.90
L15	0:00:00		11.63	3.26	22.14	16.54	29.14	27.84	62.03	62.92	51.53	62.78	-572.03	59.71	74.03	58.31
L15	0:00:30		11.48	3.19	22.29	15.78	29.84	27.77	61.96	63.03	51.71	63.07	-570.84	60.11	78.56	42.50
L15	0:01:00		10.45	3.37	21.89	15.75	28.61	27.23	61.63	62.81	51.42	62.89	-567.64	60.26	78.31	58.59
L15	0:01:30		11.27	3.37	21.85	15.75	29.49	27.20	61.60	62.81	51.46	62.89	-565.15	60.00	78.49	58.70
L15	0:02:00		11.23	3.33	21.78	16.54	29.45	27.55	61.52	62.88	51.50	62.96	-562.27	60.15	27.98	59.57
L15	0:02:30		10.30	3.30	21.56	16.58	28.40	27.23	61.60	62.92	51.57	63.14	-559.89	60.30	78.84	58.95
L15	0:03:00		11.13	3.33	21.78	15.75	28.23	27.05	61.34	62.70	51.20	61.95	-556.97	59.52	77.81	58.12
L15	0:03:30		10.98	3.26	21.45	15.64	28.93	26.77	60.95	62.34	50.80	62.03	-554.80	59.23	77.81	58.59
L15	0:04:00		11.13	3.33	21.63	16.54	29.24	27.45	61.42	62.81	51.17	62.96	-551.63	60.22	77.20	58.59
L15	0:04:30		11.13	3.33	21.70	15.78	29.31	27.52	61.52	62.92	51.50	63.07	-548.46	60.19	78.88	58.81
L15	0:05:00		11.05	3.19	21.26	15.71	29.00	26.95	61.23	62.70	51.17	62.64	-545.07	59.89	78.67	58.59
L15	0:05:30		10.98	3.30	22.03	15.71	29.00	27.20	61.09	62.56	51.02	62.39	-542.66	59.75	78.56	58.49
L16	0:00:00		11.34	3.62	21.63	17.08	28.68	28.05	62.79	64.07	53.43	64.73	-540.31	64.41	83.84	62.45
L16	0:00:30		11.27	3.69	21.81	16.29	29.52	27.69	62.57	64.11	53.43	65.13	-532.24	64.52	83.55	62.88
L16	0:01:00		11.23	3.33	21.74	16.32	28.51	27.73	62.46	64.11	53.53	64.80	-532.56	64.78	83.98	64.32
L16	0:01:30		11.13	3.69	21.70	16.29	29.24	27.62	62.21	64.00	53.39	65.09	-524.96	64.70	84.55	63.02
L16	0:02:00		11.09	3.72	21.48	17.15	28.19	27.98	62.14	63.97	53.39	65.34	-524.71	65.03	84.63	63.06
L16	0:02:30		11.05	3.72	21.52	16.32	29.10	27.87	62.03	63.93	53.39	64.62	-518.04	64.96	83.84	63.06
L16	0:03:00		10.98	3.69	21.45	16.25	28.96	27.52	61.85	63.82	53.13	64.08	-518.58	64.74	84.48	63.06
L16	0:03:30		10.98	3.69	21.45	16.29	29.24	27.59	61.88	63.93	53.13	64.66	-510.29	64.92	84.20	63.09
L16	0:04:00		10.98	3.69	21.12	17.15	29.00	27.91	61.85	63.93	52.88	64.66	-510.29	64.89	84.09	62.99
L16	0:04:30		10.80	3.30	21.37	16.25	28.82	27.41	61.52	63.71	52.88	64.44	-510.51	64.37	83.41	62.77
L16	0:05:00		10.02	3.69	21.26	16.29	28.89	27.87	61.74	63.89	53.13	64.62	-510.33	65.18	84.27	64.54
L17	0:00:00		11.55	4.01	21.67	16.83	28.23	28.51	62.57	64.98	54.77	66.24	-488.77	68.59	88.98	66.19
L17	0:00:30		11.13	3.98	21.63	16.86	29.03	28.41	62.28	64.90	55.03	66.35	-484.34	68.89	89.30	67.85
L17	0:01:00		10.16	4.01	21.56	16.90	31.03	28.44	62.17	65.01	55.17	66.60	-479.90	69.15	89.87	68.35
L17	0:01:30		10.09	3.98	21.12	16.86	28.86	28.02	61.96	64.98	54.92	66.60	-477.02	69.40	89.84	68.51
L17	0:02:00		10.05	3.98	21.12	17.73	28.33	28.02	61.88	65.01	55.28	66.57	-471.61	69.55	90.66	68.68
L17	0:02:30		10.02	3.98	21.12	16.90	27.88	28.02	61.81	65.01	55.36	66.89	-468.15	69.59	90.80	68.82
L17	0:03:00		9.94	4.05	20.97	16.83	27.63	28.23	61.49	64.87	54.92	66.68	-463.90	69.40	90.05	68.06

Table F.2 Calculated Strain, Shaft 2 - 2002

Load Interval	Elapsed Time h:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L17	0:03:30		9.87	4.01	21.34	16.76	28.37	27.80	61.34	64.80	54.99	66.60	-459.43	69.29	90.27	68.28
L17	0:04:00		9.87	3.94	20.90	17.62	27.98	28.19	61.31	64.87	55.06	66.78	-454.96	69.48	90.02	68.03
L17	0:04:30		9.87	4.01	21.30	16.83	27.56	27.87	61.34	64.94	55.17	66.86	-450.63	69.55	90.19	68.21
L17	0:05:00		9.80	4.01	21.23	17.59	28.44	28.09	61.09	64.80	54.92	66.42	-445.41	69.33	89.73	67.74
L18	0:00:00		10.95	4.26	21.63	17.98	28.79	28.55	61.70	65.84	56.48	69.38	-428.97	73.07	94.37	71.05
L18	0:00:30		9.98	4.26	21.59	17.15	27.81	28.19	61.67	65.84	56.56	69.88	-423.71	73.41	94.91	72.24
L18	0:01:00		9.84	4.23	21.45	17.04	27.59	28.05	61.38	65.66	56.30	69.13	-418.52	73.30	94.91	75.16
L18	0:01:30		9.80	4.23	21.34	17.84	27.59	28.41	61.27	65.70	56.45	69.31	-413.29	73.26	95.08	72.60
L18	0:02:00		9.77	4.41	21.45	17.04	27.56	28.44	61.31	65.77	56.45	69.34	-407.63	73.55	95.33	74.37
L18	0:02:30		9.73	4.41	21.45	17.04	28.51	28.44	61.31	65.81	56.52	69.38	-401.87	73.55	95.65	74.47
L18	0:03:00		9.69	4.41	21.45	17.04	27.56	28.44	61.27	65.84	56.56	69.45	-396.82	73.74	95.73	72.71
L18	0:03:30		10.52	4.30	21.56	17.84	28.54	28.12	61.20	65.77	59.00	69.49	-391.20	73.99	95.83	74.58
L18	0:04:00		9.66	4.30	21.45	17.01	28.33	28.41	61.23	65.84	59.07	69.96	-385.65	74.07	95.94	72.85
L18	0:04:30		9.59	4.26	21.37	16.94	30.19	27.94	61.02	65.55	56.38	69.67	-379.99	73.59	95.40	74.22
L18	0:05:00		10.34	4.23	20.97	16.86	28.05	27.87	60.87	65.48	56.27	69.52	-374.83	73.41	95.08	71.49
L18	0:05:30		9.55	4.23	21.45	17.80	28.47	28.44	61.31	65.99	57.50	70.28	-369.57	74.76	97.15	75.16
L19	0:00:00		10.41	4.41	21.41	17.87	27.67	28.48	61.56	66.09	57.50	70.24	-354.32	75.65	98.26	75.77
L19	0:00:30		10.34	4.51	21.67	16.97	27.59	28.02	61.52	65.88	61.58	70.21	-348.23	75.79	98.55	76.35
L19	0:01:00		9.55	4.37	21.78	18.59	28.75	28.05	61.70	65.91	63.62	69.99	-342.10	76.01	98.90	74.65
L19	0:01:30		9.52	4.37	21.52	16.94	28.65	28.02	61.70	65.81	64.64	69.81	-336.12	75.83	98.55	75.92
L19	0:02:00		9.52	4.33	21.81	16.97	28.72	28.02	61.96	65.84	65.15	70.71	-330.24	76.49	99.37	76.56
L19	0:02:30		9.87	4.51	21.52	16.90	28.79	28.30	62.03	65.81	65.41	69.81	-324.19	76.67	99.19	76.60
L19	0:03:00		10.05	4.26	21.67	16.79	28.30	27.80	61.85	65.48	65.53	69.41	-318.17	76.23	98.44	76.17
L19	0:03:30		10.05	4.30	21.70	17.62	28.65	27.80	61.96	65.48	65.60	70.17	-312.73	75.87	98.44	74.04
L19	0:04:00		9.91	4.23	21.59	16.65	27.49	27.59	61.67	65.19	65.63	68.98	-307.00	75.87	98.08	75.74
L19	0:04:30		9.34	4.30	21.74	16.83	28.68	28.12	62.06	65.41	65.65	69.23	-300.83	76.09	97.87	75.92
L19	0:05:00		9.27	4.37	21.56	16.61	28.40	27.48	61.74	64.98	65.65	68.73	-294.88	75.72	97.26	75.81
L19	0:05:30		9.91	4.26	21.74	17.55	28.61	27.66	62.17	65.23	65.66	70.06	-288.50	76.20	97.01	76.31
L19	0:06:00		9.77	4.23	21.67	16.65	27.84	27.59	62.03	65.05	65.66	69.38	-283.03	75.98	96.73	75.88
L19	0:06:30		9.16	4.12	21.01	16.40	27.24	27.05	61.27	64.22	65.66	67.72	-277.73	73.00	92.55	70.87
L19	0:07:00		9.19	4.15	21.15	16.50	27.91	27.66	61.70	64.72	65.66	68.41	-270.59	75.94	96.15	75.81
L19	0:07:30		9.77	4.23	21.63	16.65	28.54	27.55	62.17	64.98	65.66	69.81	-264.53	76.12	96.40	75.70
L19	0:08:00		9.23	4.01	21.34	16.61	28.47	27.48	62.10	64.98	65.66	69.27	-258.05	76.09	96.01	73.79
L19	0:08:30		9.23	4.15	21.67	16.61	28.47	27.87	62.17	64.94	65.66	68.66	-251.81	76.16	95.90	73.86
L19	0:09:00		9.80	4.15	21.56	17.44	28.54	27.48	62.21	64.94	65.66	69.70	-245.50	76.23	95.98	73.86
L19	0:09:30		9.23	4.26	21.67	17.44	28.47	27.84	62.24	64.94	65.66	69.41	-239.16	76.27	95.94	73.93
L19	0:10:00		9.77	4.15	21.74	17.44	28.47	27.77	62.28	64.94	65.66	69.34	-232.56	76.60	95.90	74.01
L20	0:00:00		9.19	4.41	21.89	17.40	27.88	27.84	63.25	64.83	60.89	69.09	-206.21	78.07	97.23	77.00
L20	0:00:30		9.73	4.26	22.40	16.65	28.96	27.48	63.51	64.76	60.89	69.52	-199.33	78.33	97.30	75.20
L20	0:01:00		9.59	4.26	22.43	17.40	29.03	27.37	63.65	64.65	60.89	69.45	-193.09	78.88	97.23	74.19
L20	0:01:30		9.66	4.23	21.89	16.54	29.10	27.27	63.83	64.62	60.89	69.45	-187.07	78.58	97.23	75.23
L20	0:02:00		9.69	4.37	22.21	16.54	29.17	27.27	64.12	64.47	61.07	69.92	-180.33	78.84	96.87	77.10

Table F.2 Calculated Strain, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L20	0:02:30		9.66	4.26	22.21	17.37	29.21	27.27	64.30	64.36	61.33	69.41	-173.99	79.46	97.12	77.18
L20	0:03:00		9.59	4.26	22.25	17.33	29.24	27.20	64.48	64.29	61.55	69.31	-167.32	79.65	97.01	75.34
L20	0:03:30		9.59	4.26	22.25	16.43	29.28	27.16	64.66	64.22	61.69	68.62	-160.83	79.28	96.90	75.41
L20	0:04:00		9.55	4.26	22.14	16.40	29.28	26.98	64.73	63.93	61.73	69.09	-154.56	79.21	96.33	76.96
L20	0:04:30		9.52	4.26	22.69	17.26	29.45	27.09	65.13	63.97	62.24	69.16	-148.33	79.54	96.37	77.03
L20	0:05:00		9.48	4.41	22.43	16.40	29.45	27.02	65.24	63.93	62.20	69.20	-141.80	79.65	96.44	75.12
U0	0:00:00		8.76	3.98	21.63	16.32	26.75	24.95	62.24	60.83	57.87	63.65	-125.08	68.85	81.98	65.72
U0	0:00:30		8.66	3.94	20.64	16.11	27.07	24.38	61.31	59.96	56.45	62.21	-121.29	65.58	76.38	60.07
U0	0:01:00		8.94	3.87	20.71	15.21	26.58	24.56	60.44	59.13	55.61	60.55	-117.51	62.35	71.63	58.12
U0	0:01:30		8.48	3.80	20.09	15.03	26.16	23.99	59.65	58.34	54.52	59.18	-114.05	59.71	68.92	55.39
U0	0:02:00		7.94	3.76	20.24	14.85	25.67	23.24	58.85	57.44	53.46	58.03	-110.48	57.58	64.57	53.08
U0	0:02:30		8.51	3.69	19.62	14.56	25.07	22.28	57.77	56.50	52.08	56.30	-107.81	54.02	64.57	53.08
U1	0:00:00		7.58	3.62	19.40	14.41	24.76	21.81	57.09	56.07	51.35	55.65	-106.73	52.99	61.18	49.66
U1	0:00:30		7.48	3.62	19.47	14.27	24.44	21.24	56.58	55.42	50.84	55.00	-103.74	51.56	43.58	47.47
U1	0:01:00		8.12	3.58	19.25	14.31	25.32	21.60	56.62	55.67	50.58	55.18	-100.21	52.73	59.14	48.91
U1	0:01:30		7.51	3.62	18.45	14.70	24.48	21.53	56.55	55.60	50.69	55.03	-97.07	52.44	58.53	47.18
U1	0:02:00		7.51	3.62	19.43	14.67	24.34	21.46	56.40	55.20	50.00	54.75	-94.98	51.41	58.53	47.25
U1	0:02:30		8.16	3.58	19.47	14.31	24.48	21.74	56.37	55.42	50.51	55.07	-93.28	52.62	58.53	47.79
U1	0:03:00		8.16	3.62	19.36	14.77	24.51	21.56	56.62	55.63	50.62	55.18	-91.19	52.80	59.93	48.26
U2	0:00:00		6.83	3.37	16.87	13.41	22.45	20.07	52.40	51.70	46.11	49.59	-85.79	43.92	52.40	40.66
U2	0:00:30		7.41	3.40	17.75	13.15	22.59	20.21	52.65	51.95	46.43	50.02	-87.37	45.02	52.82	41.09
U2	0:01:00		7.73	3.37	17.79	13.04	22.06	20.17	52.26	51.63	45.96	49.52	-88.06	43.88	53.25	41.52
U2	0:01:30		7.62	3.40	17.82	13.15	22.48	20.14	52.51	52.24	46.18	49.84	-89.03	44.51	53.25	41.52
U2	0:02:00		7.73	3.37	17.46	13.37	22.34	20.14	52.26	51.92	45.85	49.52	-89.64	43.88	53.25	41.52
U2	0:02:30		7.76	3.30	17.31	13.44	22.45	20.07	52.26	51.77	45.96	49.70	-90.36	44.18	53.25	41.52
U2	0:03:00		7.76	3.40	17.75	13.08	22.41	20.07	52.18	51.74	45.78	49.23	-90.04	42.49	53.25	41.52
U2	0:03:30		7.51	3.37	17.46	13.22	22.10	19.60	51.75	51.16	45.23	48.94	-90.18	42.71	53.07	41.34
U2	0:04:00		7.62	3.33	17.42	12.14	22.06	19.75	51.39	51.05	45.12	48.84	-89.82	42.52	52.61	40.87
U2	0:04:30		6.83	3.40	17.38	12.83	21.99	20.17	51.28	51.27	44.98	48.73	-89.07	42.34	52.22	40.48
U3	0:00:00		4.87	2.44	11.75	8.61	14.43	13.01	34.62	33.70	26.73	29.63	-85.17	21.67	32.69	20.78
U3	0:00:30		5.15	2.47	11.46	8.36	14.36	12.51	34.55	33.95	25.71	29.48	-84.31	21.67	32.69	20.78
U3	0:01:00		5.15	2.47	11.38	8.61	14.36	12.87	34.33	33.55	26.37	29.23	-83.52	21.41	32.69	20.78
U3	0:01:30		4.94	2.47	11.46	8.58	14.25	12.33	34.22	33.52	26.04	28.94	-82.58	21.30	32.05	20.13
U3	0:02:00		5.12	2.47	11.27	8.22	14.18	12.76	34.04	33.30	25.82	28.69	-81.71	20.75	31.69	19.77
U3	0:02:30		4.97	2.47	11.35	7.93	14.01	12.65	33.86	32.98	24.98	28.33	-80.56	20.45	26.02	19.48
U3	0:03:00		4.90	2.47	11.27	8.43	14.01	12.15	33.47	32.47	25.20	28.04	-79.55	20.78	25.63	19.19
U4	0:00:00		0.75	0.50	2.93	1.73	2.56	1.82	6.17	5.05	4.81	3.68	-30.64	0.88	0.25	0.94
U4	0:00:30		0.39	0.36	1.57	1.01	1.47	0.68	3.79	2.99	2.59	1.69	-14.89	0.51	0.21	0.61
U4	0:01:00		0.54	0.11	0.62	0.43	0.98	0.93	2.42	2.20	2.29	1.08	-11.39	0.00	0.96	0.50
U4	0:01:30		0.39	0.21	1.13	0.29	0.77	0.50	2.16	1.66	1.46	0.65	-8.54	0.29	0.14	1.15
U4	0:02:00		0.32	0.00	1.28	0.18	0.56	0.32	1.69	1.30	1.13	0.40	-7.14	0.26	0.14	0.32
U4	0:02:30		0.32	0.14	0.88	0.36	0.49	-0.11	1.33	0.87	0.87	0.29	-4.94	0.22	0.07	0.29

Table F.2 Calculated Strain, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
U4	0:03:00		0.18	0.11	0.37	0.29	0.35	-0.18	0.87	0.83	0.69	0.14	-3.42	-0.92	0.07	0.22
U4	0:03:30		0.36	-0.11	0.48	0.00	0.46	0.25	0.87	0.58	1.09	0.04	-2.56	0.22	0.82	0.29
U4	0:04:00		0.07	0.07	0.95	-0.04	0.25	0.21	0.69	0.47	0.47	-0.04	-2.16	-0.40	0.04	0.14
U4	0:04:30		0.21	0.04	0.66	0.11	0.14	-0.14	0.43	0.29	0.84	-0.22	-1.33	-0.55	0.04	0.18
U4	0:05:00		0.00	-0.14	0.15	0.07	0.11	-0.43	0.14	0.29	0.76	-0.25	-1.12	0.00	0.00	0.83
U4	0:05:30		0.00	0.00	0.77	-0.14	0.04	-0.04	0.04	0.11	0.11	-0.32	-0.40	0.00	0.00	0.14
U4	0:06:00		0.50	0.00	0.55	0.04	0.04	-0.46	0.11	0.07	0.62	-0.32	-0.22	0.04	0.00	0.04
U4	0:06:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table F.3 Calculated Strain, 4 Minute Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain														
		Gage #	10614	10615	10616	10617	10618	10619	10620	10621	10622	10623	10626	10627	10624	10625
		Elev. ft	+24.40	+24.40	+14.40	+14.40	+4.40	+4.40	-5.60	-5.60	-15.60	-15.60	-27.60	-27.60	-32.60	-32.60
L0	0:00:00		3.29	-1.75	3.37	-0.32	-2.17	1.00	-13.96	1.41	-11.44	-3.60	-545.22	1.32	-2.75	-2.05
L7	0:04:00		9.01	2.26	14.82	8.90	16.67	14.54	29.14	31.57	21.96	27.17	-627.72	25.52	32.87	26.18
L8	0:04:00		10.12	2.26	17.64	10.09	20.24	17.54	35.92	37.70	26.37	32.73	-624.59	30.18	38.44	27.33
L9	0:04:00		9.91	2.26	19.40	10.99	22.27	18.96	41.87	42.75	30.37	38.42	-620.91	33.75	43.87	32.92
L10	0:04:00		11.20	2.26	20.39	12.32	24.65	20.67	46.20	47.59	34.85	42.82	-616.80	38.59	48.65	37.99
L11	0:04:00		11.73	2.22	21.08	13.19	26.05	22.78	51.43	52.53	39.59	48.58	-611.47	43.26	55.43	42.96
L12	0:04:00		10.84	2.18	21.41	13.69	27.45	24.02	54.38	55.27	42.32	51.65	-604.22	46.12	59.25	45.41
L13	0:04:00		11.63	2.33	22.11	15.06	27.63	25.70	57.77	58.73	46.18	56.22	-593.81	51.48	66.03	50.24
L14	0:04:00		10.55	3.04	22.11	15.31	31.69	26.73	60.26	61.33	49.27	60.04	-582.09	56.07	72.81	57.08
L15	0:04:00		11.13	3.33	21.63	16.54	29.24	27.45	61.42	62.81	51.17	62.96	-551.63	60.22	77.20	58.59
L16	0:04:00		10.98	3.69	21.12	17.15	29.00	27.91	61.85	63.93	52.88	64.66	-510.29	64.89	84.09	62.99
L17	0:04:00		9.87	3.94	20.90	17.62	27.98	28.19	61.31	64.87	55.06	66.78	-454.96	69.48	90.02	68.03
L18	0:04:00		9.66	4.30	21.45	17.01	28.33	28.41	61.23	65.84	59.07	69.96	-385.65	74.07	95.94	72.85
L19	0:04:00		9.91	4.23	21.59	16.65	27.49	27.59	61.67	65.19	65.63	68.98	-307.00	75.87	98.08	75.74
L19	0:07:30		9.77	4.23	21.63	16.65	28.54	27.55	62.17	64.98	65.66	69.81	-264.53	76.12	96.40	75.70
L20	0:04:00		9.55	4.26	22.14	16.40	29.28	26.98	64.73	63.93	61.73	69.09	-154.56	79.21	96.33	76.96
U0	0:02:30		8.51	3.69	19.62	14.56	25.07	22.28	57.77	56.50	52.08	56.30	-107.81	54.02	64.57	53.08
U1	0:03:00		8.16	3.62	19.36	14.77	24.51	21.56	56.62	55.63	50.62	55.18	-91.19	52.80	59.93	48.26
U2	0:03:00		7.76	3.40	17.75	13.08	22.41	20.07	52.18	51.74	45.78	49.23	-90.04	42.49	53.25	41.52
U3	0:03:00		4.90	2.47	11.27	8.43	14.01	12.15	33.47	32.47	25.20	28.04	-79.55	20.78	25.63	19.19
U4	0:03:00		0.18	0.11	0.37	0.29	0.35	-0.18	0.87	0.83	0.69	0.14	-3.42	-0.92	0.07	0.22
U4	0:06:00		0.50	0.00	0.55	0.04	0.04	-0.46	0.11	0.07	0.62	-0.32	-0.22	0.04	0.00	0.04

Table F.4 Average Calculated Strain, 4 Minute Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain							
		Elev. +46.30	Elev. +42.60	Elev. +24.40	Elev. +14.40	Elev. +4.40	Elev. -5.60	Elev. -15.60	Elev. -23.60
L0	0:00:00	0.00	0.00	0.77	1.52	-0.59	-4.05	-7.52	0.00
L7	0:04:00	0.00	0.00	5.64	11.86	15.61	20.09	24.57	24.01
L8	0:04:00	0.00	0.00	6.19	13.87	18.89	24.22	29.55	27.56
L9	0:04:00	0.00	0.00	6.08	15.19	20.62	27.51	34.40	31.16
L10	0:04:00	0.00	0.00	6.73	16.35	22.66	30.75	38.83	34.08
L11	0:04:00	0.00	0.00	6.98	17.13	24.42	34.25	44.08	38.05
L12	0:04:00	0.00	0.00	6.51	17.55	25.74	36.36	46.98	40.41
L13	0:04:00	0.00	0.00	6.98	18.58	26.66	38.93	51.20	45.03
L14	0:04:00	0.00	0.00	6.80	18.71	29.21	41.94	54.66	48.65
L15	0:04:00	0.00	0.00	7.23	19.08	28.34	42.70	57.07	52.14
L16	0:04:00	0.00	0.00	7.34	19.13	28.45	43.61	58.77	55.41
L17	0:04:00	0.00	0.00	6.91	19.26	28.09	44.51	60.92	59.02
L18	0:04:00	0.00	0.00	6.98	19.23	28.37	46.44	64.51	62.76
L19	0:04:00	0.00	0.00	7.07	19.12	27.54	47.42	67.31	64.46
L19	0:07:30	0.00	0.00	7.00	19.14	28.05	47.89	67.74	64.14
L20	0:04:00	0.00	0.00	6.91	19.27	28.13	46.77	65.41	66.44
U0	0:02:30	0.00	0.00	6.10	17.09	23.68	38.93	54.19	42.74
U1	0:03:00	0.00	0.00	5.89	17.07	23.04	37.97	52.90	43.04
U2	0:03:00	0.00	0.00	5.58	15.42	21.24	34.37	47.50	33.01
U3	0:03:00	0.00	0.00	3.69	9.85	13.08	19.85	26.62	15.88
U4	0:03:00	0.00	0.00	0.14	0.33	0.09	0.25	0.42	0.00
U4	0:06:00	0.00	0.00	0.25	0.29	-0.21	-0.03	0.15	0.00

Top of Shaft Ground Surface Top of Mid Cell

Note: Measured strain at Elev. -5.60 reflects an unknown shaft defect and is replaced by interpolation.

Table F.5 Shaft Load, 4 Minute Readings, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Shaft Load, tons							
		Elev. +46.30	Elev. +42.60	Elev. +24.40	Elev. +14.40	Elev. +4.40	Elev. -5.60	Elev. -15.60	Elev. -23.60
L0	0:00:00	0.0	0.0	6.6	13.2	-5.1	-35.0	-64.9	0.0
L7	0:04:00	0.0	0.0	48.7	102.5	134.9	173.6	212.2	414.8
L8	0:04:00	0.0	0.0	53.5	119.9	163.3	209.3	255.2	476.0
L9	0:04:00	0.0	0.0	52.6	131.3	178.2	237.8	297.0	538.2
L10	0:04:00	0.0	0.0	58.1	141.4	195.9	265.8	335.4	588.6
L11	0:04:00	0.0	0.0	60.3	148.1	211.1	296.1	380.7	657.3
L12	0:04:00	0.0	0.0	56.3	151.7	222.5	314.3	405.7	698.0
L13	0:04:00	0.0	0.0	60.3	160.6	230.5	336.6	442.2	777.8
L14	0:04:00	0.0	0.0	58.8	161.7	252.5	362.5	472.0	840.2
L15	0:04:00	0.0	0.0	62.5	165.0	245.0	369.2	492.8	900.6
L16	0:04:00	0.0	0.0	63.4	165.4	246.0	377.0	507.5	957.0
L17	0:04:00	0.0	0.0	59.7	166.5	242.8	384.7	526.1	1019.4
L18	0:04:00	0.0	0.0	60.3	166.2	245.2	401.5	557.1	1083.9
L19	0:04:00	0.0	0.0	61.1	165.3	238.1	409.9	581.3	1113.4
L19	0:07:30	0.0	0.0	60.5	165.4	242.4	414.0	585.0	1107.8
L20	0:04:00	0.0	0.0	59.7	166.6	243.2	404.3	564.9	1147.6
U0	0:02:30	0.0	0.0	52.7	147.7	204.7	336.5	468.0	738.3
U1	0:03:00	0.0	0.0	50.9	147.5	199.2	328.2	456.8	743.5
U2	0:03:00	0.0	0.0	48.3	133.3	183.6	297.1	410.3	570.1
U3	0:03:00	0.0	0.0	31.9	85.2	113.1	171.6	229.9	274.3
U4	0:03:00	0.0	0.0	1.2	2.8	0.7	2.2	3.6	0.0
U4	0:06:00	0.0	0.0	2.2	2.5	-1.9	-0.3	1.3	0.0
Modulus, ksi		3998	3998	3998	3998	3998	3998	3994	3994
Diameter, in		74.20	74.20	74.20	74.20	74.20	74.20	74.20	74.20
		Top of Shaft	Ground Surface					Top of Rock	Top of Ocell

Table F.6 Average Segment Side Shear, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf							
		CL Elev., ft	+44.45	+33.50	+19.40	+9.40	-0.60	-10.60	-19.60
		Length, ft	3.70	18.20	10.00	10.00	10.00	10.00	8.00
L0	0:00:00		0.00	-0.05	-0.03	-0.16	-0.22	-0.22	0.35
L7	0:04:00		0.00	0.07	0.21	0.10	0.13	0.13	1.24
L8	0:04:00		0.00	0.08	0.27	0.16	0.17	0.17	1.35
L9	0:04:00		0.00	0.08	0.34	0.17	0.24	0.24	1.48
L10	0:04:00		0.00	0.10	0.36	0.21	0.29	0.29	1.56
L11	0:04:00		0.00	0.10	0.38	0.26	0.37	0.37	1.71
L12	0:04:00		0.00	0.09	0.42	0.30	0.40	0.40	1.81
L13	0:04:00		0.00	0.10	0.45	0.29	0.48	0.48	2.09
L14	0:04:00		0.00	0.10	0.46	0.40	0.50	0.50	2.30
L15	0:04:00		0.00	0.11	0.46	0.34	0.57	0.57	2.56
L16	0:04:00		0.00	0.11	0.46	0.35	0.61	0.60	2.82
L17	0:04:00		0.00	0.10	0.48	0.33	0.66	0.66	3.11
L18	0:04:00		0.00	0.10	0.48	0.34	0.74	0.73	3.32
L19	0:04:00		0.00	0.11	0.47	0.31	0.82	0.81	3.36
L19	0:07:30		0.00	0.10	0.47	0.33	0.82	0.81	3.30
L20	0:04:00		0.00	0.10	0.48	0.33	0.76	0.76	3.68
U0	0:02:30		0.00	0.08	0.42	0.23	0.61	0.61	1.67
U1	0:03:00		0.00	0.08	0.43	0.20	0.60	0.59	1.78
U2	0:03:00		0.00	0.07	0.37	0.19	0.52	0.51	0.96
U3	0:03:00		0.00	0.02	0.21	0.08	0.23	0.23	0.22
U4	0:03:00		0.00	-0.06	-0.06	-0.08	-0.06	-0.06	-0.09
U4	0:06:00		0.00	-0.06	-0.07	-0.09	-0.06	-0.06	-0.08
Segment Wt., tons			8.33	23.94	13.15	13.15	13.15	13.15	10.52
Maximum Shear, tsf			0.00	0.11	0.48	0.40	0.82	0.81	3.68

Table F.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 2 -2002

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain								Shaft Compression				
		CL Elev., ft	+44.45	+33.50	+19.40	+9.40	-0.60	-10.60	-19.60	Strain Gage		TT in	Error in	Error %
		Length, ft	3.70	18.20	10.00	10.00	10.00	10.00	8.00	Net, in	Change, in			
L0	0:00:00	0.00	0.38	1.14	0.47	-2.32	-5.79	-3.76	-0.0011	0.0000	0.0000	0.0000	0.0000	
L7	0:04:00	0.00	2.82	8.75	13.73	17.85	22.33	24.29	0.0105	0.0115	0.0118	-0.0002	-1.9%	
L8	0:04:00	0.00	3.10	10.03	16.38	21.55	26.88	28.55	0.0124	0.0135	0.0138	-0.0003	-2.2%	
L9	0:04:00	0.00	3.04	10.64	17.91	24.06	30.95	32.78	0.0138	0.0149	0.0156	-0.0007	-4.2%	
L10	0:04:00	0.00	3.36	11.54	19.51	26.71	34.79	36.46	0.0153	0.0164	0.0171	-0.0007	-3.8%	
L11	0:04:00	0.00	3.49	12.06	20.77	29.33	39.17	41.07	0.0169	0.0179	0.0185	-0.0005	-2.9%	
L12	0:04:00	0.00	3.26	12.03	21.65	31.05	41.67	43.70	0.0177	0.0187	0.0195	-0.0007	-3.7%	
L13	0:04:00	0.00	3.49	12.78	22.62	32.80	45.07	48.12	0.0190	0.0200	0.0204	-0.0004	-1.8%	
L14	0:04:00	0.00	3.40	12.75	23.96	35.57	48.30	51.65	0.0202	0.0212	0.0213	0.0000	-0.1%	
L15	0:04:00	0.00	3.61	13.16	23.71	35.52	49.88	54.60	0.0207	0.0218	0.0219	-0.0001	-0.4%	
L16	0:04:00	0.00	3.67	13.24	23.79	36.03	51.19	57.09	0.0212	0.0222	0.0223	0.0000	0.0%	
L17	0:04:00	0.00	3.45	13.08	23.67	36.30	52.71	59.97	0.0216	0.0227	0.0227	0.0000	-0.2%	
L18	0:04:00	0.00	3.49	13.10	23.80	37.40	55.48	63.63	0.0224	0.0235	0.0231	0.0004	1.7%	
L19	0:04:00	0.00	3.53	13.09	23.33	37.48	57.36	65.88	0.0228	0.0239	0.0233	0.0006	2.6%	
L19	0:07:30	0.00	3.50	13.07	23.59	37.97	57.81	65.94	0.0230	0.0240	0.0234	0.0007	3.0%	
L20	0:04:00	0.00	3.45	13.09	23.70	37.45	56.09	65.92	0.0227	0.0238	0.0234	0.0004	1.6%	
U0	0:02:30	0.00	3.05	11.59	20.38	31.30	46.56	48.47	0.0185	0.0196	0.0230	-0.0034	-14.8%	
U1	0:03:00	0.00	2.94	11.48	20.05	30.50	45.43	47.97	0.0181	0.0192	0.0206	-0.0014	-6.8%	
U2	0:03:00	0.00	2.79	10.50	18.33	27.81	40.94	40.26	0.0162	0.0172	0.0189	-0.0017	-8.8%	
U3	0:03:00	0.00	1.84	6.77	11.47	16.47	23.24	21.25	0.0094	0.0105	0.0127	-0.0022	-17.4%	
U4	0:03:00	0.00	0.07	0.24	0.21	0.17	0.34	0.21	0.0001	0.0012	0.0031	-0.0018	-60.5%	
U4	0:06:00	0.00	0.13	0.27	0.04	-0.12	0.06	0.07	0.0001	0.0011	0.0028	-0.0017	-60.0%	

Table F.8 Movement at Segment Centerline, Shaft 2 - 2002

Load Interval	Elapsed Time hhmmss	Segment Movement, in								Mid Cell
		CL Elev., ft	+44.45	+33.50	+19.40	+9.40	-0.60	-10.60	-19.60	-23.60
		Length, ft	3.70	18.20	10.00	10.00	10.00	10.00	8.00	-
L0	0:00:00	0.0011	0.0011	0.0012	0.0013	0.0012	0.0007	0.0002	0.0000	
L7	0:04:00	0.1944	0.1947	0.1955	0.1968	0.1987	0.2011	0.2037	0.2048	
L8	0:04:00	0.2720	0.2723	0.2732	0.2748	0.2771	0.2800	0.2830	0.2844	
L9	0:04:00	0.3420	0.3423	0.3433	0.3450	0.3475	0.3508	0.3542	0.3558	
L10	0:04:00	0.4081	0.4085	0.4095	0.4114	0.4142	0.4179	0.4217	0.4235	
L11	0:04:00	0.4808	0.4811	0.4822	0.4842	0.4872	0.4913	0.4956	0.4976	
L12	0:04:00	0.5452	0.5456	0.5466	0.5487	0.5518	0.5562	0.5608	0.5629	
L13	0:04:00	0.6121	0.6125	0.6136	0.6157	0.6191	0.6237	0.6288	0.6311	
L14	0:04:00	0.6800	0.6804	0.6816	0.6838	0.6873	0.6924	0.6977	0.7002	
L15	0:04:00	0.7542	0.7546	0.7558	0.7580	0.7616	0.7667	0.7723	0.7750	
L16	0:04:00	0.8330	0.8334	0.8346	0.8368	0.8404	0.8456	0.8514	0.8542	
L17	0:04:00	0.9517	0.9521	0.9533	0.9555	0.9591	0.9644	0.9705	0.9733	
L18	0:04:00	1.1493	1.1497	1.1508	1.1531	1.1567	1.1623	1.1687	1.1717	
L19	0:04:00	1.4008	1.4011	1.4023	1.4045	1.4081	1.4138	1.4204	1.4236	
L19	0:07:30	1.4585	1.4588	1.4600	1.4622	1.4659	1.4717	1.4783	1.4815	
L20	0:04:00	1.8020	1.8024	1.8036	1.8058	1.8095	1.8151	1.8216	1.8248	
U0	0:02:30	1.8942	1.8946	1.8956	1.8975	1.9006	1.9053	1.9104	1.9127	
U1	0:03:00	1.8776	1.8779	1.8789	1.8808	1.8838	1.8884	1.8934	1.8957	
U2	0:03:00	1.8676	1.8679	1.8688	1.8705	1.8733	1.8774	1.8818	1.8837	
U3	0:03:00	1.8104	1.8106	1.8112	1.8123	1.8140	1.8163	1.8188	1.8198	
U4	0:03:00	1.5388	1.5388	1.5388	1.5389	1.5389	1.5389	1.5389	1.5390	
U4	0:06:00	1.5231	1.5231	1.5231	1.5232	1.5232	1.5232	1.5232	1.5232	

Table F.9 Section Properties, Shaft 2 - 2002

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	22	1.561	34.352
3/4" Galvanized Steel Telltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			38.296

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.586
Area of Pipe =			28.354

232

Concrete Modulus 3800 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
+46.30	74.2	4324.12	38.30	28.35	4257.47	3998.26	4PVC pipe, 4hose
+0.50	74.2	4324.12	38.30	28.35	4257.47	3998.26	4PVC pipe, 4hose
-8.70	74.2	4324.12	37.63	28.35	4258.14	3994.38	4PVC pipe, 4hose
-16.00	74.2	4324.12	37.63	28.35	4258.14	3994.38	4PVC pipe, 4hose
-23.60	74.2	4324.12	36.30	27.47	4260.35	3987.40	4PVC pipe, 2hose
-38.60	74.2	4324.12	34.97	26.59	4262.57	3980.41	4PVC pipe, 0hose

Figure F.1 Shaft Top VW Strain, Shaft 2 - 2002

233

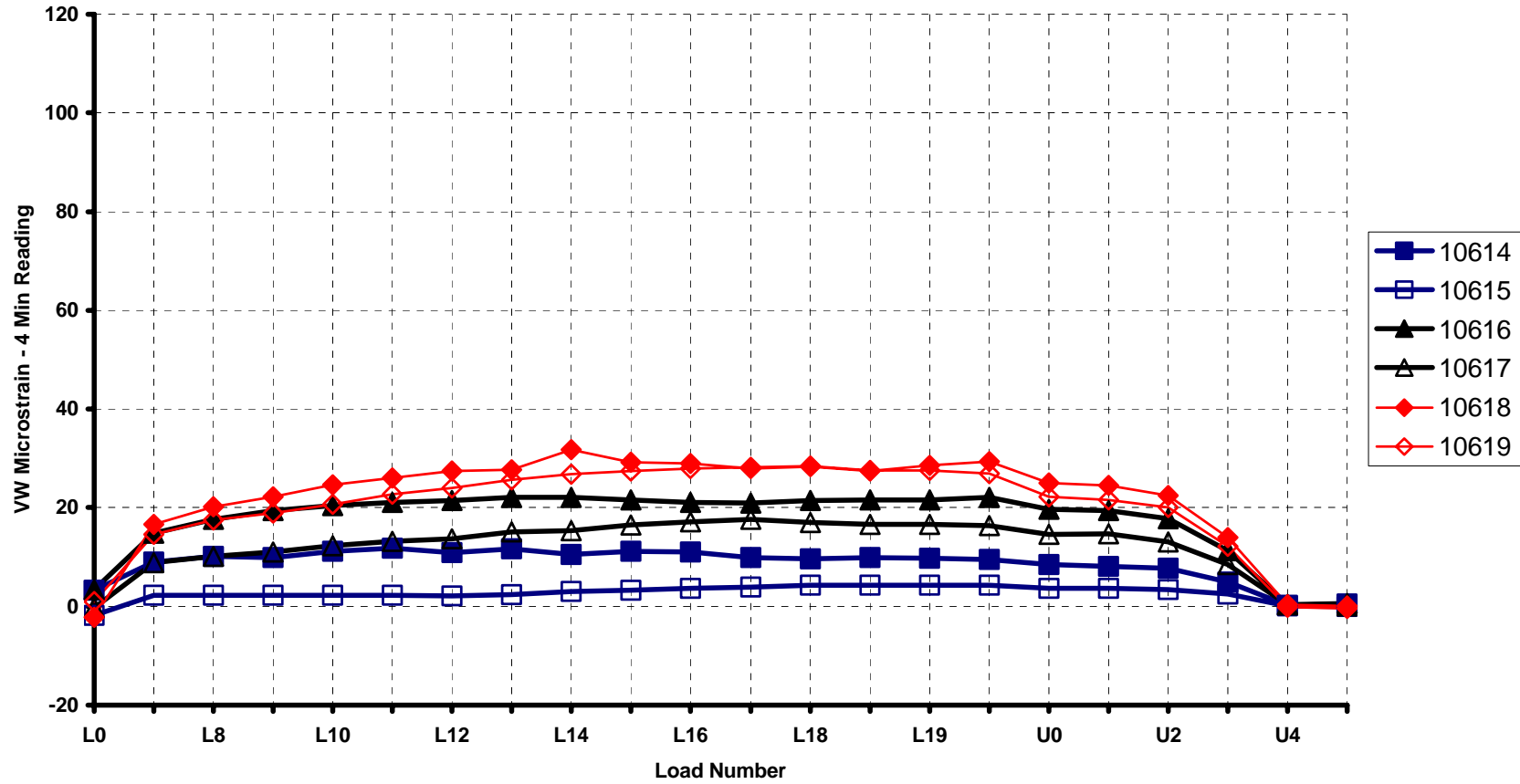


Figure F.2 Shaft Middle VW Strain, Shaft 2 - 2002

234

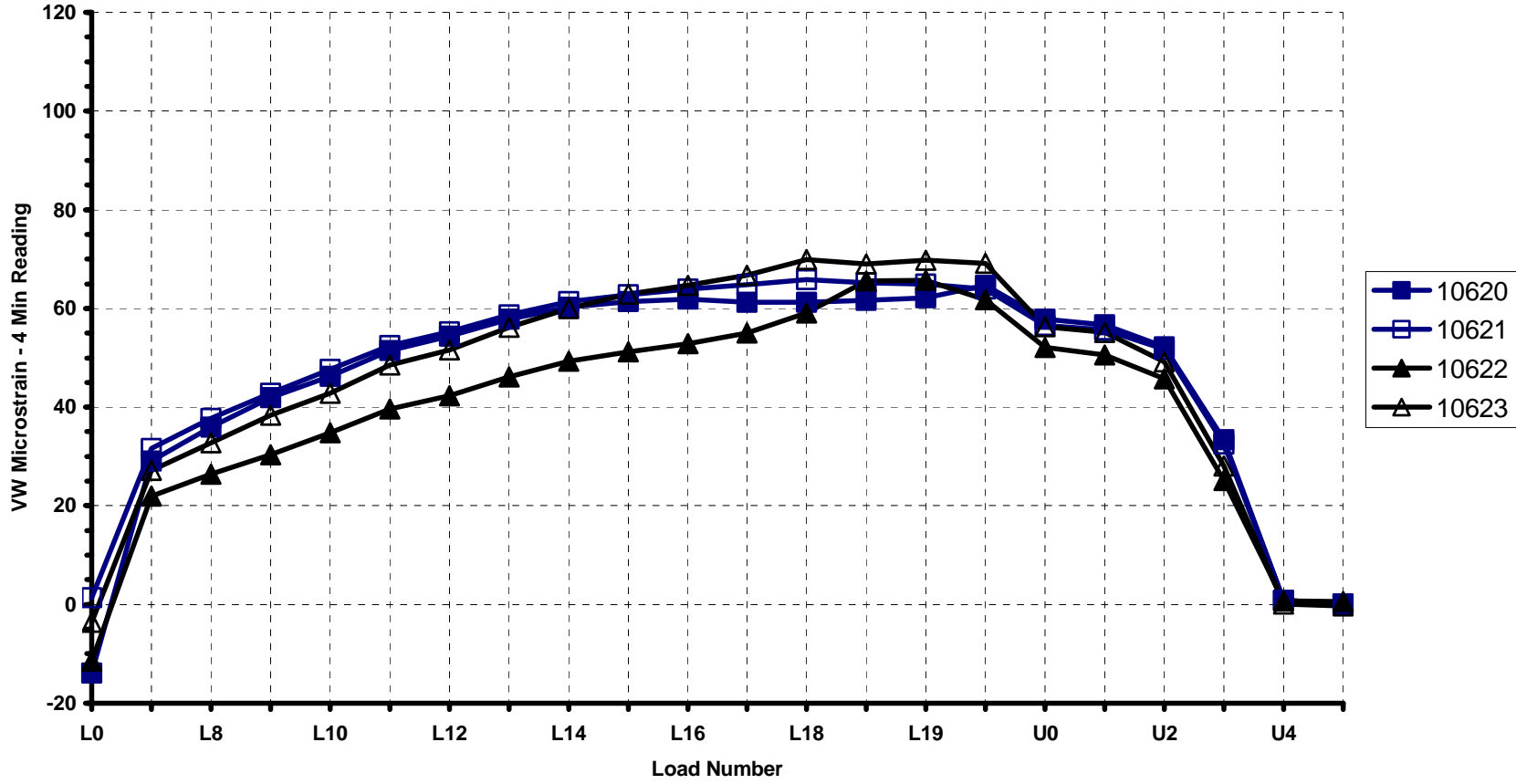


Figure F.3 Shaft Bottom VW Strain, Shaft 2 - 2002

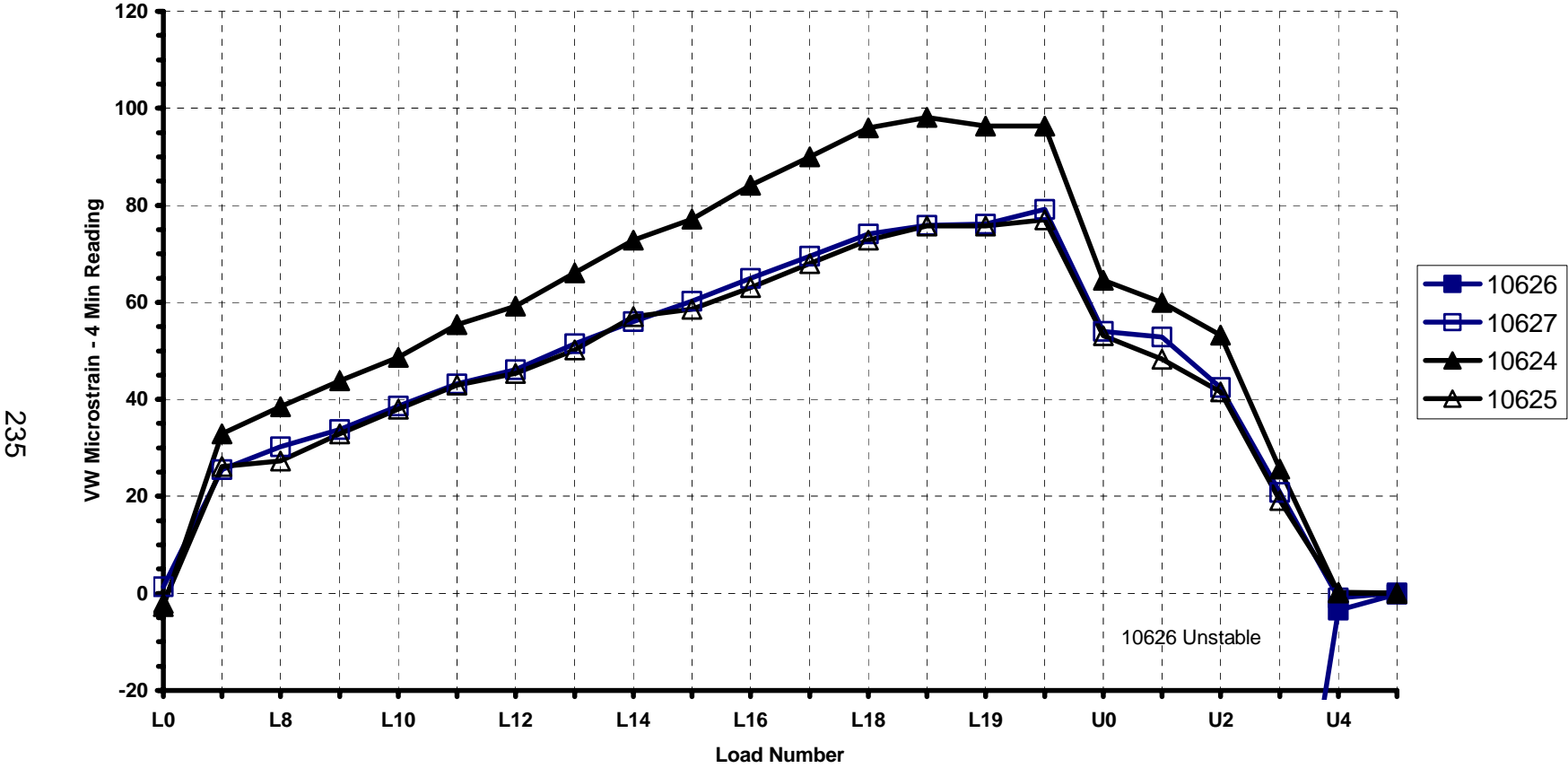


Figure F.4 Shear Stress vs. Movement, Shaft 2 - 2002

236

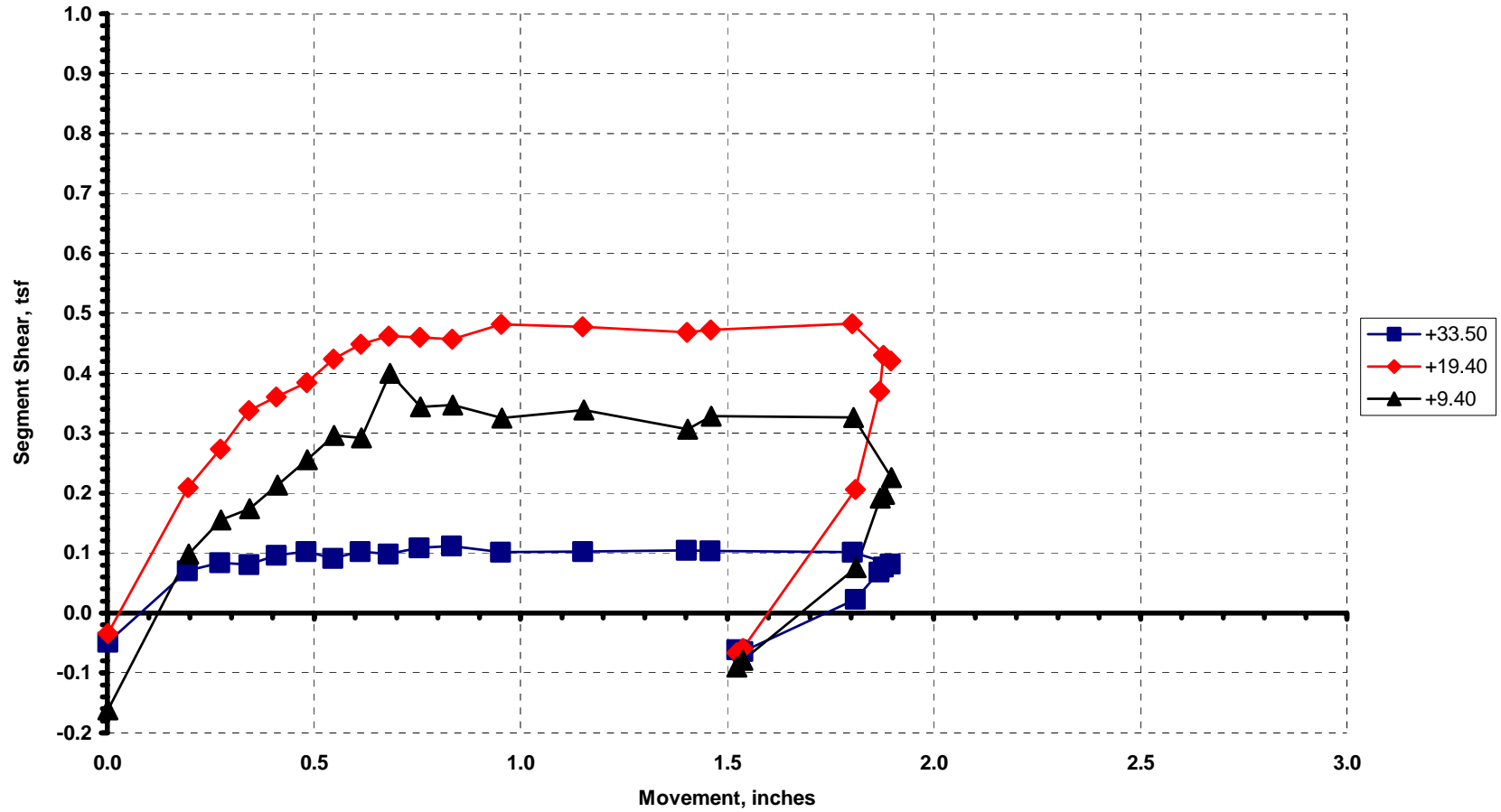


Figure F.5 Shear Stress vs. Movement, Shaft 2 - 2002

237

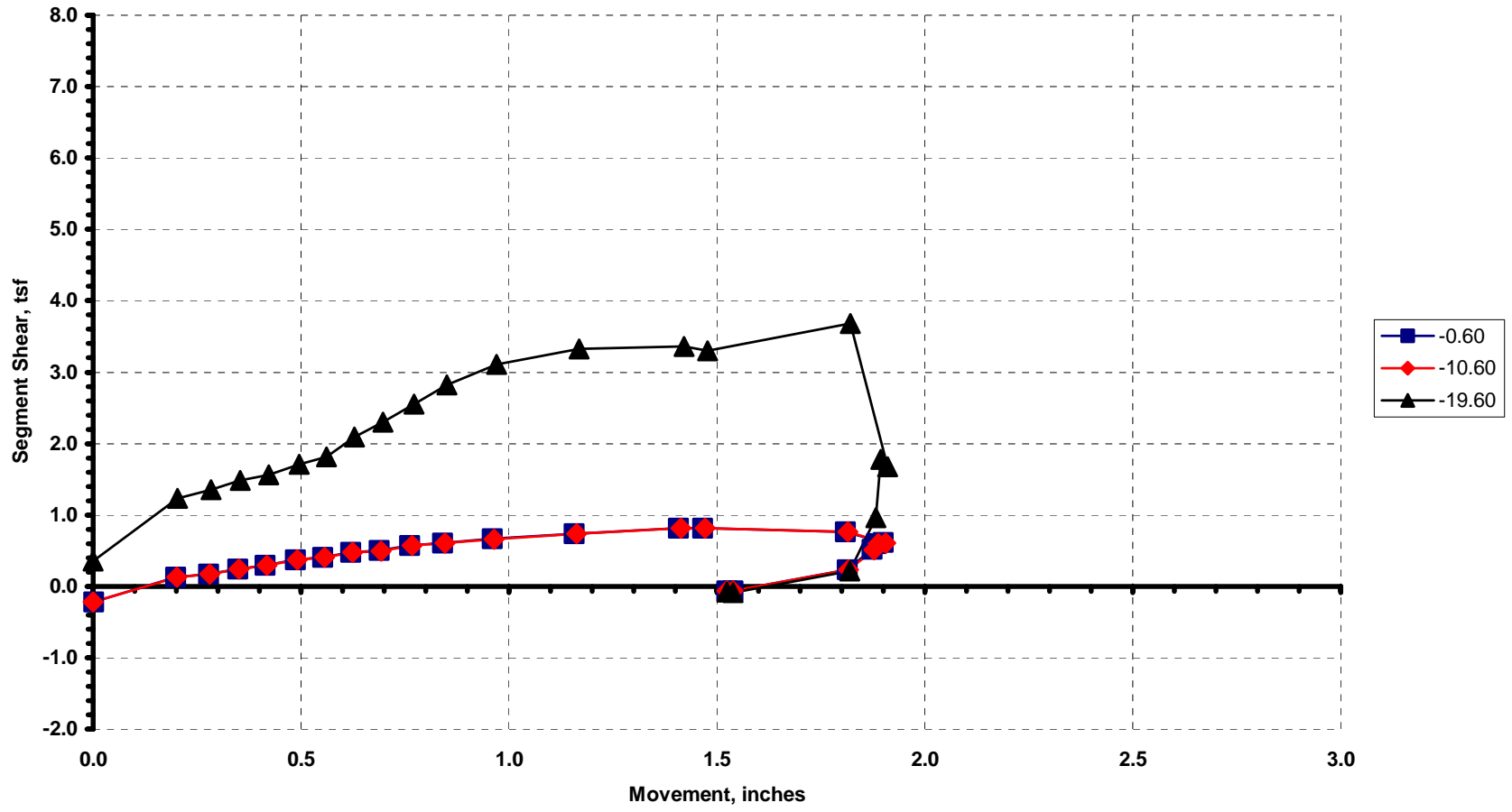


Figure F.6 Strain Distribution, Shaft 2 - 2002

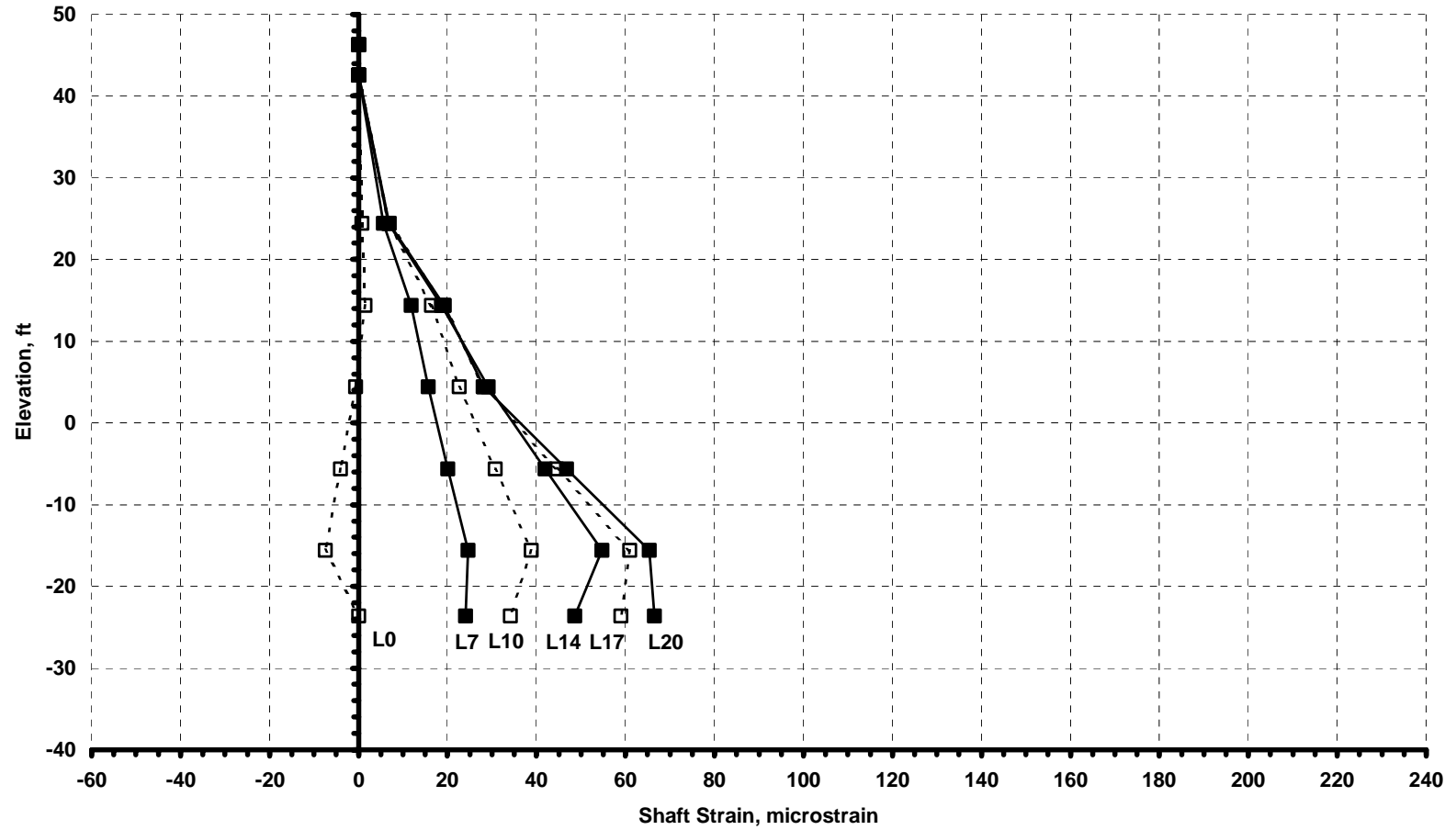


Figure F.7 Load Distribution, Shaft 2 - 2002

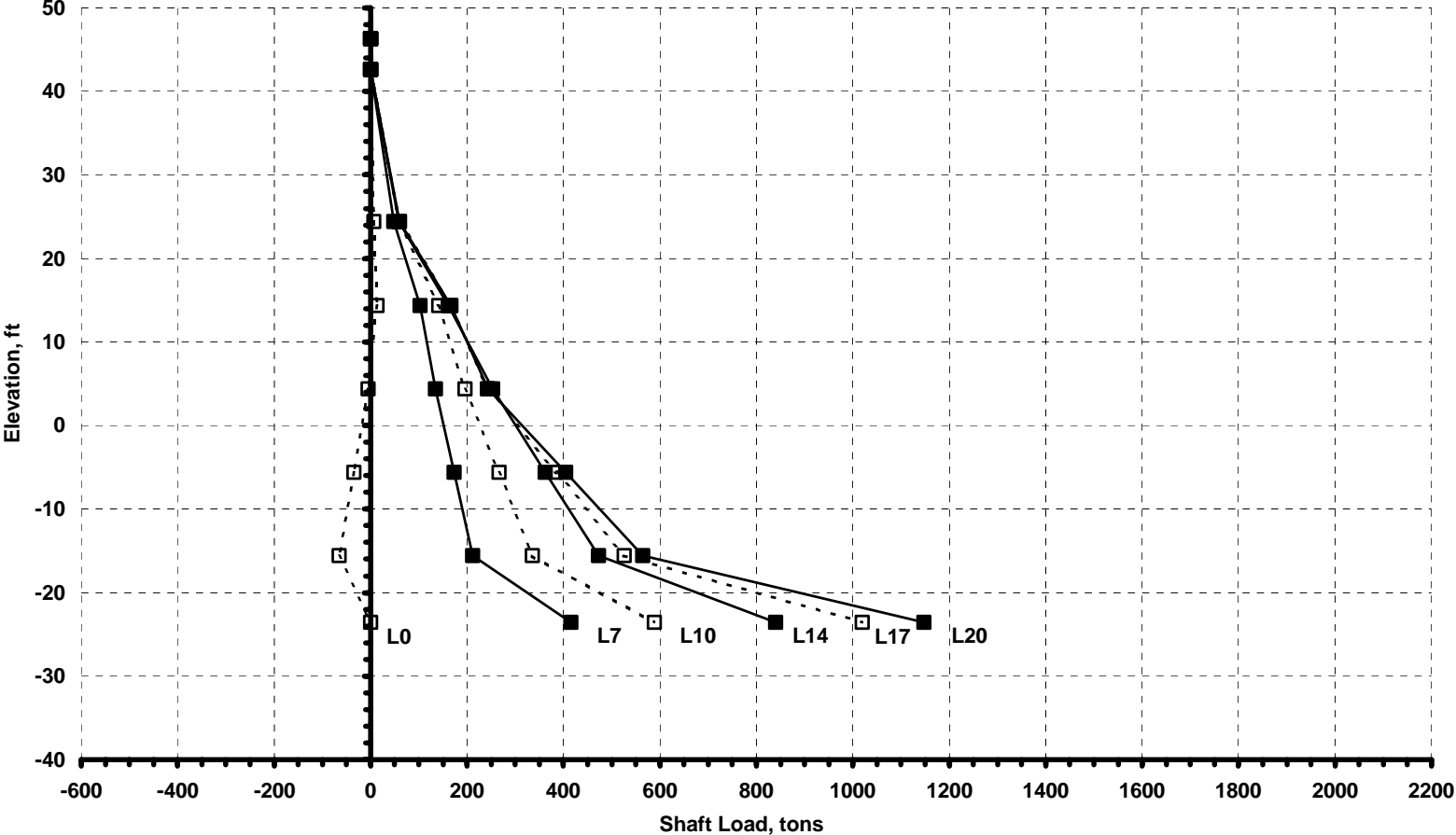


Figure F.8 Shear Stress Distribution, Shaft 2 - 2002

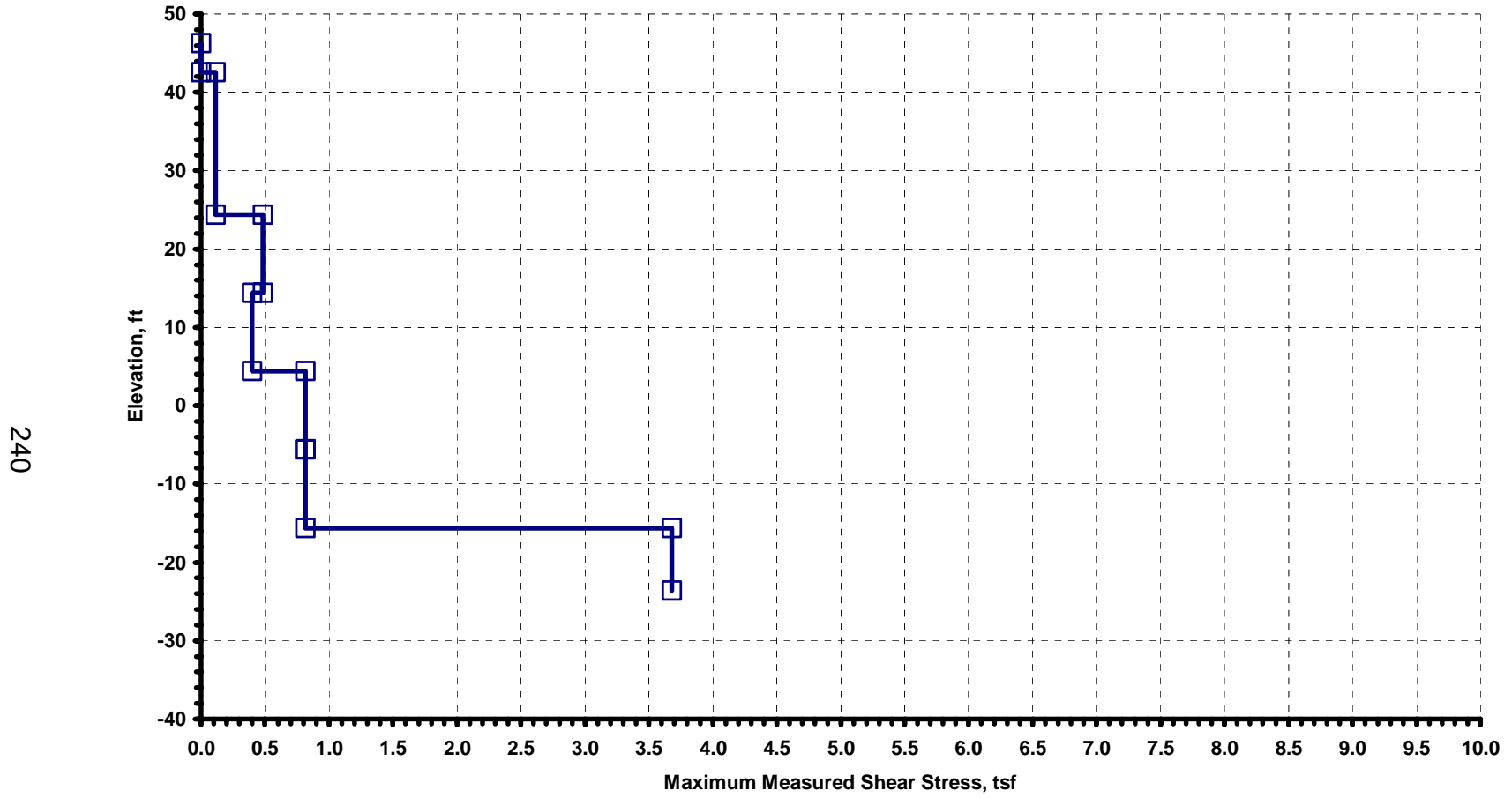


Figure F.9 Top of Shaft Indicators vs Survey Level, Stage 3 - Shaft 2 - 2002

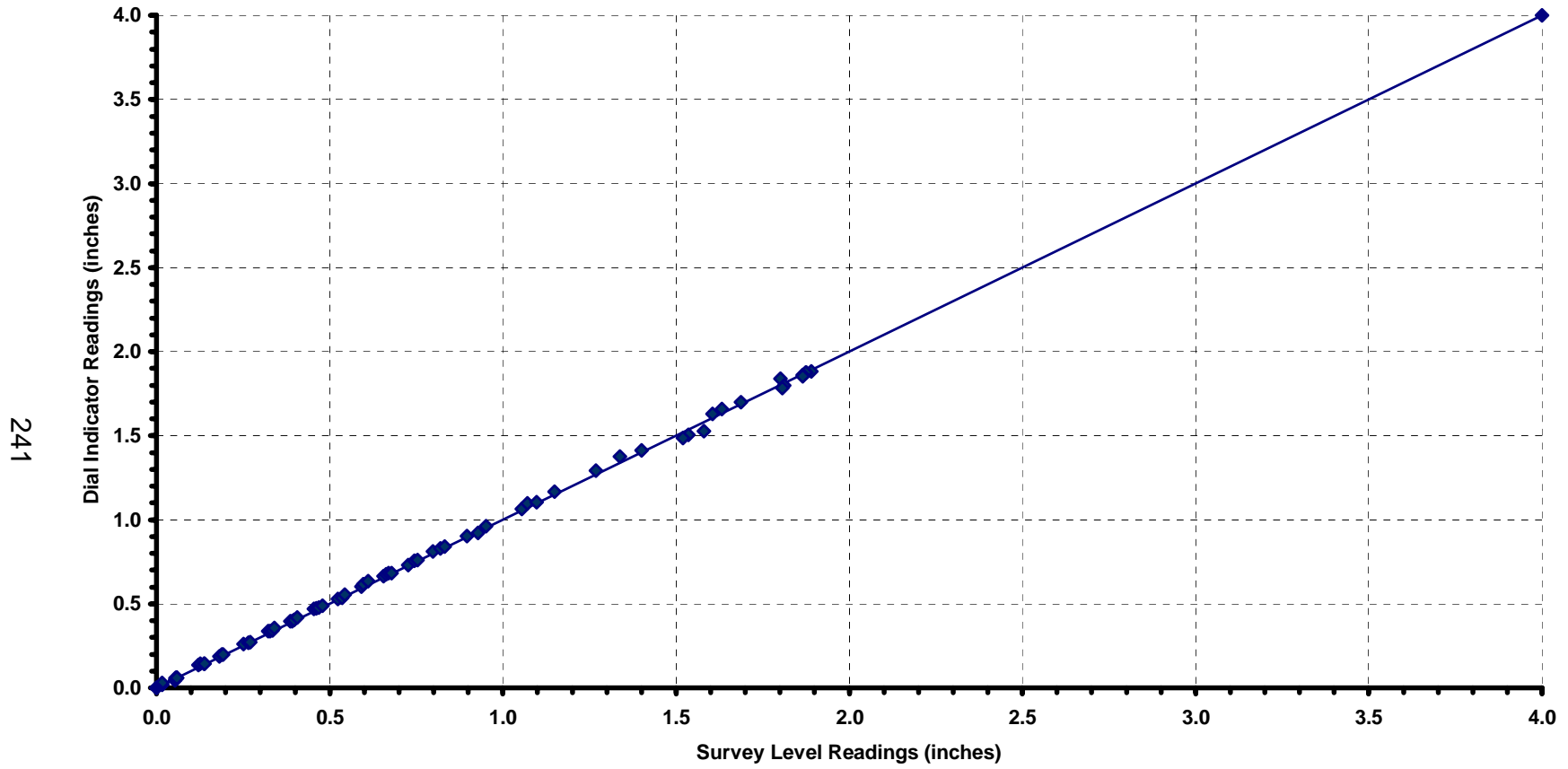


Figure F.10 Average Compression vs Load, Stage 3 - Shaft 2 - 2002

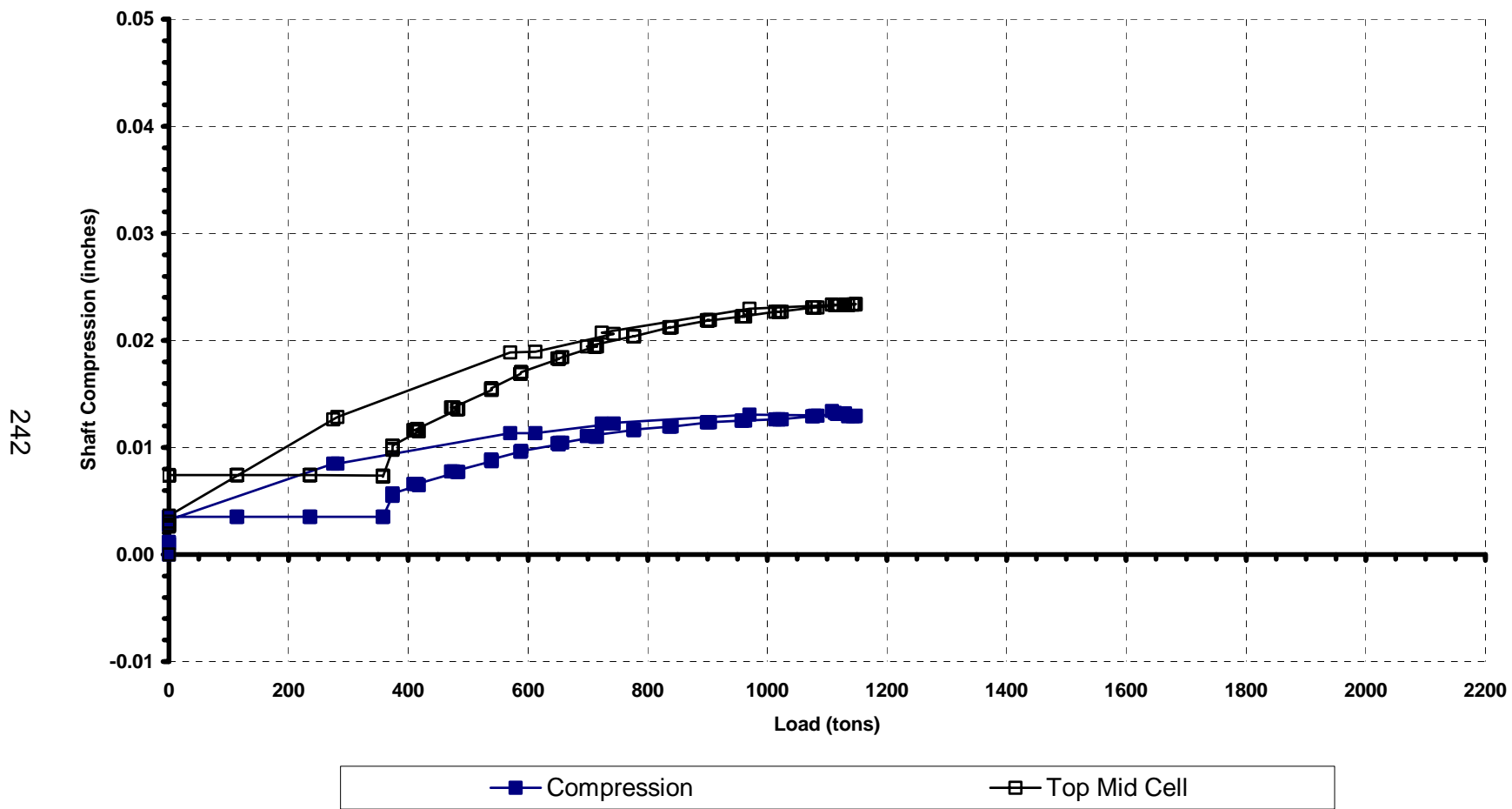
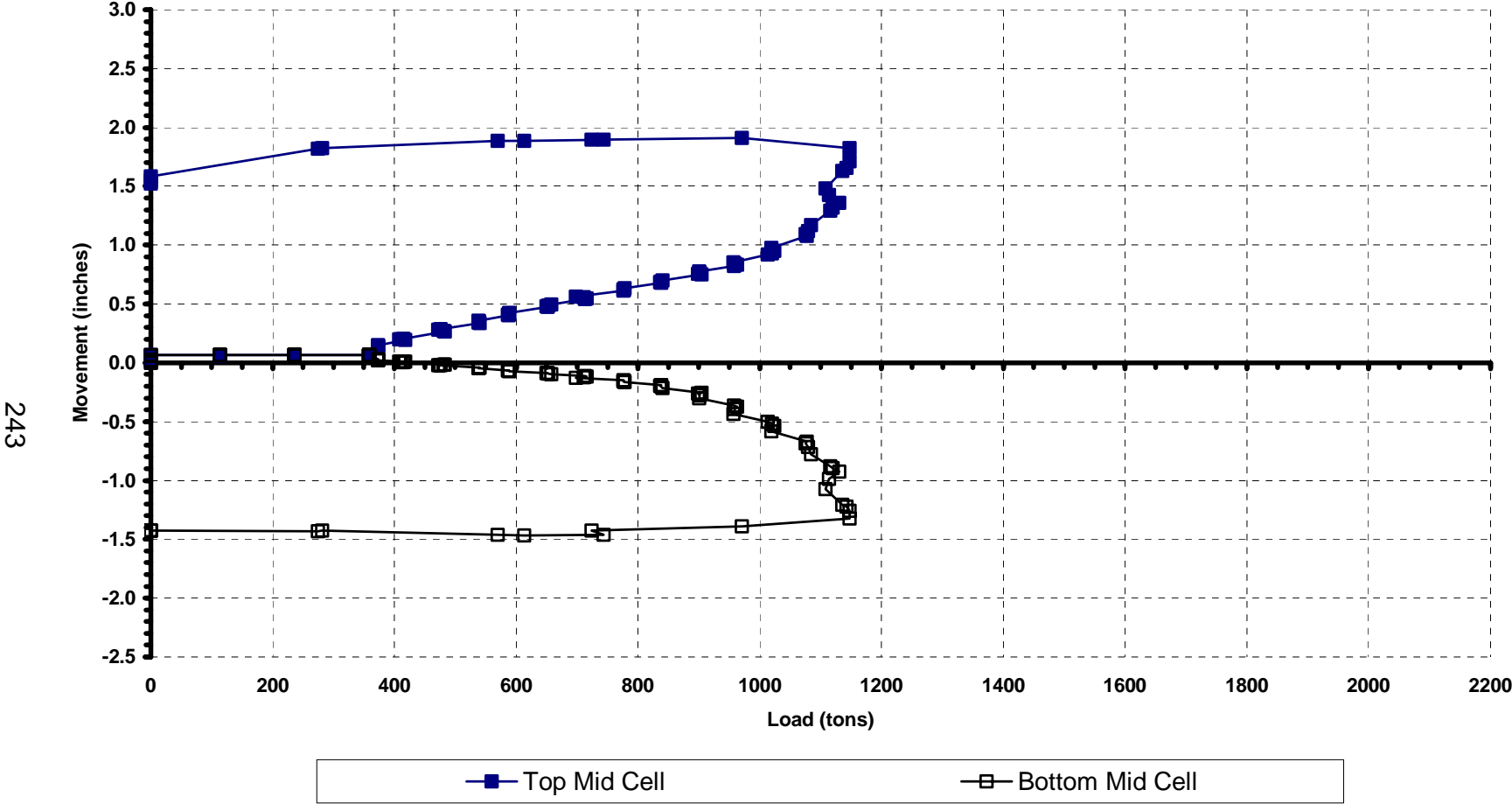


Figure F.11 Mid Cell Movement, Stage 3 - Shaft 2 - 2002



243

Figure F.12 Bottom Cell Movement, Stage 3 - Shaft 2 - 2002

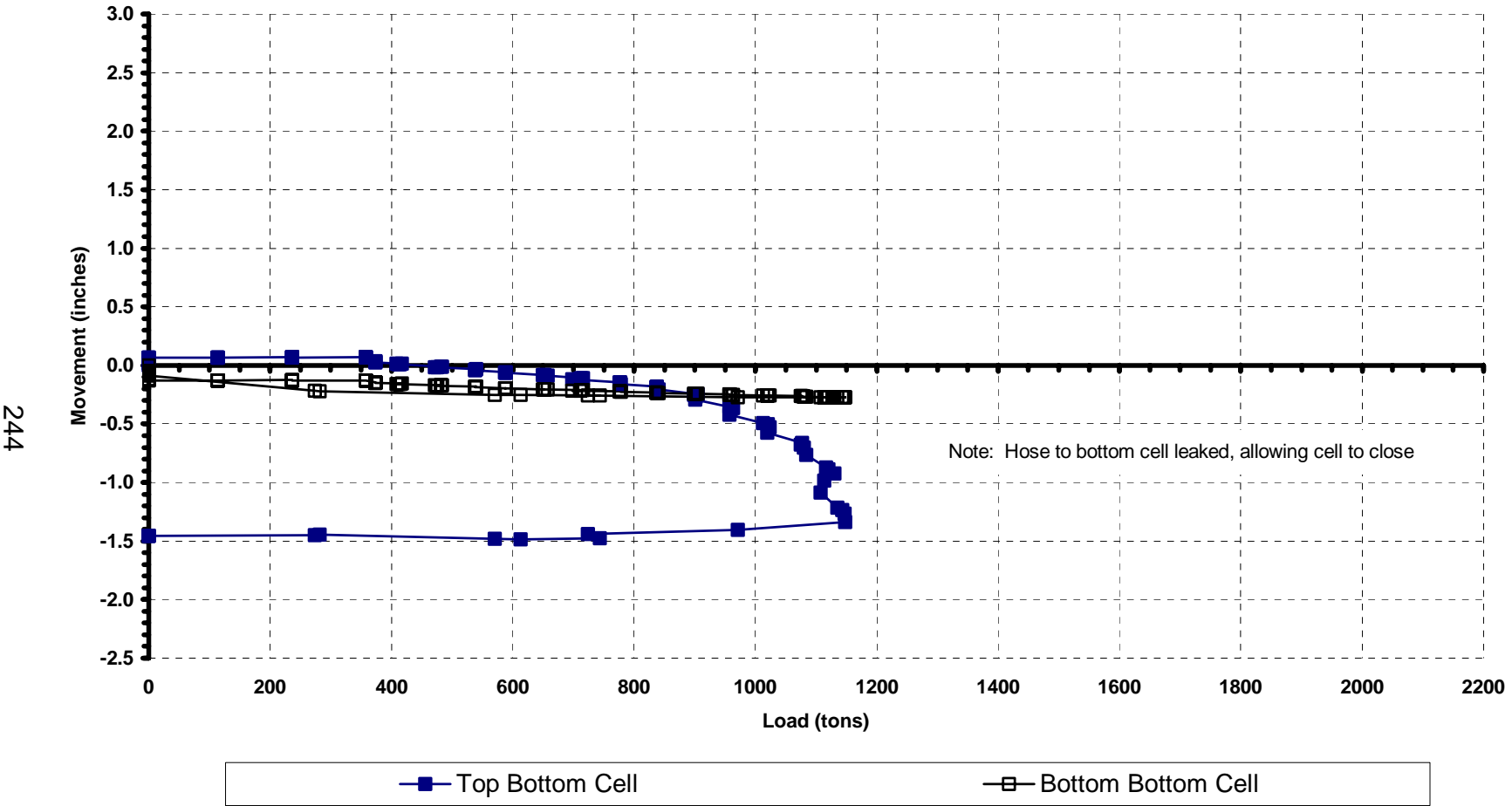


Figure F.13 VW Pressure Transducer vs Pressure Gage, Mid Cell - Stage 3 - Shaft 2 - 2002

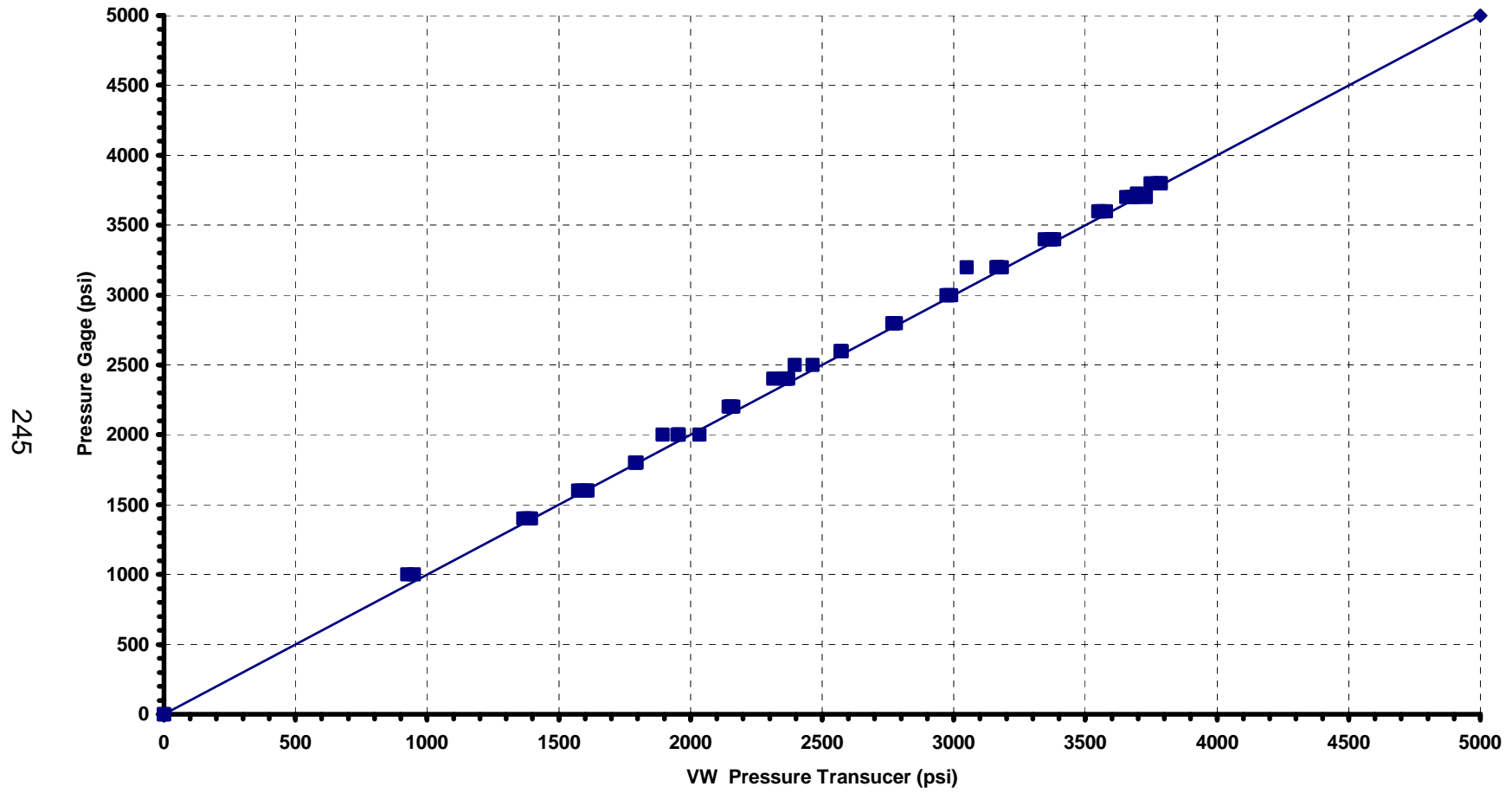
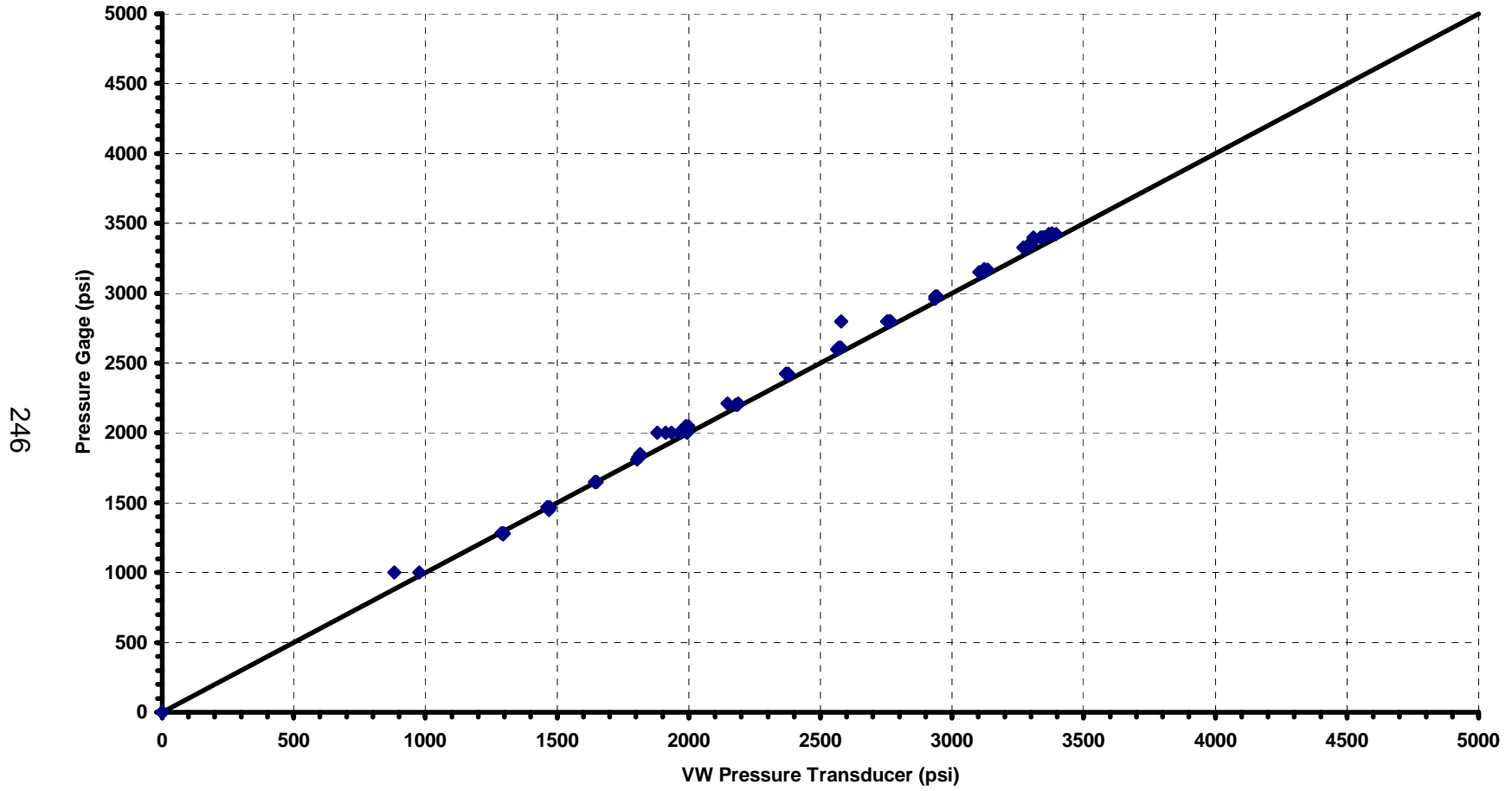


Figure F.14 VW Pressure vs Gage Pressure, Bottom Cell - Stage 3 - Shaft 2 - 2002



**APPENDIX G
TEST SHAFT 10 – ANALYSIS OF 1996 TEST**

Table G.1 Adjusted Indicator Readings, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
			Indicators			Compression		
			DG-A1 (inches)	DG-B1 (inches)	Average (inches)	TT-H (inches)	TT-G (inches)	Avg. Rdg (inches)
L0	0:00:00	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	105.8	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L1	0:01:00	114.7	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L1	0:02:00	98.3	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L1	0:04:00	101.8	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L2	0:00:30	227.1	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L2	0:01:00	256.5	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L2	0:02:00	249.5	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L2	0:04:00	253.0	-0.0003	0.0000	-0.0002	0.0000	-0.0001	-0.0001
L3	0:00:30	377.3	0.0226	0.0274	0.0250	0.0000	0.0009	0.0005
L3	0:01:00	385.8	0.0259	0.0308	0.0284	0.0000	0.0010	0.0005
L3	0:02:00	382.3	0.0276	0.0325	0.0301	0.0000	0.0010	0.0005
L3	0:04:00	375.4	0.0299	0.0345	0.0322	0.0000	0.0011	0.0006
L4	0:00:30	503.2	0.0464	0.0516	0.0490	0.0000	0.0014	0.0007
L4	0:01:00	500.7	0.0473	0.0526	0.0500	0.0000	0.0014	0.0007
L4	0:02:00	505.7	0.0489	0.0542	0.0516	0.0000	0.0014	0.0007
L4	0:04:00	505.7	0.0501	0.0553	0.0527	0.0000	0.0014	0.0007
L5	0:00:30	557.4	0.0552	0.0603	0.0578	0.0000	0.0015	0.0008
L5	0:01:00	563.9	0.0560	0.0612	0.0586	0.0000	0.0015	0.0008
L5	0:02:00	570.4	0.0578	0.0627	0.0603	0.0000	0.0015	0.0008
L5	0:04:00	552.0	0.0595	0.0630	0.0613	0.0000	0.0015	0.0008
L6	0:00:30	624.5	0.0653	0.0684	0.0669	0.0000	0.0015	0.0008
L6	0:01:00	630.5	0.0665	0.0694	0.0680	0.0000	0.0015	0.0008
L6	0:02:00	622.6	0.0670	0.0699	0.0685	0.0000	0.0015	0.0008
L6	0:04:00	632.5	0.0681	0.0709	0.0695	0.0000	0.0015	0.0008
L7	0:00:30	688.2	0.0742	0.0764	0.0753	0.0000	0.0016	0.0008
L7	0:01:00	689.7	0.0744	0.0770	0.0757	0.0000	0.0016	0.0008
L7	0:02:00	693.2	0.0758	0.0783	0.0771	0.0000	0.0016	0.0008
L7	0:04:00	688.2	0.0768	0.0791	0.0780	0.0000	0.0017	0.0009
L8	0:00:30	747.4	0.0828	0.0844	0.0836	0.0000	0.0017	0.0009
L8	0:01:00	753.3	0.0845	0.0861	0.0853	0.0000	0.0017	0.0009
L8	0:02:00	759.8	0.0871	0.0889	0.0880	0.0000	0.0018	0.0009
L8	0:04:00	752.8	0.0887	0.0904	0.0896	0.0000	0.0018	0.0009
L9	0:00:30	809.0	0.0949	0.0968	0.0959	0.0000	0.0019	0.0010
L9	0:01:00	804.5	0.0976	0.0993	0.0985	0.0000	0.0019	0.0010
L9	0:02:00	811.5	0.1008	0.1025	0.1017	0.0000	0.0020	0.0010
L9	0:04:00	818.0	0.1048	0.1064	0.1056	0.0000	0.0021	0.0011
L10	0:00:30	864.7	0.1111	0.1129	0.1120	0.0000	0.0022	0.0011
L10	0:01:00	874.7	0.1174	0.1192	0.1183	0.0000	0.0022	0.0011
L10	0:02:00	879.1	0.1275	0.1282	0.1279	0.0000	0.0023	0.0012
L10	0:04:00	882.6	0.1370	0.1373	0.1372	0.0000	0.0024	0.0012
L11	0:00:30	922.9	0.1417	0.1424	0.1421	0.0000	0.0025	0.0013

Table G.1 Adjusted Indicator Readings, Shaft 10 - 1996

Load Interval	Elapsed Time h:mm:ss	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
			Indicators			Compression		
			DG-A1 (inches)	DG-B1 (inches)	Average (inches)	TT-H (inches)	TT-G (inches)	Avg. Rdg (inches)
L11	0:01:00	937.3	0.1549	0.1557	0.1553	0.0000	0.0025	0.0013
L11	0:02:00	937.8	0.1643	0.1648	0.1646	0.0000	0.0026	0.0013
L11	0:04:00	937.3	0.1711	0.1713	0.1712	0.0000	0.0027	0.0014
L12	0:00:30	1020.9	0.2024	0.2028	0.2026	0.0000	0.0030	0.0015
L12	0:01:00	1024.9	0.2179	0.2171	0.2175	0.0000	0.0031	0.0016
L12	0:02:00	1038.3	0.2320	0.2311	0.2316	0.0000	0.0032	0.0016
L12	0:04:00	1020.4	0.2490	0.2464	0.2477	0.0000	0.0033	0.0017
L13	0:00:30	1120.8	0.2915	0.2872	0.2894	0.0000	0.0038	0.0019
L13	0:01:00	1132.3	0.3031	0.2983	0.3007	0.0000	0.0039	0.0020
L13	0:02:00	1118.3	0.3132	0.3085	0.3109	0.0000	0.0040	0.0020
L13	0:04:00	1126.7	0.3252	0.3201	0.3227	0.0000	0.0041	0.0021
L14	0:00:30	1249.1	0.3879	0.3817	0.3848	0.0000	0.0046	0.0023
L14	0:01:00	1246.1	0.4064	0.3991	0.4028	0.0000	0.0046	0.0023
L14	0:02:00	1243.1	0.4219	0.4139	0.4179	0.0000	0.0047	0.0024
L14	0:04:00	1245.1	0.4403	0.4316	0.4360	0.0000	0.0048	0.0024
L15	0:00:30	1374.4	0.5398	0.5347	0.5373	0.0000	0.0053	0.0027
L15	0:01:00	1376.9	0.5526	0.5472	0.5499	-0.0001	0.0054	0.0027
L15	0:02:00	1388.9	0.5709	0.5650	0.5680	-0.0001	0.0054	0.0027
L15	0:04:00	1373.9	0.5890	0.5831	0.5861	-0.0001	0.0056	0.0028
L16	0:00:30	1494.3	0.6684	0.6626	0.6655	-0.0003	0.0058	0.0028
L16	0:01:00	1497.8	0.6985	0.6915	0.6950	-0.0003	0.0059	0.0028
L16	0:02:00	1499.3	0.7232	0.7160	0.7196	-0.0004	0.0062	0.0029
L16	0:04:00	1503.2	0.7530	0.7458	0.7494	-0.0004	0.0062	0.0029
L17	0:00:30	1630.1	0.8862	0.8795	0.8829	-0.0008	0.0065	0.0029
L17	0:01:00	1621.1	0.9167	0.9089	0.9128	-0.0008	0.0065	0.0029
L17	0:02:00	1619.6	0.9461	0.9375	0.9418	-0.0008	0.0066	0.0029
L17	0:04:00	1620.6	0.9790	0.9698	0.9744	-0.0008	0.0067	0.0030
L18	0:00:30	1745.9	1.1281	1.1197	1.1239	-0.0011	0.0071	0.0030
L18	0:01:00	1747.4	1.1851	1.1762	1.1807	-0.0012	0.0072	0.0030
L18	0:02:00	1744.4	1.2224	1.2123	1.2174	-0.0012	0.0073	0.0031
L18	0:04:00	1745.4	1.2592	1.2490	1.2541	-0.0013	0.0073	0.0030
L19	0:00:30	1865.8	1.4660	1.4573	1.4617	-0.0017	0.0077	0.0030
L19	0:01:00	1865.8	1.5190	1.5097	1.5144	-0.0018	0.0078	0.0030
L19	0:02:00	1858.8	1.5757	1.5656	1.5707	-0.0019	0.0079	0.0030
L19	0:04:00	1869.3	1.6589	1.6488	1.6539	-0.0020	0.0081	0.0031
U1	0:00:30	1783.3	1.6926	1.6821	1.6874	-0.0020	0.0082	0.0031
U1	0:03:00	1801.1	1.7024	1.6924	1.6974	-0.0020	0.0082	0.0031
U2	0:00:30	1188.9	1.6938	1.6866	1.6902	-0.0027	0.0082	0.0028
U2	0:02:30	1182.0	1.6927	1.6854	1.6891	-0.0027	0.0082	0.0028
U3	0:00:30	567.8	1.6694	1.6616	1.6655	-0.0031	0.0074	0.0022
U3	0:02:30	569.8	1.6670	1.6591	1.6631	-0.0032	0.0066	0.0017
U4	0:00:30	0.0	1.5819	1.5741	1.5780	-0.0032	0.0056	0.0012
U4	0:03:00	0.0	1.5746	1.5667	1.5707	-0.0032	0.0055	0.0012

Table G.2 Calculated Strain, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	15.00	15.00	15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
L17	0:02:30		2.16	1.82	1.36	11.06	8.95	5.01	29.43	6.23	30.89	61.42	39.32	73.43	62.59	82.76	74.20	60.50	41.68	73.41
L17	0:03:00		2.19	2.00	1.36	10.91	8.88	5.69	29.43	6.48	30.93	61.56	39.00	73.47	62.56	83.35	74.20	59.98	41.53	73.31
L17	0:03:30		1.83	1.96	1.39	10.88	8.95	5.05	29.32	6.55	30.86	62.33	39.28	73.66	62.27	83.24	74.05	59.73	41.28	73.02
L17	0:04:00		1.87	2.14	1.39	10.99	8.95	5.08	29.36	6.80	30.86	62.04	40.07	73.77	62.88	83.31	74.30	59.95	40.98	72.98
L17	0:04:30		2.26	1.96	1.39	11.02	8.74	5.30	29.93	6.80	31.79	63.65	40.21	74.94	64.21	85.79	76.96	61.92	42.78	75.70
L18	0:00:00		1.98	1.96	1.39	11.95	6.52	6.66	31.43	3.15	32.82	66.57	37.14	76.26	65.61	88.06	78.93	63.60	44.74	77.81
L18	0:00:30		1.44	2.25	1.43	13.77	4.76	7.34	32.82	0.97	34.22	68.36	36.07	77.44	65.71	90.28	79.22	64.04	46.80	78.95
L18	0:01:00		1.51	2.21	1.46	13.09	4.33	7.69	33.17	1.04	34.15	68.98	36.10	78.43	65.79	90.28	78.93	62.80	46.65	78.81
L18	0:01:30		1.40	2.14	1.50	13.13	4.33	7.69	33.24	1.50	34.07	69.71	36.85	78.47	65.46	89.88	79.55	62.94	46.14	79.13
L18	0:02:00		1.87	2.03	1.54	13.13	4.30	7.12	33.10	1.90	33.97	69.20	37.00	78.80	65.39	89.33	79.66	63.42	45.47	78.66
L18	0:02:30		1.51	2.07	1.54	13.09	4.40	7.59	33.24	2.22	34.22	69.74	37.71	78.91	65.43	89.48	79.98	62.58	46.36	79.56
L18	0:03:00		1.55	1.93	1.54	13.13	4.48	7.59	33.21	2.50	33.93	69.82	38.14	79.06	64.82	89.33	79.58	62.43	45.51	79.16
L18	0:03:30		1.98	1.61	1.61	12.98	4.48	7.55	32.99	2.76	34.07	69.93	38.03	79.43	65.50	89.48	79.95	62.58	45.62	78.99
L18	0:04:00		1.58	1.96	1.64	13.02	4.44	7.51	32.96	2.90	33.75	70.00	38.21	79.57	65.46	89.11	79.80	62.65	46.54	80.06
L18	0:04:30		2.01	1.82	1.57	13.02	4.19	6.98	32.96	3.01	34.04	70.07	38.39	79.39	66.04	89.37	80.71	63.13	46.91	80.38
L18	0:05:00		1.98	2.07	1.54	14.80	3.19	7.87	33.74	1.15	35.50	72.08	37.14	81.48	68.30	92.32	82.75	66.01	49.30	82.99
L19	0:00:00		1.40	1.96	1.54	14.87	0.82	9.41	34.95	-1.50	37.33	74.05	34.82	83.25	69.34	93.75	84.32	66.93	50.81	84.67
L19	0:00:30		1.72	2.21	1.50	15.98	-0.25	9.84	35.92	-3.76	38.65	74.97	33.43	85.86	69.20	94.84	84.90	66.82	51.40	85.92
L19	0:01:00		1.72	2.28	1.50	15.37	-0.79	10.84	36.13	-3.90	39.83	75.95	33.28	86.92	68.77	94.81	85.26	66.78	51.95	86.27
L19	0:01:30		1.47	2.07	1.54	15.91	-0.97	11.02	36.49	-3.72	40.01	76.13	33.53	87.84	68.80	94.66	85.23	66.82	51.84	86.20
L19	0:02:00		1.80	2.18	1.57	15.12	-1.00	10.99	35.95	-3.44	40.26	76.13	33.85	88.47	68.98	94.73	85.74	66.86	51.36	86.17
L19	0:02:30		1.37	1.50	1.54	15.77	-1.18	11.45	35.92	-2.54	40.37	76.54	33.85	88.94	69.02	94.81	85.55	66.93	52.51	86.17
L19	0:03:00		1.76	1.86	1.68	14.98	-1.36	11.63	35.88	-3.36	41.15	76.75	34.25	89.35	69.34	94.66	85.41	67.00	51.36	86.13
L19	0:03:30		1.40	2.03	1.64	14.98	-1.40	11.27	35.88	-3.33	41.47	77.27	34.03	89.39	69.16	94.48	85.74	66.71	51.40	86.52
L19	0:04:00		1.47	1.57	1.64	15.09	-1.72	11.66	35.92	-3.26	41.26	77.96	34.35	89.53	69.12	94.51	85.77	66.78	51.81	86.52
L19	0:04:30		1.40	2.00	1.68	15.02	-1.86	11.41	35.92	-3.26	41.76	77.85	34.10	89.68	69.59	94.44	85.81	67.04	51.62	86.56
U1	0:00:00		1.44	1.68	1.72	14.87	-1.90	12.17	35.35	-3.26	41.08	76.61	33.39	88.39	67.19	92.51	82.93	64.74	49.49	83.59
U1	0:00:30		1.87	1.68	1.79	14.77	-1.79	12.02	35.42	-2.61	40.44	76.32	34.21	88.54	67.33	91.08	82.90	64.55	49.19	83.74
U1	0:01:00		1.80	1.25	1.75	15.30	-1.72	12.31	35.42	-2.72	40.44	76.32	34.43	88.72	67.22	91.38	82.57	64.19	49.04	83.59
U1	0:01:30		1.98	1.57	1.86	14.55	-1.65	12.20	35.27	-2.58	40.44	76.13	34.50	88.94	66.68	90.54	82.50	63.78	49.27	82.84
U1	0:02:00		1.62	1.71	1.86	14.52	-1.61	11.66	35.38	-1.72	40.29	76.35	34.50	88.98	66.83	91.52	82.71	63.53	48.68	83.74
U1	0:02:30		1.62	1.57	1.82	14.77	-1.58	11.66	35.35	-2.25	40.47	76.39	34.68	89.05	67.40	91.81	82.39	63.57	48.82	82.99
U1	0:03:00		1.33	1.64	1.79	14.94	-2.11	11.92	33.67	-4.29	37.26	70.44	26.82	78.58	56.42	79.81	68.15	52.38	36.86	67.66
U2	0:00:00		0.97	1.25	1.18	11.16	-4.91	9.52	27.65	-7.66	31.14	59.96	18.96	67.99	47.63	73.93	61.67	49.75	35.53	65.27
U2	0:00:30		1.51	0.96	1.18	11.59	-5.12	9.48	27.90	-7.51	31.25	61.02	19.25	67.55	47.45	73.86	60.98	48.54	35.24	64.59
U2	0:01:00		1.04	1.14	1.18	11.13	-5.55	9.41	27.69	-7.55	31.32	59.30	18.82	67.22	47.37	73.93	61.53	48.76	35.35	64.77
U2	0:01:30		1.51	1.14	1.18	11.13	-5.55	9.88	27.72	-7.41	31.11	60.58	19.14	67.33	47.41	73.97	61.53	48.91	34.83	64.62
U2	0:02:00		1.04	0.93	1.07	11.06	-5.55	9.88	27.79	-7.30	31.18	60.61	19.00	67.37	47.45	73.71	61.42	49.53	34.79	64.73
U2	0:02:30		1.44	1.11	1.11	11.13	-5.73	9.45	27.76	-7.26	31.39	60.65	19.25	67.41	47.45	73.93	61.42	48.62	34.87	64.62
U3	0:00:00		0.93	0.57	0.57	8.03	-7.88	7.87	18.24	-11.20	19.38	37.21	3.57	39.18	24.62	48.64	34.73	26.57	19.96	37.37
U3	0:00:30		0.32	0.43	0.61	8.03	-8.16	7.48	18.46	-10.95	19.27	36.88	3.68	38.81	24.26	48.10	34.22	26.28	21.02	37.47
U3	0:01:00		0.25	0.61	0.57	7.92	-8.38	7.19	18.46	-10.81	19.31	37.28	3.96	38.85	24.44	48.72	34.19	26.28	21.54	37.37
U3	0:01:30		0.79	0.36	0.57	7.92	-8.63	7.01	18.24	-10.73	19.20	36.62	3.89	38.48	24.08	48.13	33.64	26.06	21.58	36.94

Table G.2 Calculated Strain, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	15.00	15.00	15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
U3	0:02:00		0.50	0.36	0.43	7.88	-8.77	7.01	18.46	-10.63	19.27	36.92	4.04	38.70	24.30	48.35	34.00	26.21	21.47	37.08
U3	0:02:30		0.36	-0.07	0.07	2.60	-4.51	4.11	4.06	-4.72	4.15	5.84	-0.29	5.11	4.16	3.65	4.70	3.18	-5.63	3.61
U4	0:00:00		0.40	-0.18	0.07	0.61	-0.90	1.61	1.00	-0.57	1.25	1.68	0.36	1.36	0.86	0.77	1.53	1.17	-4.31	1.25
U4	0:00:30		0.11	-0.11	0.07	0.04	-0.36	1.25	0.75	-0.47	1.07	1.13	0.32	0.96	0.47	0.66	0.73	0.88	-2.84	0.89
U4	0:01:00		0.29	0.00	0.07	-0.14	-0.47	0.82	0.43	-0.25	1.00	0.95	0.25	0.74	0.50	0.29	0.51	0.69	-1.77	0.68
U4	0:01:30		-0.43	-0.07	0.00	0.21	-0.36	0.25	0.53	0.14	0.46	0.69	0.21	0.62	0.39	0.44	1.06	0.44	-1.22	0.50
U4	0:02:00		-0.54	0.04	-0.14	0.11	-0.32	0.97	0.29	-0.18	-0.29	0.47	0.07	0.48	0.22	0.36	0.04	0.37	-0.77	0.11
U4	0:02:30		0.00	0.14	0.00	-0.25	-0.21	0.93	0.18	0.25	0.61	0.26	0.11	0.29	0.18	-0.29	0.00	0.26	-0.52	0.11
U4	0:03:00		0.36	-0.14	-0.04	-0.32	-0.36	0.86	0.11	0.32	0.18	0.18	0.07	0.22	0.11	-0.11	-0.07	0.15	-0.33	-0.14
U4	0:03:30		0.18	0.14	0.00	-0.29	-0.18	0.04	0.21	0.25	0.50	0.11	0.07	0.22	0.14	-0.22	0.80	0.07	-0.11	0.04
U4	0:04:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table G.3 Calculated Strain, 4 Minute Readings, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
L0	0:00:00		-0.65	1.71	-2.00	-14.77	40.97	-22.08	-17.85	41.65	-21.24	-16.80	44.35	-16.25	-10.48	36.42	-7.03	-4.09	22.46	-15.29
L1	0:04:00		-0.50	1.82	-1.75	-14.73	40.82	-21.76	-17.14	41.22	-20.67	-16.76	44.60	-15.77	-10.98	38.10	-6.88	-4.39	23.05	-14.97
L2	0:04:00		-0.18	2.21	-1.68	-11.27	35.95	-17.32	-10.01	30.49	-11.69	-3.36	23.50	0.33	2.80	10.22	8.37	3.22	13.26	-6.97
L3	0:04:00		0.50	2.78	0.07	-7.49	38.14	-13.74	-3.24	35.14	-5.29	4.31	36.28	8.16	16.69	28.97	17.44	17.25	17.67	5.54
L4	0:04:00		0.61	3.00	0.36	-6.53	38.82	-13.02	-1.00	36.96	-1.11	8.65	43.35	16.21	28.46	34.48	26.43	28.66	21.80	17.54
L5	0:04:00		0.75	3.18	0.57	-6.35	38.60	-13.38	-0.78	37.07	-0.25	9.06	44.00	17.20	29.97	33.65	27.67	29.39	21.10	18.36
L6	0:04:00		1.26	3.21	0.68	-5.99	38.03	-12.74	0.53	37.00	1.47	10.99	45.96	20.69	33.09	36.31	31.02	32.71	22.72	22.76
L7	0:04:00		0.86	2.96	0.61	-5.53	37.71	-12.56	1.46	36.64	3.29	12.71	47.64	23.67	35.42	38.54	34.04	35.49	24.45	26.97
L8	0:04:00		1.11	3.25	0.75	-5.17	36.42	-11.41	2.35	35.89	5.18	14.39	48.64	27.05	37.47	40.80	36.81	37.47	25.33	30.08
L9	0:04:00		1.37	3.35	0.86	-4.42	35.06	-10.52	3.92	34.60	7.54	16.47	48.50	30.47	39.87	43.61	39.76	39.84	26.18	33.79
L10	0:04:00		1.51	3.25	0.86	-3.25	32.98	-8.80	6.09	32.06	11.37	19.65	48.00	34.55	41.78	46.27	42.70	42.07	27.39	37.26
L11	0:04:00		1.11	3.14	0.82	-1.75	31.19	-7.69	7.87	29.84	13.26	21.87	47.64	38.00	43.39	48.75	45.40	43.61	28.43	40.19
L12	0:04:00		1.40	2.93	0.89	-0.29	27.54	-4.62	10.62	24.98	17.81	25.52	44.89	44.33	45.51	51.86	49.18	45.11	29.31	44.37
L13	0:04:00		1.51	2.68	0.93	1.57	24.42	-2.33	13.43	21.90	21.09	30.89	44.85	51.79	49.71	57.62	55.77	50.63	32.36	52.44
L14	0:04:00		1.58	2.46	1.11	3.46	20.56	-0.32	17.14	17.57	23.92	36.19	43.32	57.08	52.29	61.71	59.92	51.47	32.77	56.09
L15	0:04:00		2.08	2.25	1.32	5.96	16.94	1.43	21.49	14.35	26.74	46.12	43.67	64.14	57.35	70.50	66.99	56.29	36.45	64.95
L16	0:04:00		2.16	2.03	1.39	8.63	13.25	3.58	25.58	10.23	28.17	53.24	41.39	69.13	59.65	76.38	70.19	57.83	37.59	68.05
L17	0:04:00		1.87	2.14	1.39	10.99	8.95	5.08	29.36	6.80	30.86	62.04	40.07	73.77	62.88	83.31	74.30	59.95	40.98	72.98
L18	0:04:00		1.58	1.96	1.64	13.02	4.44	7.51	32.96	2.90	33.75	70.00	38.21	79.57	65.46	89.11	79.80	62.65	46.54	80.06
L19	0:04:00		1.47	1.57	1.64	15.09	-1.72	11.66	35.92	-3.26	41.26	77.96	34.35	89.53	69.12	94.51	85.77	66.78	51.81	86.52
U1	0:03:00		1.33	1.64	1.79	14.94	-2.11	11.92	33.67	-4.29	37.26	70.44	26.82	78.58	56.42	79.81	68.15	52.38	36.86	67.66
U2	0:02:30		1.44	1.11	1.11	11.13	-5.73	9.45	27.76	-7.26	31.39	60.65	19.25	67.41	47.45	73.93	61.42	48.62	34.87	64.62
U3	0:02:30		0.36	-0.07	0.07	2.60	-4.51	4.11	4.06	-4.72	4.15	5.84	-0.29	5.11	4.16	3.65	4.70	3.18	-5.63	3.61
U4	0:03:00		0.36	-0.14	-0.04	-0.32	-0.36	0.86	0.11	0.32	0.18	0.18	0.07	0.22	0.11	-0.11	-0.07	0.15	-0.33	-0.14

Table G.4 Average Calculated Strain, 4 Minute Readings, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain							
		Elev. +47.50	Elev. +15.00	Elev. -20.00	Elev. -26.00	Elev. -32.00	Elev. -37.50	Elev. -42.00	Elev. -47.50
L0	0:00:00	0.00	-0.31	1.37	0.85	3.77	0.00	6.30	1.03
L1	0:04:00	0.00	-0.14	1.45	1.14	4.03	8.14	6.74	1.23
L2	0:04:00	0.00	0.12	2.45	2.93	6.82	20.22	7.13	3.17
L3	0:04:00	0.00	1.12	5.64	8.87	16.25	30.00	21.03	13.49
L4	0:04:00	0.00	1.32	6.42	11.62	22.74	40.42	29.79	22.67
L5	0:04:00	0.00	1.50	6.29	12.01	23.42	44.11	30.43	22.95
L6	0:04:00	0.00	1.72	6.43	13.00	25.88	50.55	33.47	26.06
L7	0:04:00	0.00	1.48	6.54	13.80	28.01	55.00	36.00	28.97
L8	0:04:00	0.00	1.70	6.61	14.48	30.03	60.16	38.36	30.96
L9	0:04:00	0.00	1.86	6.71	15.36	31.81	65.37	41.08	33.27
L10	0:04:00	0.00	1.87	6.98	16.51	34.06	70.54	43.58	35.58
L11	0:04:00	0.00	1.69	7.25	16.99	35.84	74.91	45.85	37.41
L12	0:04:00	0.00	1.74	7.55	17.80	38.25	81.55	48.85	39.59
L13	0:04:00	0.00	1.70	7.89	18.81	42.51	90.05	54.37	45.14
L14	0:04:00	0.00	1.72	7.90	19.54	45.53	99.51	57.97	46.77
L15	0:04:00	0.00	1.88	8.11	20.86	51.31	109.81	64.95	52.56
L16	0:04:00	0.00	1.86	8.49	21.33	54.59	120.14	68.74	54.49
L17	0:04:00	0.00	1.80	8.34	22.34	58.62	129.52	73.50	57.97
L18	0:04:00	0.00	1.73	8.32	23.20	62.59	139.50	78.13	63.08
L19	0:04:00	0.00	1.56	8.34	24.64	67.28	149.39	83.14	68.37
U1	0:03:00	0.00	1.59	8.25	22.21	58.61	143.95	68.13	52.30
U2	0:02:30	0.00	1.22	4.95	17.29	49.10	94.47	60.93	49.37
U3	0:02:30	0.00	0.12	0.74	1.16	3.56	45.54	4.17	0.38
U4	0:03:00	0.00	0.06	0.06	0.20	0.16	0.00	-0.02	-0.11

Ground
Surface

Top of
Mid Cell

Table G.5 Shaft Load, 4 Minute Readings, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Shaft Load, tons					
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.50	+15.00	-20.00	-26.00	-32.00	-37.50
L0	0:00:00	0.00	-4.00	17.66	10.69	47.18	0.0
L1	0:04:00	0.00	-1.86	18.58	14.25	50.36	101.8
L2	0:04:00	0.00	1.51	31.54	36.63	85.37	253.0
L3	0:04:00	0.00	14.38	72.40	110.96	203.33	375.4
L4	0:04:00	0.00	16.98	82.50	145.38	284.51	505.7
L5	0:04:00	0.00	19.28	80.82	150.30	293.01	552.0
L6	0:04:00	0.00	22.04	82.65	162.66	323.84	632.5
L7	0:04:00	0.00	18.98	84.02	172.64	350.41	688.2
L8	0:04:00	0.00	21.89	84.93	181.12	375.69	752.8
L9	0:04:00	0.00	23.88	86.14	192.13	398.03	818.0
L10	0:04:00	0.00	24.04	89.64	206.56	426.21	882.6
L11	0:04:00	0.00	21.74	93.14	212.64	448.42	937.3
L12	0:04:00	0.00	22.36	96.94	222.72	478.55	1020.4
L13	0:04:00	0.00	21.90	101.34	235.35	531.91	1126.7
L14	0:04:00	0.00	22.06	101.46	244.52	569.66	1245.1
L15	0:04:00	0.00	24.21	104.17	261.00	642.01	1373.9
L16	0:04:00	0.00	23.91	109.02	266.89	683.02	1503.2
L17	0:04:00	0.00	23.14	107.14	279.50	733.53	1620.6
L18	0:04:00	0.00	22.21	106.94	290.32	783.20	1745.4
L19	0:04:00	0.00	20.07	107.20	308.30	841.86	1869.3
U1	0:03:00	0.00	20.37	105.97	277.91	733.38	1801.1
U2	0:02:30	0.00	15.63	63.57	216.40	614.39	1182.0
U3	0:02:30	0.00	1.54	9.45	14.54	44.48	569.8
U4	0:03:00	0.00	0.77	0.77	2.53	1.98	0.0
Modulus, ksi		4423.1	4423.1	4423.1	3805.7	3805.7	3805.7
Diameter, in		86.00	86.00	86.00	91.50	91.50	91.50

Top of
Shaft

Ocell

Table G.6 Average Segment Side Shear, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf					
		CL Elev., ft	+31.25	-2.50	-23.00	-29.00	-34.75
		Length, ft	32.50	35.00	6.00	6.00	5.50
L0	0:00:00		-0.08	-0.05	-0.13	0.17	-0.44
L1	0:04:00		-0.08	-0.05	-0.11	0.17	0.31
L2	0:04:00		-0.08	-0.04	-0.04	0.26	1.19
L3	0:04:00		-0.06	0.00	0.20	0.56	1.22
L4	0:04:00		-0.06	0.00	0.37	0.88	1.60
L5	0:04:00		-0.05	0.00	0.42	0.91	1.88
L6	0:04:00		-0.05	0.00	0.49	1.04	2.26
L7	0:04:00		-0.05	0.00	0.55	1.15	2.48
L8	0:04:00		-0.05	0.00	0.61	1.27	2.78
L9	0:04:00		-0.05	0.00	0.68	1.35	3.10
L10	0:04:00		-0.05	0.00	0.76	1.44	3.38
L11	0:04:00		-0.05	0.01	0.78	1.56	3.63
L12	0:04:00		-0.05	0.02	0.82	1.70	4.03
L13	0:04:00		-0.05	0.02	0.88	1.98	4.43
L14	0:04:00		-0.05	0.02	0.95	2.18	5.04
L15	0:04:00		-0.05	0.02	1.04	2.57	5.47
L16	0:04:00		-0.05	0.03	1.05	2.81	6.14
L17	0:04:00		-0.05	0.03	1.16	3.08	6.65
L18	0:04:00		-0.05	0.03	1.23	3.35	7.22
L19	0:04:00		-0.05	0.03	1.36	3.63	7.71
U1	0:03:00		-0.05	0.03	1.15	3.09	8.02
U2	0:02:30		-0.06	-0.02	1.02	2.69	4.22
U3	0:02:30		-0.08	-0.07	-0.04	0.12	3.90
U4	0:03:00		-0.08	-0.08	-0.07	-0.09	-0.10
Segment Wt., tons			57.42	61.84	11.30	12.00	11.00
Maximum Shear, tsf			-0.05	0.03	1.36	3.63	8.02

Table G.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 10 -

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain					Shaft Compression					
		CL Elev., ft	+31.25	-2.50	-23.00	-29.00	-34.75	Strain Gage		TT in	Error in	Error %
		Length, ft	32.50	35.00	6.00	6.00	5.50	Net, in	Change, in			
L0	0:00:00		-0.16	0.53	1.11	2.31	1.89	0.0005	0.0000	0.0000	0.0000	
L1	0:04:00		-0.07	0.65	1.29	2.58	6.08	0.0009	0.0004	-0.0002	0.0005	-361.2%
L2	0:04:00		0.06	1.29	2.69	4.88	13.52	0.0020	0.0015	-0.0005	0.0020	-393.4%
L3	0:04:00		0.56	3.38	7.25	12.56	23.12	0.0046	0.0041	0.0008	0.0033	440.8%
L4	0:04:00		0.66	3.87	9.02	17.18	31.58	0.0059	0.0053	0.0015	0.0038	254.7%
L5	0:04:00		0.75	3.90	9.15	17.71	33.76	0.0061	0.0056	0.0018	0.0038	208.8%
L6	0:04:00		0.86	4.07	9.72	19.44	38.22	0.0067	0.0061	0.0021	0.0040	192.1%
L7	0:04:00		0.74	4.01	10.17	20.90	41.50	0.0069	0.0064	0.0024	0.0040	167.3%
L8	0:04:00		0.85	4.16	10.54	22.25	45.09	0.0074	0.0069	0.0027	0.0042	154.9%
L9	0:04:00		0.93	4.28	11.03	23.58	48.59	0.0079	0.0073	0.0030	0.0044	148.4%
L10	0:04:00		0.94	4.42	11.74	25.29	52.30	0.0083	0.0078	0.0034	0.0045	133.1%
L11	0:04:00		0.85	4.47	12.12	26.42	55.38	0.0086	0.0081	0.0037	0.0045	122.0%
L12	0:04:00		0.87	4.64	12.67	28.02	59.90	0.0092	0.0086	0.0043	0.0043	100.9%
L13	0:04:00		0.85	4.80	13.35	30.66	66.28	0.0099	0.0094	0.0048	0.0046	94.9%
L14	0:04:00		0.86	4.81	13.72	32.54	72.52	0.0105	0.0099	0.0054	0.0046	85.7%
L15	0:04:00		0.94	5.00	14.48	36.08	80.56	0.0114	0.0109	0.0058	0.0051	87.8%
L16	0:04:00		0.93	5.17	14.91	37.96	87.36	0.0121	0.0116	0.0061	0.0055	89.8%
L17	0:04:00		0.90	5.07	15.34	40.48	94.07	0.0127	0.0122	0.0066	0.0056	84.5%
L18	0:04:00		0.86	5.03	15.76	42.90	101.04	0.0133	0.0128	0.0072	0.0056	77.9%
L19	0:04:00		0.78	4.95	16.49	45.96	108.34	0.0140	0.0135	0.0081	0.0054	67.7%
U1	0:03:00		0.79	4.92	15.23	40.41	101.28	0.0131	0.0125	0.0082	0.0044	53.8%
U2	0:02:30		0.61	3.08	11.12	33.20	71.78	0.0095	0.0089	0.0070	0.0019	27.5%
U3	0:02:30		0.06	0.43	0.95	2.36	24.55	0.0021	0.0015	0.0017	-0.0002	-10.1%
U4	0:03:00		0.03	0.06	0.13	0.18	0.08	0.0001	-0.0005	-0.0003	-0.0002	87.6%

Table G.8 Movement at Segment Centerline, Shaft 10 - 1996

Load Interval	Elapsed Time hhmmss	Segment Movement, in						Mid Cell
		CL Elev., ft	+31.25	-2.50	-23.00	-29.00	-34.75	-37.50
		Length, ft	32.50	35.00	6.00	6.00	5.50	-
L0	0:00:00	0.0006	0.0007	0.0009	0.0010	0.0011	0.0000	
L1	0:04:00	-0.0012	-0.0011	-0.0009	-0.0008	-0.0005	-0.0003	
L2	0:04:00	-0.0023	-0.0020	-0.0016	-0.0013	-0.0007	-0.0007	
L3	0:04:00	0.0290	0.0299	0.0308	0.0315	0.0327	0.0330	
L4	0:04:00	0.0491	0.0500	0.0512	0.0521	0.0538	0.0542	
L5	0:04:00	0.0575	0.0584	0.0596	0.0605	0.0623	0.0631	
L6	0:04:00	0.0653	0.0663	0.0675	0.0686	0.0706	0.0716	
L7	0:04:00	0.0738	0.0748	0.0760	0.0771	0.0792	0.0804	
L8	0:04:00	0.0852	0.0863	0.0875	0.0887	0.0910	0.0923	
L9	0:04:00	0.1011	0.1022	0.1035	0.1047	0.1072	0.1086	
L10	0:04:00	0.1326	0.1337	0.1350	0.1364	0.1390	0.1405	
L11	0:04:00	0.1666	0.1677	0.1691	0.1705	0.1732	0.1749	
L12	0:04:00	0.2432	0.2444	0.2458	0.2473	0.2503	0.2520	
L13	0:04:00	0.3181	0.3193	0.3207	0.3223	0.3256	0.3275	
L14	0:04:00	0.4314	0.4326	0.4341	0.4358	0.4393	0.4413	
L15	0:04:00	0.5811	0.5823	0.5839	0.5857	0.5897	0.5919	
L16	0:04:00	0.7441	0.7453	0.7470	0.7489	0.7531	0.7555	
L17	0:04:00	0.9689	0.9702	0.9718	0.9738	0.9783	0.9810	
L18	0:04:00	1.2486	1.2498	1.2514	1.2535	1.2584	1.2613	
L19	0:04:00	1.6485	1.6497	1.6513	1.6536	1.6588	1.6619	
U1	0:03:00	1.6926	1.6938	1.6954	1.6974	1.7022	1.7056	
U2	0:02:30	1.6855	1.6863	1.6873	1.6889	1.6925	1.6961	
U3	0:02:30	1.6602	1.6603	1.6604	1.6605	1.6614	1.6648	
U4	0:03:00	1.5680	1.5680	1.5680	1.5680	1.5680	1.5704	

Table G.9 Section Properties, Shaft 10 - 1996

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in ²)	Total Area (in ²)
No. 14 Rebar	24	2.25	54.00
3/4" Galvanized Steel Telltale Pipe	10	0.33	3.33
No. 5 Spiral Stiffeners	2	0.31	0.61
Permanent Casing (1/2" thick, 85" ID)	1	134.30	134.30
Area of Steel =			192.247

PVC and Hose

Element	Quantity	X-Sectional Area (in ²)	Total Area (in ²)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.77
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.59
Area of Pipe =			28.35

264

Concrete Modulus 3600 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in ²)	Area of Steel (in ²)	Area Pipe (in ²)	Area of Concrete (in ²)	Shaft Modulus (ksi)	Notes
48.6	86.0	5808.80	192.25	28.35	5588.20	4423.06	4PVC pipe, 4hose
-20.9	91.5	6575.55	57.28	28.35	6489.92	3805.73	4PVC pipe, 4hose
-37.5	91.5	6575.55	55.95	27.47	6492.13	3801.07	4PVC pipe, 2hose

Figure G.1 Shaft Top VW Strain, Shaft 10 - 1996

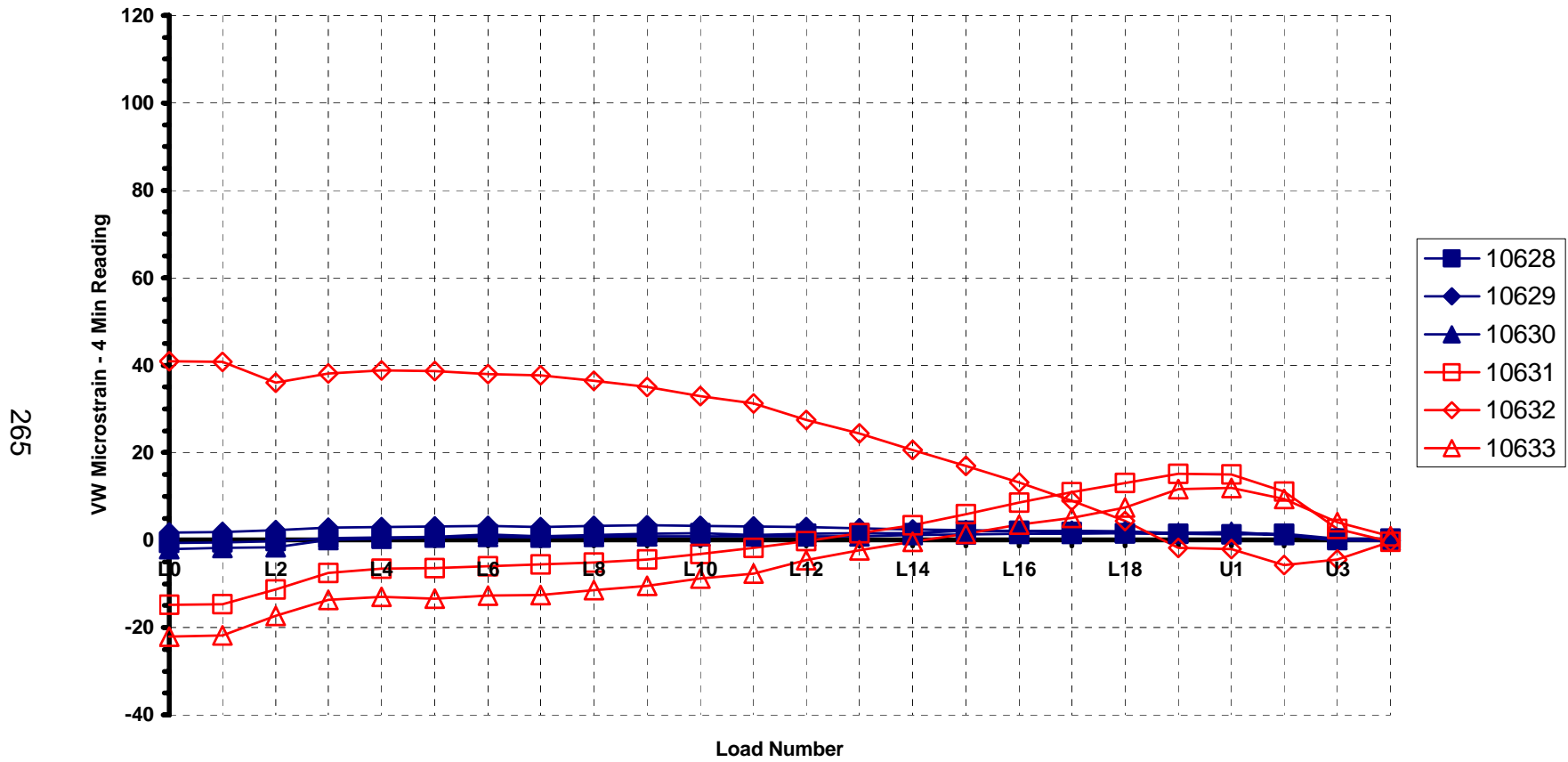


Figure G.2 Shaft Middle VW Strain, Shaft 10 - 1996

266

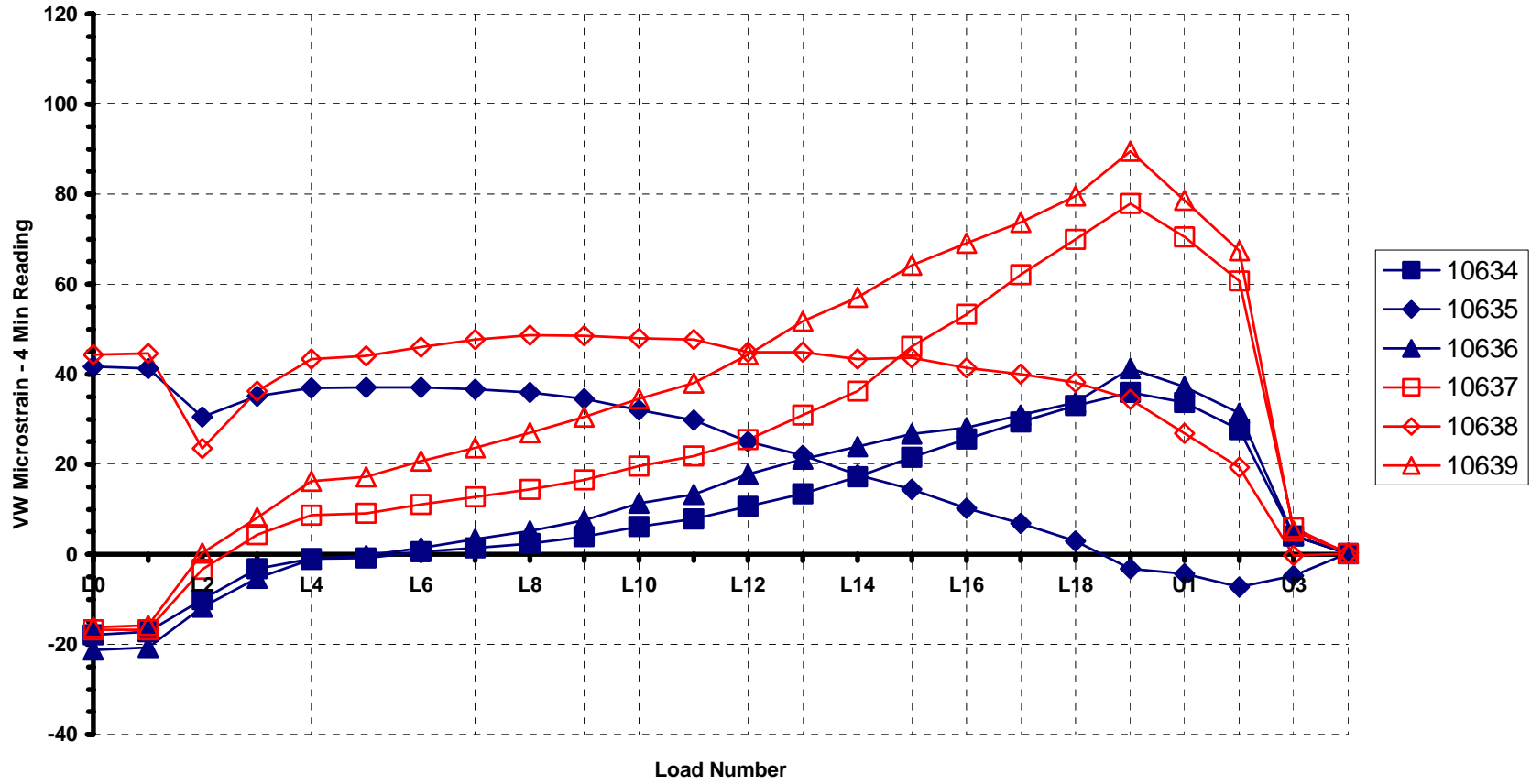


Figure G.3 Shaft Middle VW Strain, Shaft 10 - 1996

267

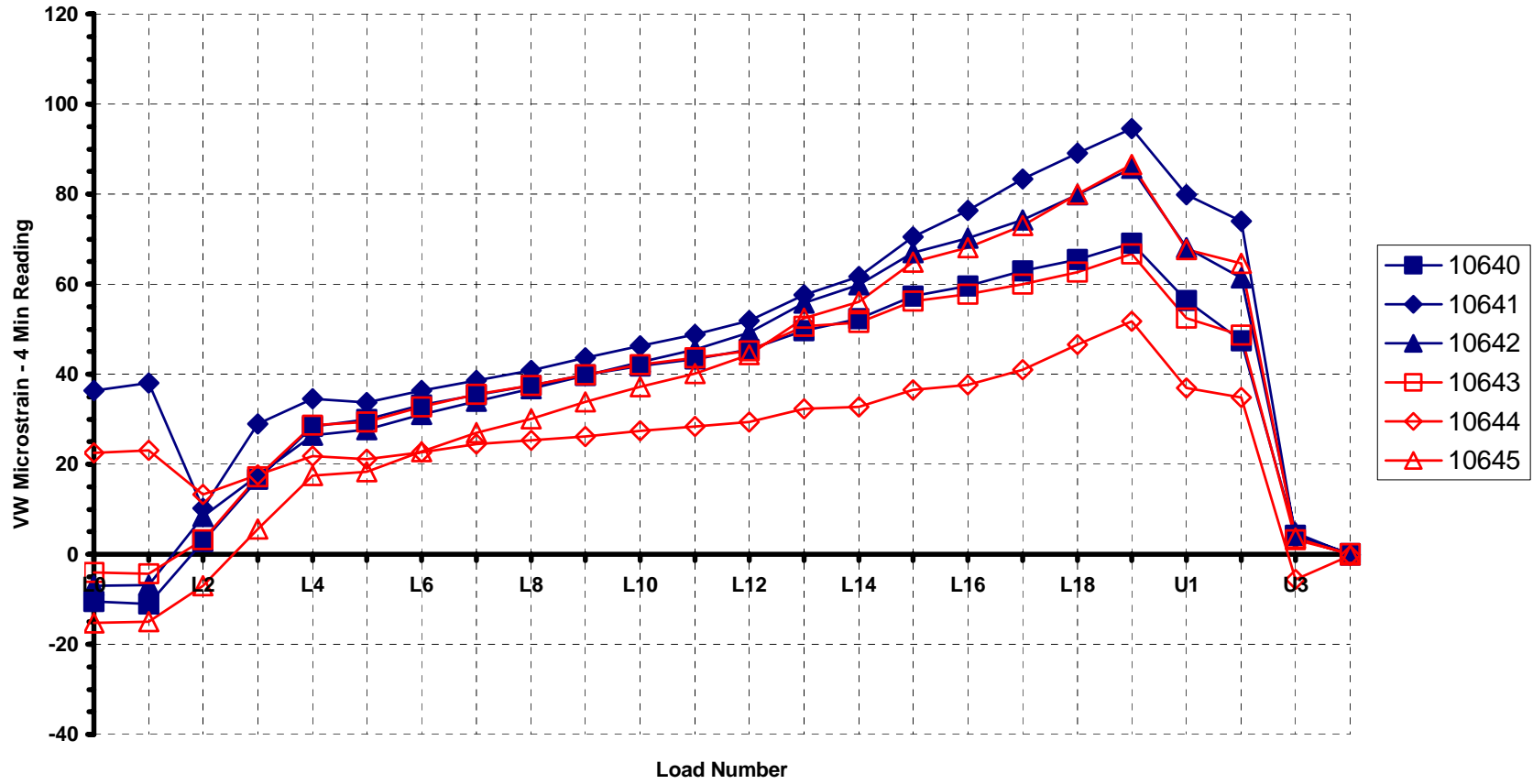


Figure G.4 Shaft TopShear Stress vs. Movement, Shaft 10 - 1996

268

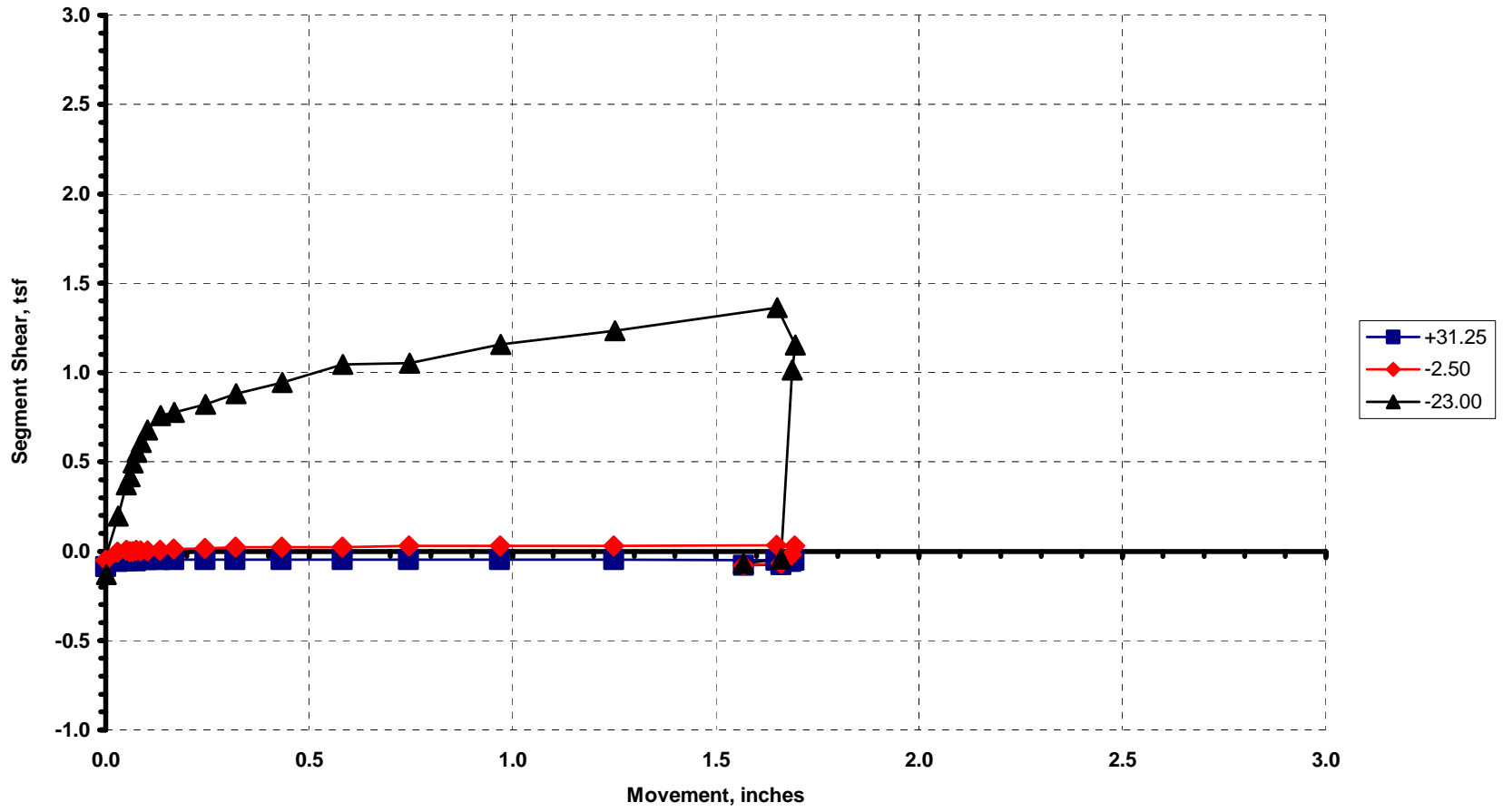


Figure G.5 Shaft Middle Shear Stress vs. Movement, Shaft 10 - 1996

269

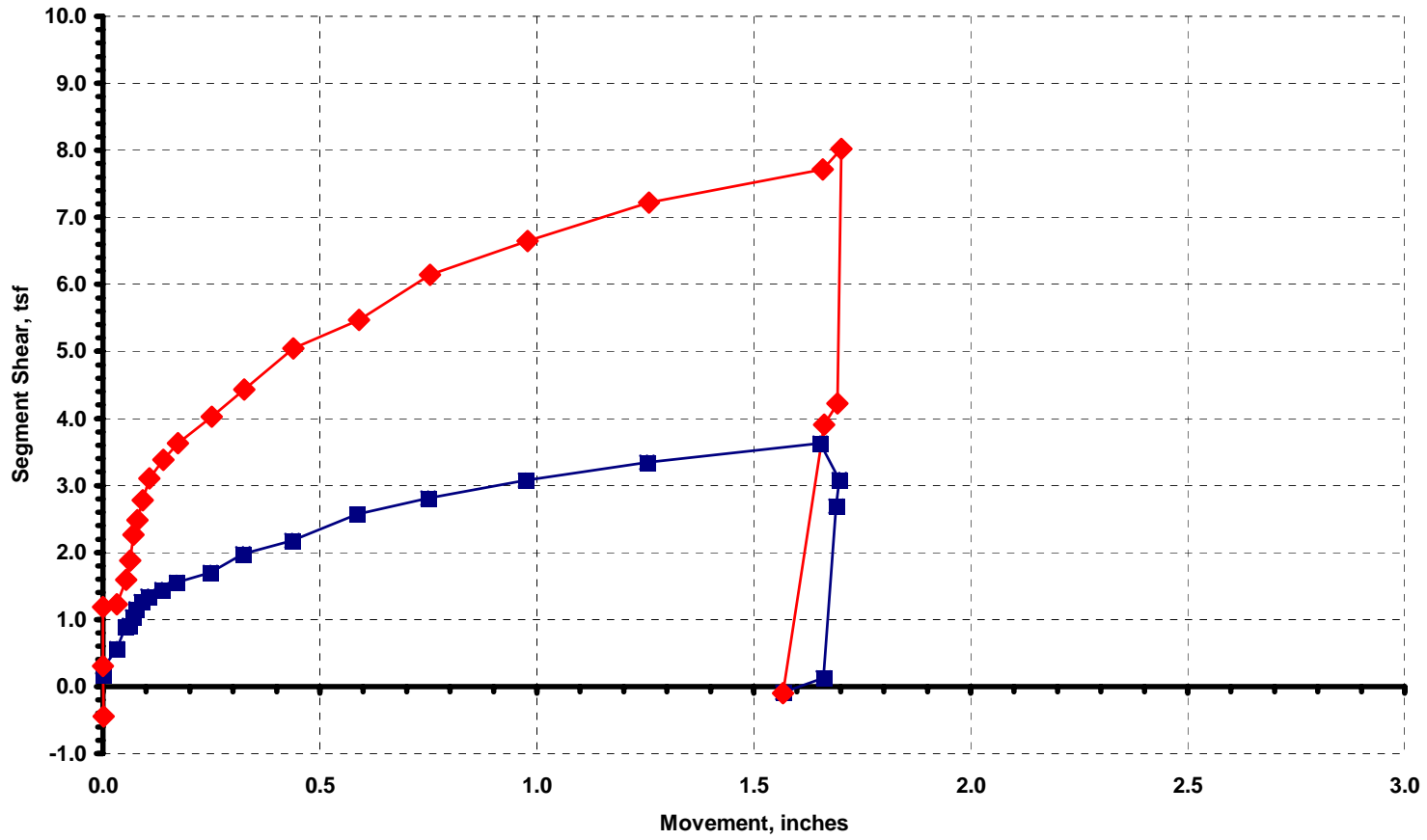


Figure G.6 Shaft Strain Distribution, Shaft 10 - 1996

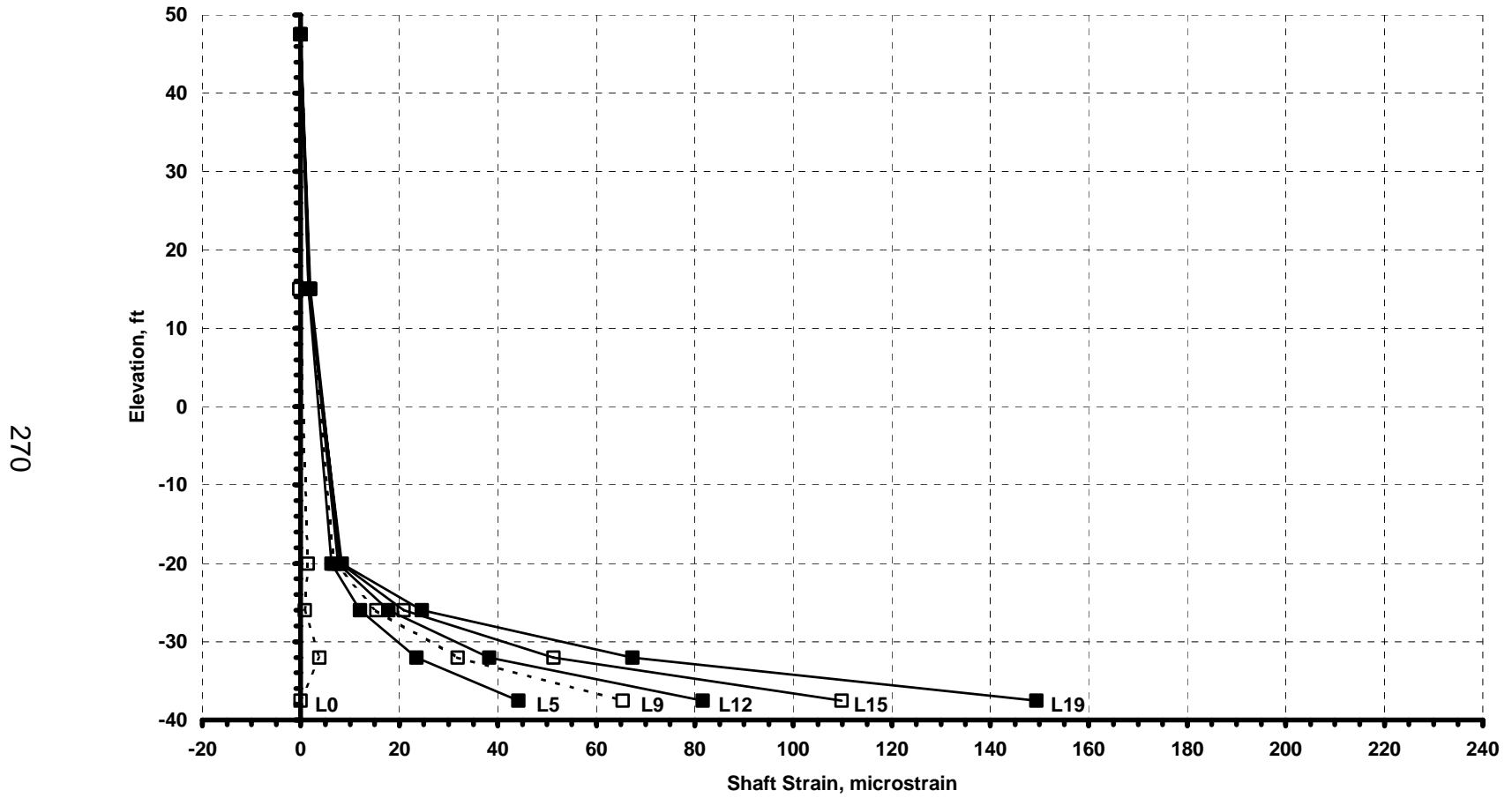


Figure G.7 Load Distribution, Shaft 10 - 1996

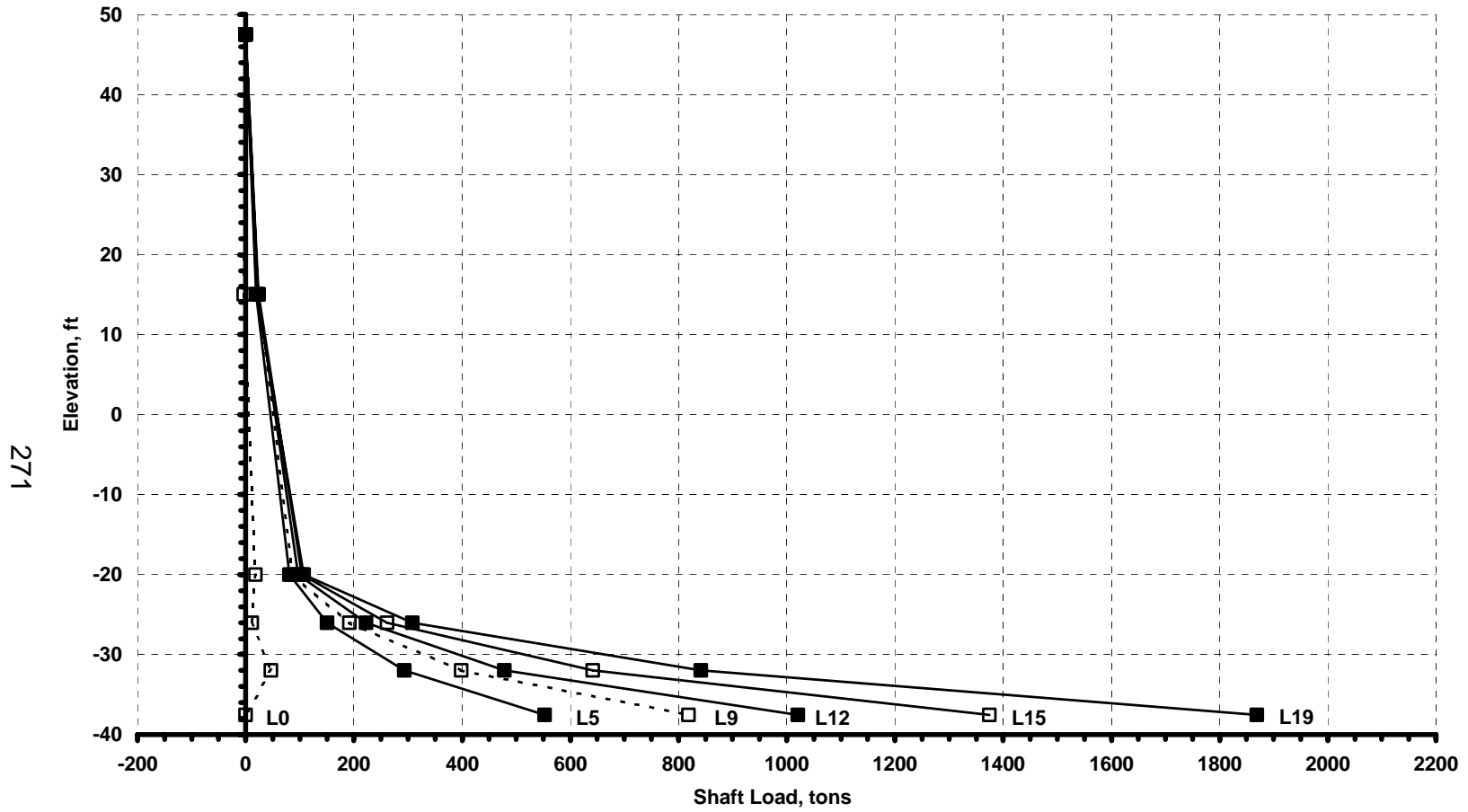


Figure G.8 Shear Stress Distribution, Shaft 10 - 1996

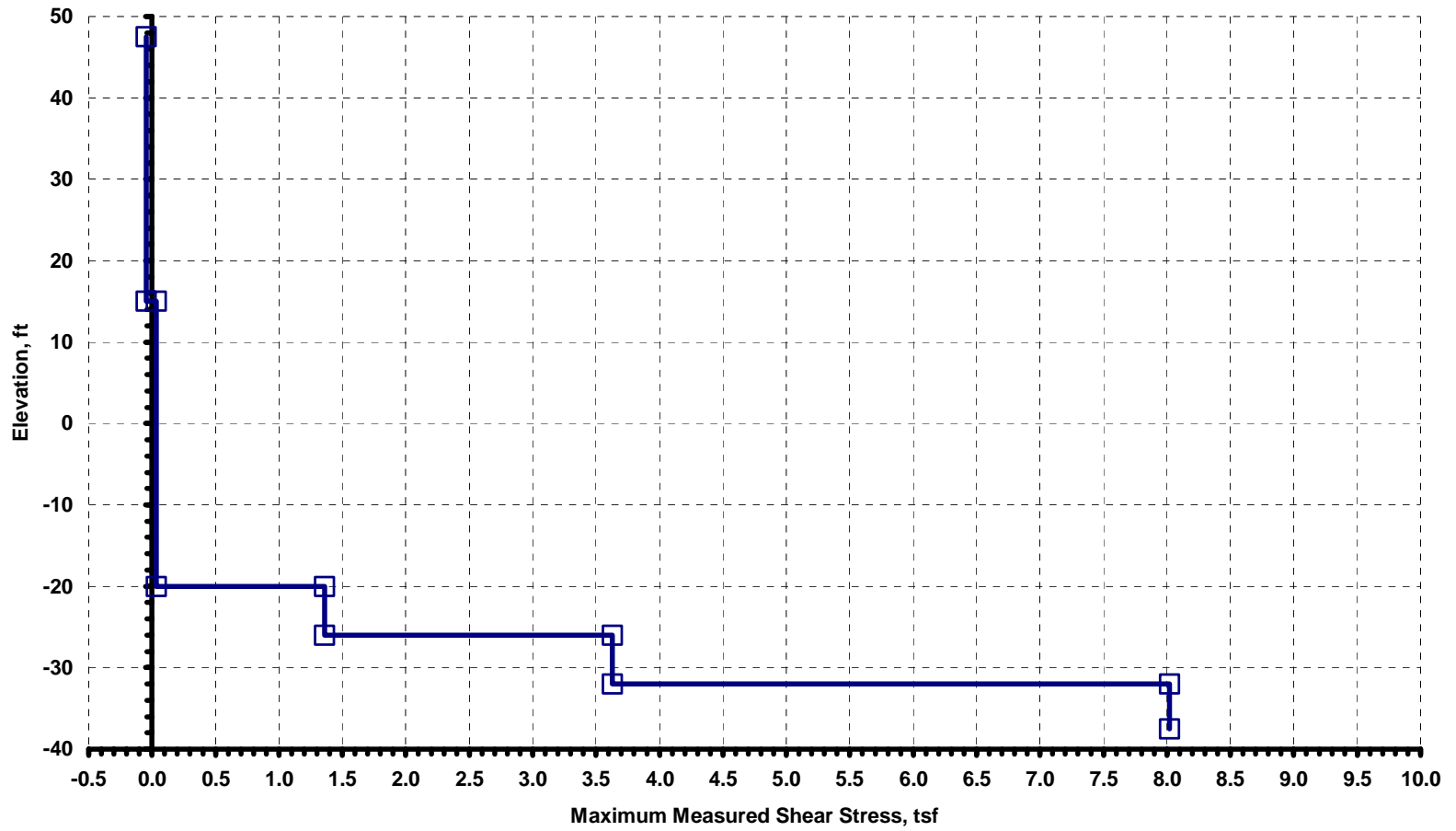


Figure G.9 Average Compression vs Load, Stage 2 - Shaft 10 - 1996

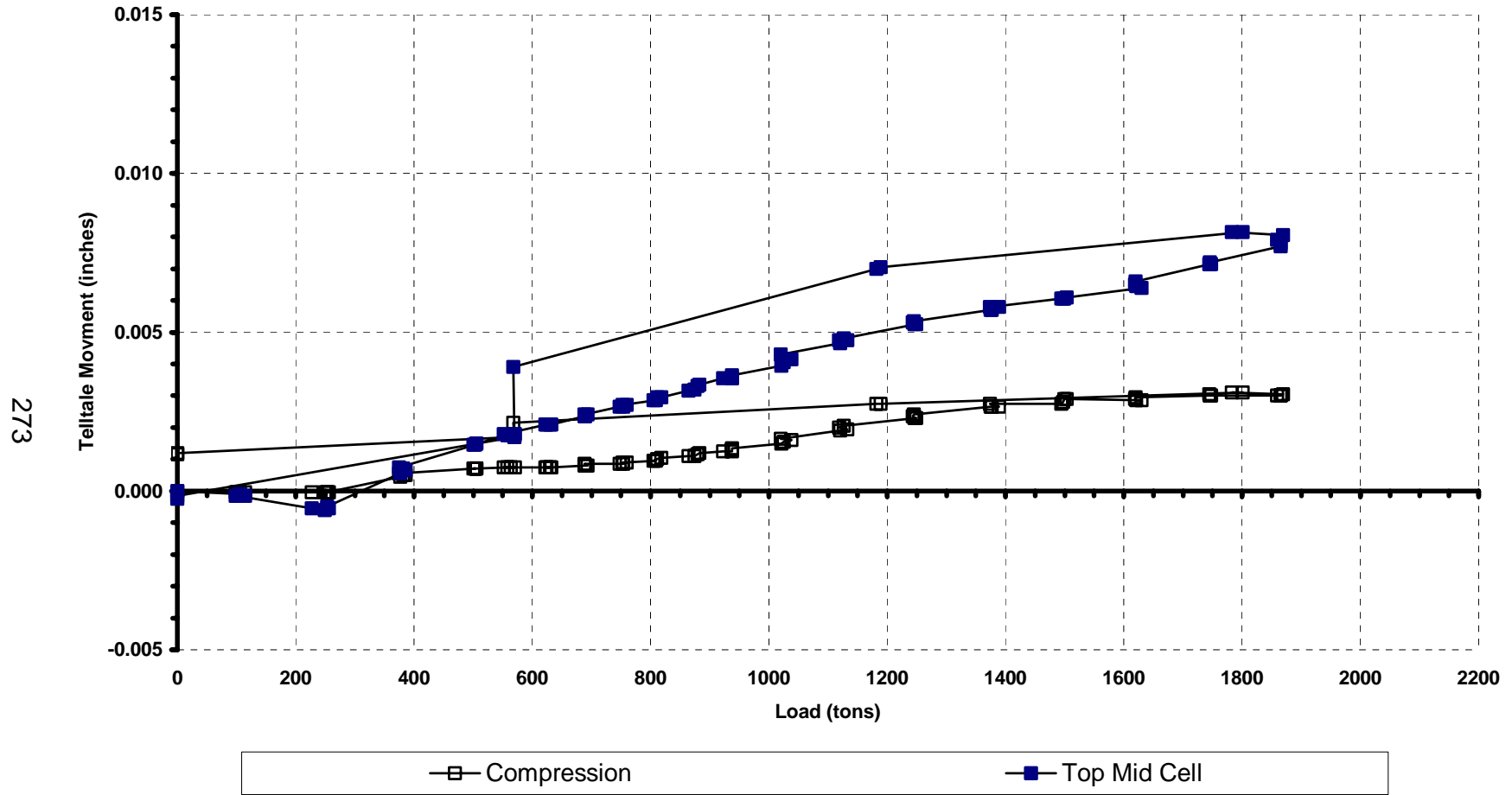


Figure G.10 Mid Cell Movement, Stage 2 - Shaft 10 - 1996

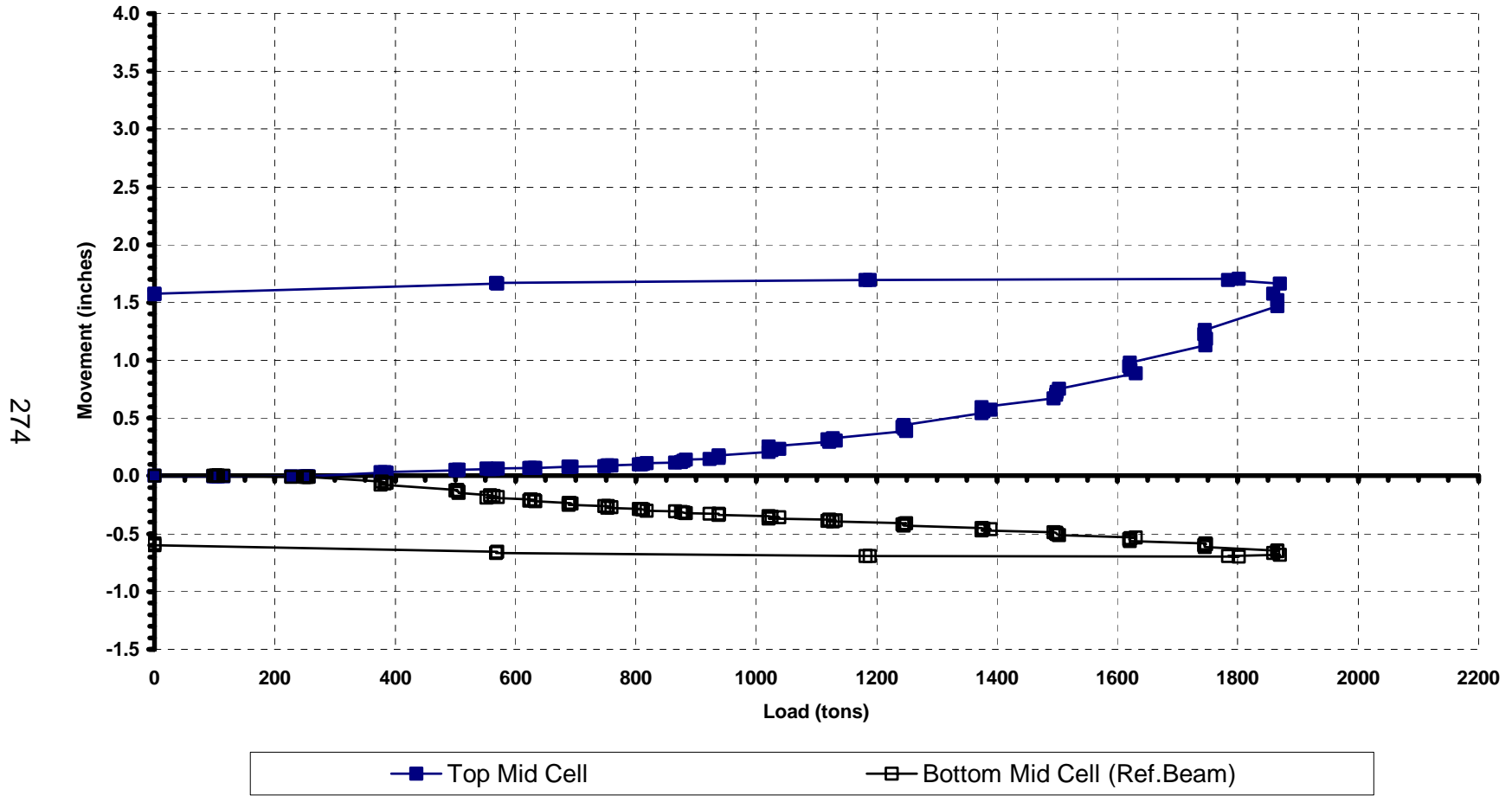
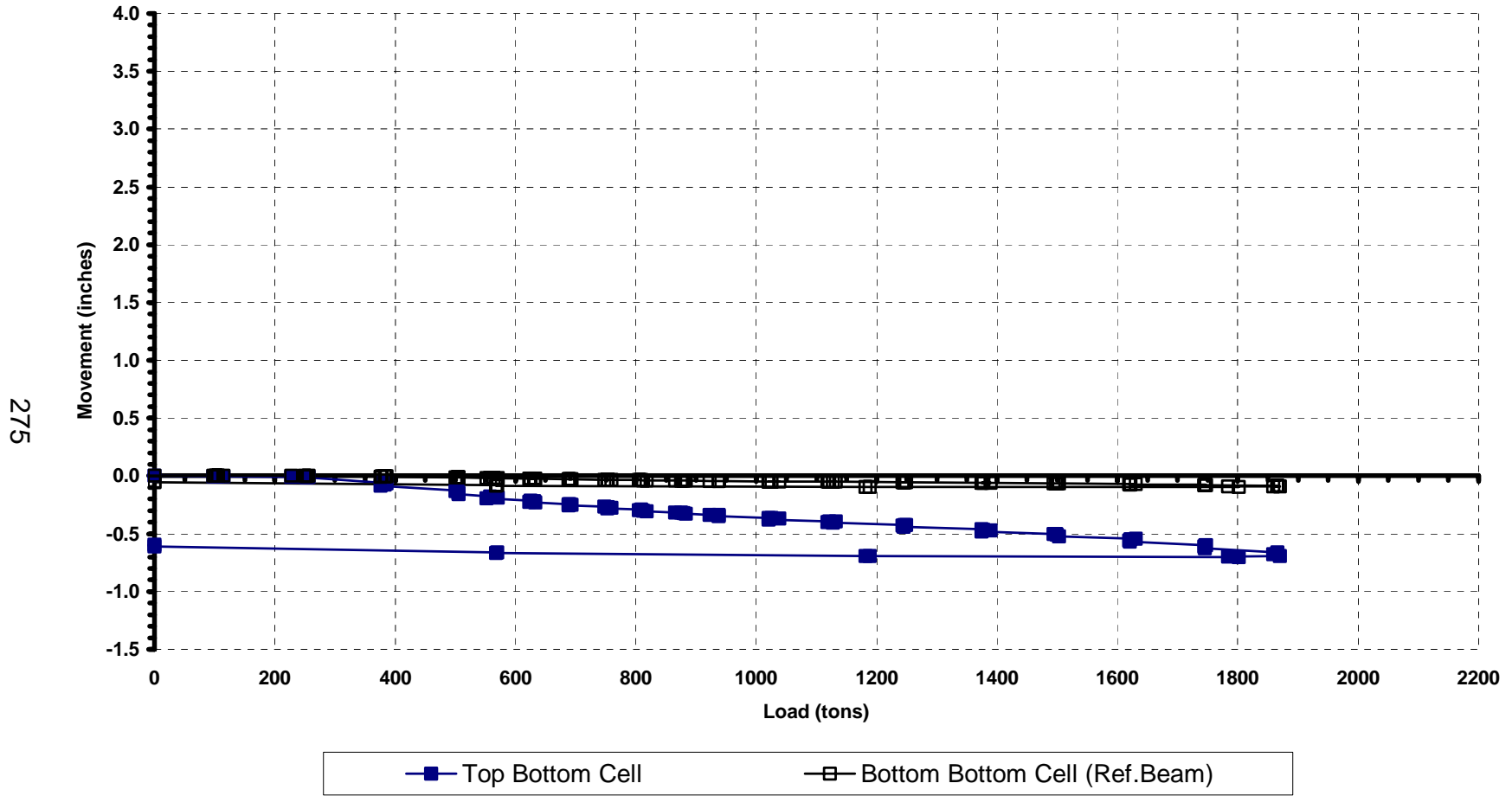


Figure G.11 Bottom Cell Movement, Stage 2 - Shaft 10 - 1996



**APPENDIX H
TEST SHAFT 10 – ANALYSIS OF 2002 TEST**

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time h:mm:ss	Top of Shaft Movement												
		Mid Cell Load (tons)	Bottom Cell Load (tons)	Indicators				Survey Level Readings				Compression		
				DG -11	DG -12	DG -13	Average	Ruler 1	Ruler 2	Ruler 3	Average	TT-6	TT-1	Avg. Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:00:30	0.0	142.0	0.0000	0.0013	-0.0001	0.0004					0.0000	0.0000	0.0000
L1	0:01:00	0.0	127.0	-0.0003	0.0027	-0.0007	0.0006					0.0000	0.0000	0.0000
L1	0:02:00	0.0	141.4	-0.0002	0.0033	-0.0007	0.0008	0.01	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:04:00	0.0	147.6	0.0008	0.0019	0.0003	0.0010	0.01	0.00	0.00	0.00	0.0000	0.0000	0.0000
U1	0:00:30	0.0	0.0	-0.0001	0.0010	0.0003	0.0004					0.0000	0.0000	0.0000
U1	0:03:00	0.0	0.0	-0.0009	0.0008	0.0003	0.0001					0.0000	0.0000	0.0000
U1	0:05:30	0.0	0.0	-0.0016	0.0001	-0.0024	-0.0013					0.0000	0.0000	0.0000
2L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
2L1	0:00:30	133.5	0.0	0.0022	0.0000	0.0012	0.0011					0.0000	0.0000	0.0000
2L1	0:01:00	131.2	0.0	0.0023	0.0002	0.0012	0.0012					0.0000	0.0000	0.0000
2L1	0:02:00	132.1	0.0	0.0016	0.0002	0.0015	0.0011	0.00	0.00	0.01	0.00	0.0000	0.0000	0.0000
2L1	0:04:00	129.3	0.0	-0.0050	0.0036	-0.0057	-0.0024	0.01	0.00	0.01	0.01	0.0000	0.0000	0.0000
2L2	0:00:30	281.1	0.0	-0.0017	0.0042	-0.0023	0.0001					0.0005	0.0005	0.0005
2L2	0:01:00	291.7	0.0	-0.0023	0.0033	-0.0017	-0.0002					0.0005	0.0006	0.0006
2L2	0:02:00	283.7	0.0	-0.0015	0.0036	-0.0016	0.0002	0.01	0.01	0.01	0.01	0.0005	0.0006	0.0006
2L2	0:04:00	287.9	0.0	0.0014	0.0017	0.0003	0.0011	0.02	0.01	0.02	0.02	0.0006	0.0008	0.0007
2L3	0:00:30	440.7	0.0	0.0471	0.0492	0.0419	0.0461					0.0022	0.0026	0.0024
2L3	0:01:00	432.1	0.0	0.0531	0.0549	0.0473	0.0518					0.0022	0.0028	0.0025
2L3	0:02:00	429.2	0.0	0.0560	0.0572	0.0496	0.0543	0.05	0.06	0.05	0.05	0.0022	0.0028	0.0025
2L3	0:04:00	427.3	0.0	0.0605	0.0691	0.0552	0.0616	0.06	0.06	0.05	0.06	0.0022	0.0028	0.0025
2L4	0:00:30	478.2	0.0	0.3772	0.3780	0.3672	0.3741					0.0023	0.0035	0.0029
2L4	0:01:00	489.6	0.0	0.3905	0.3934	0.3797	0.3879					0.0023	0.0035	0.0029
2L4	0:02:00	493.1	0.0	0.4246	0.4200	0.4133	0.4193	0.43	0.39	0.47	0.43	0.0023	0.0035	0.0029
2L4	0:04:00	496.4	0.0	0.4872	0.4791	0.4761	0.4808	0.48	0.49	0.50	0.49	0.0023	0.0035	0.0029
2L5	0:00:30	539.1	0.0	0.6462	0.6363	0.6334	0.6386					0.0025	0.0035	0.0030
2L5	0:01:00	535.6	0.0	0.6707	0.6601	0.6577	0.6628					0.0025	0.0033	0.0029
2L5	0:02:00	521.6	0.0	0.6954	0.6868	0.6824	0.6882	0.68	0.69	0.70	0.69	0.0025	0.0033	0.0029
2L5	0:04:00	520.5	0.0	0.7057	0.6964	0.6928	0.6983	0.70	0.70	0.71	0.70	0.0025	0.0032	0.0029
2L6	0:00:30	563.8	0.0	0.7377	0.7359	0.7229	0.7322					0.0025	0.0031	0.0028
2L6	0:01:00	566.2	0.0	0.7591	0.7543	0.7451	0.7528					0.0025	0.0031	0.0028
2L6	0:02:00	566.7	0.0	0.7763	0.7675	0.7632	0.7690	0.77	0.78	0.78	0.78	0.0025	0.0031	0.0028
2L6	0:04:00	555.9	0.0	0.7878	0.7788	0.7749	0.7805	0.78	0.79	0.79	0.79	0.0025	0.0031	0.0028
2L7	0:00:30	591.0	0.0	0.8273	0.8159	0.8132	0.8188					0.0025	0.0030	0.0028
2L7	0:01:00	594.6	0.0	0.8450	0.8330	0.8310	0.8363					0.0025	0.0030	0.0028
2L7	0:02:00	599.4	0.0	0.8634	0.8499	0.8495	0.8543	0.86	0.86	0.86	0.86	0.0025	0.0030	0.0028
2L7	0:04:00	571.6	0.0	0.8697	0.8566	0.8562	0.8608	0.86	0.87	0.87	0.87	0.0025	0.0029	0.0027
2L8	0:00:30	620.1	0.0	0.8853	0.8709	0.8711	0.8758					0.0025	0.0029	0.0027
2L8	0:01:00	624.6	0.0	0.9008	0.8861	0.8858	0.8909					0.0025	0.0029	0.0027
2L8	0:02:00	616.0	0.0	0.9167	0.9070	0.9019	0.9085	0.93	0.91	0.92	0.92	0.0025	0.0029	0.0027
2L8	0:04:00	613.6	0.0	0.9225	0.9129	0.9073	0.9142	0.93	0.93	0.92	0.93	0.0025	0.0029	0.0027

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement											
				Indicators				Survey Level Readings				Compression			
				DG -11	DG -12	DG -13	Average	Ruler 1	Ruler 2	Ruler 3	Average	TT-6	TT-1	Avg. Rdg	
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	
2L9	0:00:30	641.6	0.0	0.9335	0.9274	0.9121	0.9243						0.0025	0.0029	0.0027
2L9	0:01:00	653.6	0.0	0.9427	0.9398	0.9212	0.9346						0.0025	0.0029	0.0027
2L9	0:02:00	655.3	0.0	0.9639	0.9634	0.9455	0.9576	0.96	0.97	0.99	0.97	0.0027	0.0029	0.0028	
2L9	0:04:00	647.0	0.0	0.9757	0.9781	0.9600	0.9713	0.98	0.98	0.99	0.98	0.0028	0.0029	0.0029	
2L10	0:00:30	661.9	0.0	0.9869	0.9823	0.9722	0.9805						0.0028	0.0029	0.0029
2L10	0:01:00	684.2	0.0	0.9967	0.9897	0.9819	0.9894						0.0028	0.0029	0.0029
2L10	0:02:00	680.3	0.0	1.0100	1.0007	0.9944	1.0017	1.02	1.02	1.02	1.02	0.0028	0.0029	0.0029	
2L10	0:04:00	693.9	0.0	1.0220	1.0172	1.0036	1.0143	1.02	1.03	1.02	1.02	0.0028	0.0029	0.0029	
2L11	0:00:30	776.9	0.0	1.1163	1.1087	1.0998	1.1083						0.0032	0.0029	0.0031
2L11	0:01:00	785.8	0.0	1.1308	1.1235	1.1135	1.1226						0.0032	0.0029	0.0031
2L11	0:02:00	759.6	0.0	1.1437	1.1357	1.1257	1.1350	1.14	1.14	1.14	1.14	0.0032	0.0029	0.0031	
2L11	0:04:00	770.9	0.0	1.1521	1.1419	1.1336	1.1425	1.15	1.15	1.14	1.15	0.0032	0.0029	0.0031	
2L12	0:00:30	867.9	0.5	1.2098	1.1972	1.1895	1.1988						0.0032	0.0029	0.0031
2L12	0:01:00	872.4	0.0	1.2245	1.2134	1.2040	1.2140						0.0032	0.0028	0.0030
2L12	0:02:00	860.5	0.0	1.2381	1.2251	1.2174	1.2269	1.23	1.23	1.23	1.23	0.0032	0.0028	0.0030	
2L12	0:04:00	874.7	0.0	1.2474	1.2351	1.2273	1.2366	1.24	1.24	1.24	1.24	0.0032	0.0028	0.0030	
2L13	0:00:30	1018.0	0.0	1.3446	1.3329	1.3228	1.3334						0.0032	0.0026	0.0029
2L13	0:01:00	1019.0	0.0	1.3592	1.3469	1.3375	1.3479						0.0032	0.0026	0.0029
2L13	0:02:00	1018.4	0.0	1.3677	1.3558	1.3461	1.3565	1.36	1.36	1.36	1.36	0.0032	0.0025	0.0029	
2L13	0:04:00	1017.9	0.0	1.3689	1.3615	1.3456	1.3587	1.36	1.37	1.36	1.36	0.0033	0.0023	0.0028	
2L14	0:00:30	1174.6	0.0	1.4577	1.4444	1.4337	1.4453						0.0035	0.0023	0.0029
2L14	0:01:00	1171.7	0.0	1.4722	1.4580	1.4481	1.4594						0.0035	0.0023	0.0029
2L14	0:02:00	1176.1	0.0	1.4804	1.4652	1.4564	1.4673	1.47	1.47	1.48	1.47	0.0035	0.0023	0.0029	
2L14	0:04:00	1178.4	0.0	1.4862	1.4745	1.4621	1.4743	1.48	1.48	1.48	1.48	0.0035	0.0023	0.0029	
2L15	0:00:30	1320.5	0.0	1.5551	1.5457	1.5293	1.5434						0.0039	0.0021	0.0030
2L15	0:01:00	1332.0	0.0	1.5691	1.5602	1.5431	1.5575						0.0039	0.0021	0.0030
2L15	0:02:00	1329.2	0.0	1.5812	1.5716	1.5553	1.5694	1.57	1.58	1.58	1.58	0.0039	0.0021	0.0030	
2L15	0:04:00	1332.1	0.0	1.5949	1.5829	1.5687	1.5822	1.58	1.59	1.59	1.59	0.0040	0.0021	0.0031	
2L16	0:00:30	1455.0	0.0	1.6710	1.6600	1.6438	1.6583						0.0041	0.0020	0.0031
2L16	0:01:00	1484.0	0.0	1.6865	1.6692	1.6582	1.6713						0.0041	0.0020	0.0031
2L16	0:02:00	1479.7	0.0	1.7022	1.6869	1.6743	1.6878	1.69	1.69	1.70	1.69	0.0041	0.0019	0.0030	
2L16	0:04:00	1482.4	0.0	1.7161	1.6992	1.6874	1.7009	1.70	1.70	1.70	1.70	0.0041	0.0019	0.0030	
2L17	0:00:30	1627.9	0.0	1.7963	1.7833	1.7685	1.7827						0.0043	0.0018	0.0031
2L17	0:01:00	1634.3	0.0	1.8154	1.8015	1.7880	1.8016						0.0043	0.0018	0.0031
2L17	0:02:00	1636.9	0.0	1.8354	1.8252	1.8084	1.8230	1.83	1.84	1.83	1.83	0.0044	0.0017	0.0031	
2L17	0:04:00	1630.2	0.0	1.8542	1.8411	1.8291	1.8415	1.85	1.85	1.84	1.85	0.0044	0.0017	0.0031	
2L18	0:00:30	1776.7	0.0	1.9860	1.9716	1.9600	1.9725						0.0047	0.0013	0.0030
2L18	0:01:00	1771.6	0.0	1.9996	1.9851	1.9733	1.9860						0.0047	0.0013	0.0030
2L18	0:02:00	1782.4	0.0	2.0210	2.0032	1.9935	2.0059	2.03	2.01	2.02	2.02	0.0047	0.0013	0.0030	
2L18	0:04:00	1778.9	0.0	2.0408	2.0256	2.0148	2.0271	2.04	2.03	2.03	2.03	0.0047	0.0013	0.0030	

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement											
				Indicators				Survey Level Readings				Compression			
				DG -11	DG -12	DG -13	Average	Ruler 1	Ruler 2	Ruler 3	Average	TT-6	TT-1	Avg. Rdg	
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	
2L19	0:00:30	1835.4	0.0	2.0786	2.0600	2.0499	2.0628						0.0047	0.0012	0.0030
2L19	0:01:00	1838.1	0.0	2.0927	2.0749	2.0648	2.0775						0.0047	0.0012	0.0030
2L19	0:02:00	1844.0	0.0	2.1187	2.1011	2.0911	2.1036	2.10	2.11	2.12	2.11	0.0048	0.0012	0.0030	
2L19	0:04:00	1836.5	0.0	2.1489	2.1296	2.1201	2.1329	2.14	2.13	2.14	2.14	0.0048	0.0012	0.0030	
2L20	0:00:30	1897.5	0.0	2.1704	2.1506	2.1408	2.1539						0.0049	0.0011	0.0030
2L20	0:01:00	1903.1	0.0	2.1930	2.1724	2.1635	2.1763						0.0049	0.0011	0.0030
2L20	0:02:00	1915.0	0.0	2.2348	2.2160	2.2063	2.2190	2.23	2.24	2.24	2.24	0.0050	0.0010	0.0030	
2L20	0:04:00	1901.7	0.0	2.2815	2.2615	2.2522	2.2651	2.27	2.28	2.26	2.27	0.0050	0.0009	0.0030	
2L21	0:00:30	1966.2	0.3	2.3737	2.3539	2.3446	2.3574						0.0054	0.0007	0.0031
2L21	0:01:00	1970.0	0.4	2.3950	2.3769	2.3659	2.3793						0.0054	0.0007	0.0031
2L21	0:02:00	1964.6	0.6	2.4286	2.4087	2.3980	2.4118	2.42	2.43	2.45	2.43	0.0054	0.0007	0.0031	
2L21	0:04:00	1970.9	0.9	2.4788	2.4579	2.4469	2.4612	2.48	2.47	2.48	2.48	0.0055	0.0005	0.0030	
2L22	0:00:30	1986.6	1.1	2.5185	2.4967	2.4862	2.5005						0.0057	0.0005	0.0031
2L22	0:01:00	1992.2	1.1	2.5331	2.5121	2.5008	2.5153						0.0057	0.0005	0.0031
2L22	0:02:00	1998.5	1.2	2.5631	2.5432	2.5307	2.5457	2.56	2.56	2.58	2.57	0.0057	0.0005	0.0031	
2L22	0:04:00	1993.2	1.7	2.6159	2.5933	2.5819	2.5970	2.62	2.60	2.61	2.61	0.0058	0.0004	0.0031	
2L23	0:00:30	2027.2	2.0	2.6655	2.6429	2.6312	2.6465						0.0059	0.0003	0.0031
2L23	0:01:00	2024.0	2.1	2.6855	2.6612	2.6506	2.6658						0.0059	0.0003	0.0031
2L23	0:02:00	2031.9	2.3	2.7169	2.6955	2.6824	2.6983	2.71	2.71	2.72	2.71	0.0060	0.0003	0.0032	
2L23	0:04:00	1714.0	1.9	2.7303	2.7086	2.6974	2.7121	2.71	2.71	2.72	2.71	0.0060	0.0000	0.0030	
2U1	0:00:30	1492.2	1.6	2.7260	2.7043	2.6934	2.7079	2.70	2.70	2.72	2.71	0.0060	-0.0004	0.0028	
2U1	0:03:00	1280.7	1.0	2.7195	2.6973	2.6873	2.7014	2.69	2.69	2.70	2.69	0.0060	-0.0007	0.0027	
2U2	0:00:30	1203.1	0.8	2.7144	2.6931	2.6814	2.6963	2.69	2.69	2.70	2.69	0.0060	-0.0011	0.0025	
2U2	0:03:00	1204.8	0.5	2.7133	2.6921	2.6805	2.6953	2.69	2.69	2.70	2.69	0.0060	-0.0011	0.0025	
2U3	0:00:30	916.0	0.0	2.7029	2.6821	2.6705	2.6852	2.68	2.67	2.68	2.68	0.0060	-0.0011	0.0025	
2U3	0:03:00	887.7	0.0	2.7014	2.6783	2.6686	2.6828	2.68	2.67	2.68	2.68	0.0060	-0.0011	0.0025	
2U4	0:00:30	453.8	0.0	2.7004	2.6766	2.6684	2.6818	2.65	2.65	2.64	2.65	0.0060	-0.0017	0.0022	
2U4	0:03:00	415.9	0.0	2.6700	2.6450	2.6387	2.6512	2.65	2.64	2.64	2.64	0.0057	-0.0025	0.0016	
2U5	0:00:30	0.0	0.0	2.5819	2.5560	2.5509	2.5629	2.54	2.54	2.53	2.54	0.0033	-0.0031	0.0001	
2U5	0:03:00	0.0	0.0	2.5611	2.5345	2.5306	2.5421	2.53	2.53	2.52	2.53	0.0030	-0.0031	0.0000	
2U5	0:06:00	0.0	0.0	2.5576	2.5307	2.5277	2.5387	2.53	2.53	2.52	2.53	0.0029	-0.0032	-0.0002	

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time h:mm:ss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT-8	TT-3	Avg. Rdg	Mvmt.	TT-7	TT-2	Avg. Rdg	Mvmt.	TT-10	TT-5	Avg. Rdg	Mvmt.	TT-9	TT-4	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0000	0.0000	0.0000	0.0004	0.0016	0.0016	0.0016	0.0020	0.0000	0.0009	0.0005	0.0009	-0.0156	-0.0371	-0.0264	-0.0260
L1	0:01:00	0.0000	0.0000	0.0000	0.0006	0.0047	0.0045	0.0046	0.0052	0.0016	0.0036	0.0026	0.0032	-0.0185	-0.0427	-0.0306	-0.0300
L1	0:02:00	0.0000	0.0000	0.0000	0.0008	0.0077	0.0080	0.0079	0.0087	0.0046	0.0071	0.0059	0.0067	-0.0212	-0.0495	-0.0354	-0.0346
L1	0:04:00	0.0000	0.0000	0.0000	0.0010	0.0095	0.0096	0.0096	0.0106	0.0059	0.0086	0.0073	0.0083	-0.0230	-0.0535	-0.0383	-0.0373
U1	0:00:30	0.0000	0.0000	0.0000	0.0004	0.0097	0.0094	0.0096	0.0100	0.0071	0.0097	0.0084	0.0088	-0.0191	-0.0512	-0.0352	-0.0348
U1	0:03:00	0.0000	0.0000	0.0000	0.0001	0.0081	0.0080	0.0081	0.0081	0.0070	0.0090	0.0080	0.0081	-0.0165	-0.0455	-0.0310	-0.0309
U1	0:05:30	0.0000	0.0000	0.0000	-0.0013	0.0081	0.0080	0.0081	0.0068	0.0070	0.0090	0.0080	0.0067	-0.0160	-0.0449	-0.0305	-0.0318
2L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2L1	0:00:30	0.0000	0.0000	0.0000	0.0011	-0.0145	-0.0152	-0.0149	-0.0137	-0.0089	-0.0120	-0.0105	-0.0093	-0.0003	0.0006	0.0002	0.0013
2L1	0:01:00	0.0000	0.0000	0.0000	0.0012	-0.0150	-0.0159	-0.0155	-0.0142	-0.0091	-0.0126	-0.0109	-0.0096	-0.0004	0.0006	0.0001	0.0013
2L1	0:02:00	0.0000	0.0000	0.0000	0.0011	-0.0156	-0.0164	-0.0160	-0.0149	-0.0100	-0.0130	-0.0115	-0.0104	-0.0005	0.0006	0.0000	0.0012
2L1	0:04:00	0.0000	0.0000	0.0000	-0.0024	-0.0161	-0.0168	-0.0165	-0.0188	-0.0101	-0.0135	-0.0118	-0.0142	-0.0006	0.0006	0.0000	-0.0024
2L2	0:00:30	0.0000	0.0010	0.0005	0.0006	-0.0327	-0.0351	-0.0339	-0.0338	-0.0277	-0.0311	-0.0294	-0.0293	-0.0085	-0.0048	-0.0067	-0.0066
2L2	0:01:00	0.0000	0.0010	0.0005	0.0003	-0.0336	-0.0361	-0.0349	-0.0351	-0.0289	-0.0321	-0.0305	-0.0307	-0.0088	-0.0049	-0.0069	-0.0071
2L2	0:02:00	0.0000	0.0010	0.0005	0.0007	-0.0363	-0.0388	-0.0376	-0.0374	-0.0315	-0.0348	-0.0332	-0.0330	-0.0095	-0.0050	-0.0073	-0.0071
2L2	0:04:00	0.0000	0.0011	0.0006	0.0017	-0.0382	-0.0407	-0.0395	-0.0383	-0.0330	-0.0366	-0.0348	-0.0337	-0.0108	-0.0053	-0.0081	-0.0069
2L3	0:00:30	0.0025	0.0052	0.0039	0.0499	-0.0947	-0.0990	-0.0969	-0.0508	-0.0893	-0.0943	-0.0918	-0.0457	-0.0604	-0.0532	-0.0568	-0.0107
2L3	0:01:00	0.0026	0.0053	0.0040	0.0557	-0.1015	-0.1055	-0.1035	-0.0517	-0.0957	-0.1009	-0.0983	-0.0465	-0.0661	-0.0584	-0.0623	-0.0105
2L3	0:02:00	0.0026	0.0053	0.0040	0.0582	-0.1048	-0.1092	-0.1070	-0.0527	-0.0992	-0.1050	-0.1021	-0.0478	-0.0687	-0.0612	-0.0650	-0.0107
2L3	0:04:00	0.0026	0.0054	0.0040	0.0656	-0.1100	-0.1141	-0.1121	-0.0505	-0.1036	-0.1118	-0.1077	-0.0461	-0.0731	-0.0650	-0.0691	-0.0075
2L4	0:00:30	0.0048	0.0056	0.0052	0.3793	-0.4293	-0.4362	-0.4328	-0.0586	-0.4227	-0.4336	-0.4282	-0.0540	-0.3901	-0.3840	-0.3871	-0.0129
2L4	0:01:00	0.0048	0.0055	0.0052	0.3930	-0.4436	-0.4504	-0.4470	-0.0591	-0.4373	-0.4475	-0.4424	-0.0545	-0.4046	-0.3987	-0.4017	-0.0138
2L4	0:02:00	0.0048	0.0055	0.0052	0.4245	-0.4761	-0.4823	-0.4792	-0.0599	-0.4698	-0.4794	-0.4746	-0.0553	-0.4372	-0.4314	-0.4343	-0.0150
2L4	0:04:00	0.0048	0.0055	0.0052	0.4860	-0.5379	-0.5447	-0.5413	-0.0605	-0.5323	-0.5402	-0.5363	-0.0554	-0.4992	-0.4935	-0.4964	-0.0156
2L5	0:00:30	0.0055	0.0051	0.0053	0.6439	-0.6961	-0.7050	-0.7006	-0.0619	-0.6912	-0.6985	-0.6949	-0.0562	-0.6577	-0.6519	-0.6548	-0.0162
2L5	0:01:00	0.0055	0.0051	0.0053	0.6681	-0.7212	-0.7295	-0.7254	-0.0625	-0.7160	-0.7229	-0.7195	-0.0566	-0.6825	-0.6763	-0.6794	-0.0166
2L5	0:02:00	0.0055	0.0051	0.0053	0.6935	-0.7466	-0.7548	-0.7507	-0.0625	-0.7414	-0.7479	-0.7447	-0.0565	-0.7077	-0.7014	-0.7046	-0.0164
2L5	0:04:00	0.0055	0.0049	0.0052	0.7035	-0.7575	-0.7653	-0.7614	-0.0631	-0.7520	-0.7578	-0.7549	-0.0566	-0.7182	-0.7118	-0.7150	-0.0167
2L6	0:00:30	0.0056	0.0048	0.0052	0.7374	-0.7980	-0.8066	-0.8023	-0.0701	-0.7931	-0.7985	-0.7958	-0.0636	-0.7585	-0.7520	-0.7553	-0.0231
2L6	0:01:00	0.0056	0.0048	0.0052	0.7580	-0.8182	-0.8266	-0.8224	-0.0696	-0.8132	-0.8184	-0.8158	-0.0630	-0.7785	-0.7719	-0.7752	-0.0224
2L6	0:02:00	0.0056	0.0048	0.0052	0.7742	-0.8341	-0.8428	-0.8385	-0.0694	-0.8294	-0.8342	-0.8318	-0.0628	-0.7946	-0.7879	-0.7913	-0.0223
2L6	0:04:00	0.0056	0.0048	0.0052	0.7857	-0.8446	-0.8533	-0.8490	-0.0685	-0.8400	-0.8444	-0.8422	-0.0617	-0.8049	-0.7982	-0.8016	-0.0211
2L7	0:00:30	0.0060	0.0048	0.0054	0.8242	-0.8836	-0.8925	-0.8881	-0.0692	-0.8794	-0.8836	-0.8815	-0.0627	-0.8438	-0.8370	-0.8404	-0.0216
2L7	0:01:00	0.0060	0.0048	0.0054	0.8417	-0.9012	-0.9094	-0.9053	-0.0690	-0.8971	-0.9017	-0.8994	-0.0631	-0.8617	-0.8547	-0.8582	-0.0219
2L7	0:02:00	0.0060	0.0048	0.0054	0.8597	-0.9194	-0.9288	-0.9241	-0.0698	-0.9156	-0.9197	-0.9177	-0.0634	-0.8799	-0.8728	-0.8764	-0.0221
2L7	0:04:00	0.0060	0.0048	0.0054	0.8662	-0.9256	-0.9350	-0.9303	-0.0695	-0.9215	-0.9254	-0.9235	-0.0626	-0.8862	-0.8788	-0.8825	-0.0217
2L8	0:00:30	0.0060	0.0048	0.0054	0.8812	-0.9435	-0.9533	-0.9484	-0.0726	-0.9400	-0.9435	-0.9418	-0.0660	-0.9035	-0.8967	-0.9001	-0.0243
2L8	0:01:00	0.0060	0.0048	0.0054	0.8963	-0.9599	-0.9694	-0.9647	-0.0738	-0.9562	-0.9598	-0.9580	-0.0671	-0.9195	-0.9127	-0.9161	-0.0252
2L8	0:02:00	0.0060	0.0048	0.0054	0.9139	-0.9802	-0.9898	-0.9850	-0.0765	-0.9763	-0.9800	-0.9782	-0.0696	-0.9395	-0.9325	-0.9360	-0.0275
2L8	0:04:00	0.0060	0.0048	0.0054	0.9196	-0.9871	-0.9966	-0.9919	-0.0776	-0.9833	-0.9866	-0.9850	-0.0707	-0.9463	-0.9395	-0.9429	-0.0287

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time h:mm:ss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT-8	TT-3	Avg. Rdg	Mvmt.	TT-7	TT-2	Avg. Rdg	Mvmt.	TT-10	TT-5	Avg. Rdg	Mvmt.	TT-9	TT-4	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2L9	0:00:30	0.0060	0.0048	0.0054	0.9297	-1.0011	-1.0106	-1.0059	-0.0815	-0.9973	-1.0006	-0.9990	-0.0746	-0.9600	-0.9526	-0.9563	-0.0320
2L9	0:01:00	0.0060	0.0048	0.0054	0.9400	-1.0112	-1.0208	-1.0160	-0.0814	-1.0076	-1.0107	-1.0092	-0.0746	-0.9702	-0.9626	-0.9664	-0.0318
2L9	0:02:00	0.0060	0.0048	0.0054	0.9630	-1.0329	-1.0430	-1.0380	-0.0804	-1.0294	-1.0326	-1.0310	-0.0734	-0.9918	-0.9843	-0.9881	-0.0305
2L9	0:04:00	0.0060	0.0048	0.0054	0.9767	-1.0485	-1.0580	-1.0533	-0.0820	-1.0451	-1.0479	-1.0465	-0.0752	-1.0069	-0.9996	-1.0033	-0.0320
2L10	0:00:30	0.0060	0.0048	0.0054	0.9859	-1.0587	-1.0671	-1.0629	-0.0824	-1.0558	-1.0581	-1.0570	-0.0765	-1.0169	-1.0096	-1.0133	-0.0328
2L10	0:01:00	0.0060	0.0048	0.0054	0.9948	-1.0672	-1.0747	-1.0710	-0.0815	-1.0645	-1.0666	-1.0656	-0.0761	-1.0254	-1.0179	-1.0217	-0.0322
2L10	0:02:00	0.0060	0.0048	0.0054	1.0071	-1.0788	-1.0874	-1.0831	-0.0814	-1.0761	-1.0785	-1.0773	-0.0756	-1.0371	-1.0296	-1.0334	-0.0317
2L10	0:04:00	0.0060	0.0048	0.0054	1.0197	-1.0935	-1.1014	-1.0975	-0.0832	-1.0910	-1.0930	-1.0920	-0.0777	-1.0515	-1.0439	-1.0477	-0.0334
2L11	0:00:30	0.0069	0.0048	0.0059	1.1141	-1.1917	-1.2021	-1.1969	-0.0886	-1.1894	-1.1913	-1.1904	-0.0821	-1.1480	-1.1401	-1.1441	-0.0358
2L11	0:01:00	0.0069	0.0048	0.0059	1.1285	-1.2048	-1.2157	-1.2103	-0.0876	-1.2028	-1.2046	-1.2037	-0.0811	-1.1612	-1.1533	-1.1573	-0.0346
2L11	0:02:00	0.0069	0.0048	0.0059	1.1409	-1.2158	-1.2267	-1.2213	-0.0862	-1.2136	-1.2151	-1.2144	-0.0793	-1.1722	-1.1640	-1.1681	-0.0331
2L11	0:04:00	0.0069	0.0048	0.0059	1.1484	-1.2224	-1.2334	-1.2279	-0.0854	-1.2206	-1.2214	-1.2210	-0.0785	-1.1784	-1.1701	-1.1743	-0.0317
2L12	0:00:30	0.0074	0.0048	0.0061	1.2049	-1.2827	-1.2935	-1.2881	-0.0893	-1.2807	-1.2810	-1.2809	-0.0820	-1.2372	-1.2286	-1.2329	-0.0341
2L12	0:01:00	0.0074	0.0048	0.0061	1.2201	-1.2985	-1.3096	-1.3041	-0.0901	-1.2967	-1.2972	-1.2970	-0.0830	-1.2528	-1.2440	-1.2484	-0.0344
2L12	0:02:00	0.0074	0.0048	0.0061	1.2330	-1.3113	-1.3226	-1.3170	-0.0901	-1.3097	-1.3098	-1.3098	-0.0829	-1.2652	-1.2565	-1.2609	-0.0340
2L12	0:04:00	0.0074	0.0048	0.0061	1.2427	-1.3217	-1.3329	-1.3273	-0.0907	-1.3202	-1.3198	-1.3200	-0.0834	-1.2751	-1.2662	-1.2707	-0.0340
2L13	0:00:30	0.0081	0.0048	0.0065	1.3399	-1.4267	-1.4386	-1.4327	-0.0992	-1.4252	-1.4250	-1.4251	-0.0917	-1.3772	-1.3674	-1.3723	-0.0389
2L13	0:01:00	0.0081	0.0048	0.0065	1.3543	-1.4425	-1.4544	-1.4485	-0.1006	-1.4411	-1.4407	-1.4409	-0.0930	-1.3924	-1.3826	-1.3875	-0.0396
2L13	0:02:00	0.0081	0.0048	0.0065	1.3630	-1.4527	-1.4651	-1.4589	-0.1024	-1.4514	-1.4506	-1.4510	-0.0945	-1.4022	-1.3923	-1.3973	-0.0407
2L13	0:04:00	0.0081	0.0048	0.0065	1.3651	-1.4589	-1.4711	-1.4650	-0.1063	-1.4575	-1.4559	-1.4567	-0.0980	-1.4080	-1.3977	-1.4029	-0.0442
2L14	0:00:30	0.0085	0.0048	0.0067	1.4519	-1.5517	-1.5644	-1.5581	-0.1128	-1.5510	-1.5498	-1.5504	-0.1051	-1.4980	-1.4871	-1.4926	-0.0473
2L14	0:01:00	0.0085	0.0048	0.0067	1.4661	-1.5671	-1.5802	-1.5737	-0.1142	-1.5665	-1.5651	-1.5658	-0.1064	-1.5127	-1.5019	-1.5073	-0.0479
2L14	0:02:00	0.0086	0.0048	0.0067	1.4740	-1.5755	-1.5888	-1.5822	-0.1148	-1.5749	-1.5731	-1.5740	-0.1067	-1.5209	-1.5099	-1.5154	-0.0481
2L14	0:04:00	0.0086	0.0048	0.0067	1.4810	-1.5844	-1.5977	-1.5911	-0.1168	-1.5840	-1.5817	-1.5829	-0.1086	-1.5289	-1.5179	-1.5234	-0.0491
2L15	0:00:30	0.0090	0.0048	0.0069	1.5503	-1.6643	-1.6778	-1.6711	-0.1277	-1.6637	-1.6619	-1.6628	-0.1194	-1.6063	-1.5943	-1.6003	-0.0569
2L15	0:01:00	0.0090	0.0048	0.0069	1.5644	-1.6795	-1.6935	-1.6865	-0.1290	-1.6792	-1.6769	-1.6781	-0.1206	-1.6209	-1.6091	-1.6150	-0.0575
2L15	0:02:00	0.0090	0.0048	0.0069	1.5763	-1.6916	-1.7056	-1.6986	-0.1292	-1.6917	-1.6888	-1.6903	-0.1209	-1.6324	-1.6205	-1.6265	-0.0571
2L15	0:04:00	0.0092	0.0048	0.0070	1.5892	-1.7029	-1.7171	-1.7100	-0.1278	-1.7030	-1.7000	-1.7015	-0.1193	-1.6431	-1.6311	-1.6371	-0.0549
2L16	0:00:30	0.0097	0.0049	0.0073	1.6656	-1.7880	-1.8027	-1.7954	-0.1371	-1.7886	-1.7853	-1.7870	-0.1287	-1.7252	-1.7125	-1.7189	-0.0606
2L16	0:01:00	0.0097	0.0049	0.0073	1.6786	-1.8016	-1.8163	-1.8090	-0.1377	-1.8021	-1.7987	-1.8004	-0.1291	-1.7381	-1.7252	-1.7317	-0.0604
2L16	0:02:00	0.0097	0.0049	0.0073	1.6951	-1.8183	-1.8334	-1.8259	-0.1381	-1.8190	-1.8114	-1.8152	-0.1274	-1.7542	-1.7412	-1.7477	-0.0599
2L16	0:04:00	0.0097	0.0049	0.0073	1.7082	-1.8315	-1.8467	-1.8391	-0.1382	-1.8325	-1.8233	-1.8279	-0.1270	-1.7667	-1.7535	-1.7601	-0.0592
2L17	0:00:30	0.0102	0.0050	0.0076	1.7903	-1.9234	-1.9383	-1.9309	-0.1482	-1.9243	-1.9189	-1.9216	-0.1389	-1.8554	-1.8411	-1.8483	-0.0655
2L17	0:01:00	0.0102	0.0050	0.0076	1.8092	-1.9446	-1.9596	-1.9521	-0.1505	-1.9456	-1.9400	-1.9428	-0.1412	-1.8757	-1.8616	-1.8687	-0.0670
2L17	0:02:00	0.0102	0.0050	0.0076	1.8306	-1.9689	-1.9840	-1.9765	-0.1535	-1.9704	-1.9642	-1.9673	-0.1443	-1.8990	-1.8850	-1.8920	-0.0690
2L17	0:04:00	0.0105	0.0050	0.0078	1.8492	-1.9868	-2.0028	-1.9948	-0.1533	-1.9892	-1.9827	-1.9860	-0.1445	-1.9168	-1.9026	-1.9097	-0.0682
2L18	0:00:30	0.0118	0.0050	0.0084	1.9809	-2.1325	-2.1491	-2.1408	-0.1683	-2.1353	-2.1275	-2.1314	-0.1589	-2.0569	-2.0430	-2.0500	-0.0774
2L18	0:01:00	0.0118	0.0050	0.0084	1.9944	-2.1465	-2.1633	-2.1549	-0.1689	-2.1500	-2.1417	-2.1459	-0.1599	-2.0707	-2.0569	-2.0638	-0.0778
2L18	0:02:00	0.0121	0.0050	0.0086	2.0145	-2.1672	-2.1839	-2.1756	-0.1697	-2.1707	-2.1622	-2.1665	-0.1606	-2.0902	-2.0764	-2.0833	-0.0774
2L18	0:04:00	0.0121	0.0050	0.0086	2.0356	-2.1920	-2.2090	-2.2005	-0.1734	-2.1957	-2.1866	-2.1912	-0.1641	-2.1138	-2.0999	-2.1069	-0.0798

Table H.1 Adjusted Indicator Readings, Shaft 10 - 2002

Load Interval	Elapsed Time h:mm:ss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT-8	TT-3	Avg. Rdg	Mvmt.	TT-7	TT-2	Avg. Rdg	Mvmt.	TT-10	TT-5	Avg. Rdg	Mvmt.	TT-9	TT-4	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2L19	0:00:30	0.0128	0.0050	0.0089	2.0717	-2.2324	-2.2499	-2.2412	-0.1783	-2.2366	-2.2274	-2.2320	-0.1692	-2.1526	-2.1388	-2.1457	-0.0829
2L19	0:01:00	0.0128	0.0050	0.0089	2.0864	-2.2476	-2.2655	-2.2566	-0.1791	-2.2523	-2.2423	-2.2473	-0.1698	-2.1676	-2.1539	-2.1608	-0.0833
2L19	0:02:00	0.0128	0.0050	0.0089	2.1125	-2.2753	-2.2931	-2.2842	-0.1806	-2.2797	-2.2706	-2.2752	-0.1715	-2.1943	-2.1807	-2.1875	-0.0839
2L19	0:04:00	0.0129	0.0050	0.0090	2.1418	-2.3059	-2.3239	-2.3149	-0.1820	-2.3109	-2.3014	-2.3062	-0.1733	-2.2239	-2.2105	-2.2172	-0.0843
2L20	0:00:30	0.0137	0.0050	0.0094	2.1633	-2.3303	-2.3485	-2.3394	-0.1855	-2.3343	-2.3257	-2.3300	-0.1761	-2.2469	-2.2339	-2.2404	-0.0865
2L20	0:01:00	0.0137	0.0050	0.0094	2.1857	-2.3541	-2.3724	-2.3633	-0.1870	-2.3593	-2.3496	-2.3545	-0.1782	-2.2693	-2.2571	-2.2632	-0.0869
2L20	0:02:00	0.0137	0.0050	0.0094	2.2284	-2.4000	-2.4176	-2.4088	-0.1898	-2.4052	-2.3952	-2.4002	-0.1812	-2.3133	-2.3012	-2.3073	-0.0882
2L20	0:04:00	0.0139	0.0050	0.0095	2.2745	-2.4494	-2.4679	-2.4587	-0.1936	-2.4549	-2.4445	-2.4497	-0.1846	-2.3615	-2.3495	-2.3555	-0.0904
2L21	0:00:30	0.0146	0.0050	0.0098	2.3672	-2.5495	-2.5680	-2.5588	-0.2014	-2.5555	-2.5439	-2.5497	-0.1923	-2.4577	-2.4463	-2.4520	-0.0946
2L21	0:01:00	0.0146	0.0050	0.0098	2.3891	-2.5727	-2.5911	-2.5819	-0.2026	-2.5789	-2.5672	-2.5731	-0.1938	-2.4805	-2.4688	-2.4747	-0.0954
2L21	0:02:00	0.0146	0.0050	0.0098	2.4216	-2.6072	-2.6260	-2.6166	-0.2048	-2.6138	-2.6019	-2.6079	-0.1961	-2.5143	-2.5024	-2.5084	-0.0966
2L21	0:04:00	0.0150	0.0050	0.0100	2.4712	-2.6593	-2.6788	-2.6691	-0.2079	-2.6664	-2.6532	-2.6598	-0.1986	-2.5653	-2.5535	-2.5594	-0.0982
2L22	0:00:30	0.0154	0.0050	0.0102	2.5107	-2.7020	-2.7216	-2.7118	-0.2113	-2.7093	-2.6960	-2.7027	-0.2022	-2.6062	-2.5947	-2.6005	-0.1000
2L22	0:01:00	0.0154	0.0050	0.0102	2.5255	-2.7180	-2.7374	-2.7277	-0.2124	-2.7252	-2.7122	-2.7187	-0.2034	-2.6213	-2.6100	-2.6157	-0.1003
2L22	0:02:00	0.0154	0.0050	0.0102	2.5559	-2.7492	-2.7690	-2.7591	-0.2134	-2.7566	-2.7434	-2.7500	-0.2043	-2.6520	-2.6405	-2.6463	-0.1006
2L22	0:04:00	0.0156	0.0050	0.0103	2.6073	-2.8038	-2.8232	-2.8135	-0.2165	-2.8119	-2.7978	-2.8049	-0.2078	-2.7051	-2.6940	-2.6996	-0.1025
2L23	0:00:30	0.0161	0.0050	0.0106	2.6571	-2.8561	-2.8765	-2.8663	-0.2198	-2.8649	-2.8494	-2.8572	-0.2106	-2.7561	-2.7452	-2.7507	-0.1041
2L23	0:01:00	0.0161	0.0050	0.0106	2.6763	-2.8769	-2.8971	-2.8870	-0.2212	-2.8856	-2.8702	-2.8779	-0.2121	-2.7757	-2.7652	-2.7705	-0.1047
2L23	0:02:00	0.0161	0.0050	0.0106	2.7088	-2.9111	-2.9312	-2.9212	-0.2229	-2.9202	-2.9056	-2.9129	-0.2146	-2.8094	-2.7989	-2.8042	-0.1059
2L23	0:04:00	0.0162	0.0047	0.0105	2.7226	-2.9242	-2.9435	-2.9339	-0.2218	-2.9336	-2.9193	-2.9265	-0.2144	-2.8225	-2.8119	-2.8172	-0.1051
2U1	0:00:30	0.0162	0.0035	0.0099	2.7178	-2.9153	-2.9346	-2.9250	-0.2171	-2.9311	-2.9150	-2.9231	-0.2152	-2.8214	-2.8089	-2.8152	-0.1073
2U1	0:03:00	0.0161	0.0024	0.0093	2.7106	-2.9018	-2.9211	-2.9115	-0.2101	-2.9188	-2.9027	-2.9108	-0.2094	-2.8116	-2.7976	-2.8046	-0.1032
2U2	0:00:30	0.0151	0.0017	0.0084	2.7047	-2.8923	-2.9128	-2.9026	-0.2063	-2.9106	-2.8944	-2.9025	-0.2062	-2.8049	-2.7908	-2.7979	-0.1016
2U2	0:03:00	0.0151	0.0017	0.0084	2.7037	-2.8909	-2.9116	-2.9013	-0.2060	-2.9091	-2.8933	-2.9012	-0.2059	-2.8038	-2.7898	-2.7968	-0.1015
2U3	0:00:30	0.0131	-0.0003	0.0064	2.6916	-2.8697	-2.8916	-2.8807	-0.1955	-2.8894	-2.8736	-2.8815	-0.1963	-2.7879	-2.7739	-2.7809	-0.0957
2U3	0:03:00	0.0130	-0.0004	0.0063	2.6891	-2.8649	-2.8864	-2.8757	-0.1929	-2.8848	-2.8690	-2.8769	-0.1941	-2.7834	-2.7694	-2.7764	-0.0936
2U4	0:00:30	0.0129	-0.0003	0.0063	2.6881	-2.8621	-2.8836	-2.8729	-0.1911	-2.8826	-2.8666	-2.8746	-0.1928	-2.7812	-2.7671	-2.7742	-0.0923
2U4	0:03:00	0.0096	-0.0031	0.0033	2.6545	-2.8042	-2.8273	-2.8158	-0.1645	-2.8273	-2.8103	-2.8188	-0.1676	-2.7360	-2.7196	-2.7278	-0.0766
2U5	0:00:30	0.0045	-0.0067	-0.0011	2.5618	-2.6777	-2.6996	-2.6887	-0.1257	-2.7033	-2.6861	-2.6947	-0.1318	-2.6254	-2.6076	-2.6165	-0.0536
2U5	0:03:00	0.0042	-0.0069	-0.0014	2.5407	-2.6380	-2.6597	-2.6489	-0.1068	-2.6629	-2.6502	-2.6566	-0.1145	-2.5973	-2.5770	-2.5872	-0.0451
2U5	0:06:00	0.0042	-0.0070	-0.0014	2.5373	-2.6262	-2.6479	-2.6371	-0.0984	-2.6510	-2.6381	-2.6446	-0.1059	-2.5894	-2.5686	-2.5790	-0.0403

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
L0	0:00:00		5.50	3.25	1.43	-1.14	38.85	-15.71	-1.53	-	-9.37	1.46	24.43	0.11	-1.51	-3.21	3.68	-2.63	-3.57	-
L1	0:00:30		5.32	3.32	1.50	-1.03	39.36	-14.74	-1.35	-	-7.76	1.46	25.82	2.24	0.04	0.40	6.23	-0.95	2.17	-
L1	0:01:00		5.39	3.35	1.46	-1.11	39.32	-14.81	-1.39	-	-8.37	1.42	25.85	2.24	0.04	0.26	6.04	-1.10	2.58	-
L1	0:01:30		5.64	3.35	1.50	-1.07	39.32	-14.74	-1.35	-	-8.29	1.06	25.78	2.35	0.11	0.55	6.19	-1.06	3.28	-
L1	0:02:00		5.39	3.35	1.50	-1.11	39.32	-14.71	-1.35	-	-7.65	1.02	25.64	2.46	0.00	0.73	6.26	-0.91	3.72	-
L1	0:02:30		5.64	3.35	1.50	-1.18	39.32	-14.71	-1.35	-	-7.62	1.06	25.60	2.46	0.04	0.66	6.19	-1.02	3.50	-
L1	0:03:00		5.39	3.39	1.46	-1.18	39.32	-14.85	-1.28	-	-7.87	1.50	25.64	2.39	-0.04	0.55	6.12	-0.99	3.68	-
L1	0:03:30		5.64	3.39	1.50	-1.21	39.28	-14.85	-1.39	-	-7.87	1.39	25.60	2.35	-0.22	0.11	5.97	-1.02	3.46	-
L1	0:04:00		5.64	3.35	1.46	-1.14	39.28	-14.71	-1.25	-	-7.69	1.02	25.57	2.39	0.00	0.58	6.08	-1.06	3.79	-
L1	0:04:30		5.39	3.35	1.46	-1.07	39.32	-14.85	-1.39	-	-8.22	1.02	25.78	2.43	-0.11	0.66	6.15	-1.13	3.79	-
L1	0:05:00		5.68	3.35	1.50	-1.11	39.32	-14.85	-1.39	-	-8.37	1.06	25.60	2.43	-0.11	0.66	6.12	-1.13	3.57	-
L1	0:05:30		5.68	3.35	1.50	-1.07	39.28	-14.78	-1.28	-	-8.29	1.53	25.53	2.35	-0.11	0.47	6.01	-1.13	3.65	-
U1	0:00:30		5.21	3.21	1.39	-1.39	38.78	-15.71	-1.92	-	-9.37	0.95	23.82	0.04	-1.11	-4.74	2.51	-2.23	-3.09	-
U1	0:01:00		5.17	3.21	1.43	-1.28	38.71	-15.74	-1.89	-	-9.51	0.58	23.68	-0.26	-1.15	-4.60	2.33	-2.27	-3.61	-
U1	0:01:30		5.46	3.18	1.36	-1.32	38.68	-15.74	-1.82	-	-9.58	1.02	23.64	-0.29	-1.15	-5.22	2.26	-2.34	-3.76	-
U1	0:02:00		5.14	3.21	1.36	-1.36	38.64	-15.85	-1.85	-	-9.62	0.62	23.53	-0.40	-1.18	-5.04	2.22	-2.30	-3.83	-
U1	0:02:30		5.17	3.21	1.36	-1.32	38.68	-15.78	-1.89	-	-9.98	0.58	23.57	-0.44	-1.18	-4.93	2.18	-2.34	-3.87	-
U1	0:03:00		5.17	3.18	1.36	-1.32	38.68	-15.85	-1.89	-	-9.62	0.62	23.50	-0.33	-1.22	-5.29	2.18	-2.34	-4.23	-
U1	0:03:30		5.21	3.21	1.43	-1.32	38.75	-15.89	-1.82	-	-9.98	1.06	23.57	-0.37	-1.22	-5.33	2.18	-2.34	-3.94	-
U1	0:04:00		5.17	3.21	1.36	-1.46	38.68	-15.78	-1.85	-	-10.01	0.95	23.46	-0.37	-1.22	-5.33	2.18	-2.38	-3.94	-
U1	0:04:30		5.46	3.18	1.36	-1.36	38.64	-15.74	-1.89	-	-9.65	0.66	23.50	-0.37	-1.22	-5.33	2.18	-2.34	-3.98	-
U1	0:05:00		5.17	3.21	1.36	-1.32	38.68	-15.74	-1.89	-	-9.69	0.62	23.50	-0.40	-1.18	-4.85	2.18	-2.34	-3.94	-
U1	0:05:30		5.21	3.18	1.36	-1.36	38.68	-15.78	-1.89	-	-9.69	0.88	23.50	-0.40	-1.18	-4.96	2.18	-2.34	-3.98	-
2L0	0:00:00		5.21	3.21	1.36	-1.32	38.64	-15.82	-1.89	-	-9.65	1.13	23.50	-0.40	-1.18	-5.33	2.18	-2.38	-3.98	-
2L1	0:00:30		5.61	3.60	1.68	0.89	39.50	-14.21	3.46	-	-7.15	9.42	24.93	2.87	4.34	4.74	9.50	1.86	-0.55	-
2L1	0:01:00		5.86	3.64	1.68	0.86	39.50	-14.24	3.35	-	-7.26	9.38	24.85	2.83	4.31	4.85	9.39	1.79	-0.85	-
2L1	0:01:30		5.57	3.64	1.75	0.82	39.50	-14.10	3.28	-	-7.51	9.38	24.85	2.72	4.27	4.67	9.43	1.79	-0.81	-
2L1	0:02:00		5.82	3.64	1.72	0.82	39.50	-14.10	3.17	-	-7.22	7.96	24.85	2.79	4.31	4.74	9.43	1.79	-0.92	-
2L1	0:02:30		5.82	3.60	1.72	0.86	39.50	-14.24	3.14	-	-7.19	7.96	24.85	2.87	4.24	4.67	9.43	1.75	-0.99	-
2L1	0:03:00		5.57	3.64	1.72	0.82	39.50	-14.10	3.14	-	-7.83	7.96	24.96	2.76	4.24	4.49	9.43	1.75	-0.99	-
2L1	0:03:30		5.53	3.68	1.72	0.82	39.50	-14.24	3.31	-	-7.54	9.24	24.85	2.76	4.24	4.56	9.36	1.72	-1.03	-
2L1	0:04:00		5.82	3.64	1.75	0.89	39.50	-14.24	3.10	-	-7.87	7.96	24.85	2.72	4.20	5.07	9.39	1.72	-1.07	-
2L1	0:04:30		5.82	3.64	1.68	0.82	39.50	-14.13	3.17	-	-7.26	7.92	24.85	2.72	4.20	4.53	9.39	1.68	-1.10	-
2L1	0:05:00		5.57	3.64	1.68	0.86	39.50	-14.28	3.10	-	-7.47	9.46	24.85	2.79	4.20	4.56	9.39	1.68	-1.10	-
2L1	0:05:30		5.82	3.68	1.72	0.86	39.46	-14.13	3.24	-	-7.26	9.31	24.85	2.68	4.13	4.60	9.39	1.68	-1.14	-
2L1	0:06:00		5.82	3.64	1.72	0.96	39.50	-14.28	3.06	-	-8.04	7.96	24.85	2.72	4.16	4.60	9.36	1.64	-1.18	-
2L1	0:06:30		5.82	3.64	1.72	0.82	39.50	-14.31	3.28	-	-7.87	7.81	24.85	2.76	4.16	4.45	9.36	1.64	-1.14	-
2L1	0:07:00		5.82	3.68	1.86	1.14	39.50	-14.10	3.24	-	-7.51	9.20	24.93	2.76	4.20	4.56	8.96	1.64	-1.18	-
2L2	0:00:30		6.43	4.53	2.39	5.42	41.18	-11.02	11.08	-	-3.25	18.91	26.43	8.05	7.90	13.76	14.96	5.78	3.02	-
2L2	0:01:00		6.43	4.50	2.39	4.92	41.08	-11.16	10.44	-	-3.75	17.20	26.50	8.27	8.00	14.12	15.33	6.10	4.01	-
2L2	0:01:30		6.50	4.60	2.47	5.24	41.33	-10.84	11.01	-	-3.15	17.53	26.57	8.31	7.97	14.01	15.22	5.96	3.42	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L2	0:02:00		6.43	4.60	2.47	5.21	41.29	-10.91	10.87	-	-3.61	17.34	26.35	8.20	7.90	13.68	15.11	5.85	3.02	-
2L2	0:02:30		6.50	4.57	2.47	5.14	41.33	-10.88	11.12	-	-3.65	19.21	26.57	8.38	8.04	14.09	15.25	5.99	3.35	-
2L2	0:03:00		6.79	4.64	2.54	5.35	41.40	-10.70	11.51	-	-2.93	17.86	26.75	8.53	8.11	13.90	15.40	6.10	3.31	-
2L2	0:03:30		6.54	4.64	2.50	5.67	41.68	-10.73	11.12	-	-3.47	17.64	26.46	8.38	8.04	14.12	15.33	5.99	3.20	-
2L2	0:04:00		6.54	4.60	2.50	5.49	41.43	-10.77	11.37	-	-3.58	19.32	26.64	8.34	8.00	14.01	15.29	6.07	3.09	-
2L2	0:04:30		6.54	4.64	2.47	5.49	41.47	-10.56	11.47	-	-3.47	19.65	26.60	8.60	8.11	14.12	15.44	5.81	3.20	-
2L3	0:00:30		8.73	9.06	4.68	13.13	46.70	-3.33	20.17	-	4.04	27.86	32.46	16.72	13.42	20.69	20.79	11.62	6.52	-
2L3	0:01:00		8.44	9.24	4.68	12.91	46.16	-3.15	19.63	-	4.00	27.50	32.10	16.50	13.32	20.40	20.61	11.48	6.15	-
2L3	0:01:30		8.52	9.38	5.00	12.70	46.30	-2.97	19.78	-	4.18	27.39	32.35	16.65	13.35	20.47	20.57	11.51	6.08	-
2L3	0:02:00		8.44	9.28	4.65	12.38	46.77	-3.18	19.31	-	4.00	27.13	32.00	16.39	13.21	20.18	20.50	11.37	5.85	-
2L3	0:02:30		8.23	9.21	4.90	12.06	46.70	-3.33	19.10	-	3.83	27.13	32.00	16.25	13.06	20.33	20.39	11.33	5.71	-
2L3	0:03:00		8.34	9.42	5.07	12.59	46.52	-2.72	19.74	-	3.47	27.68	32.43	16.83	13.42	20.47	20.64	11.59	5.89	-
2L3	0:03:30		8.23	9.35	4.93	12.38	46.98	-3.01	19.38	-	4.11	27.39	32.32	16.58	13.28	20.22	20.53	11.44	5.71	-
2L3	0:04:00		8.30	9.35	4.93	12.16	46.27	-3.18	19.21	-	3.83	27.31	32.21	16.47	13.17	20.25	20.46	11.37	5.60	-
2L3	0:04:30		8.16	9.31	4.65	12.16	46.23	-3.29	19.38	-	3.93	27.35	32.00	16.36	13.14	20.00	20.39	11.11	5.52	-
2L3	0:05:00		8.26	9.42	5.00	12.27	46.52	-2.90	19.63	-	4.00	27.61	32.35	16.76	13.39	20.58	20.64	11.51	5.63	-
2L3	0:05:30		8.30	9.38	4.97	12.09	46.45	-2.97	19.31	-	3.47	27.31	32.21	16.65	13.24	20.47	20.53	11.40	5.56	-
2L3	0:06:00		8.34	9.35	4.93	11.95	46.95	-3.11	19.35	-	4.11	27.64	32.25	17.02	13.46	20.58	21.01	12.06	5.56	-
2L4	0:00:30		4.71	11.60	6.43	12.98	43.98	1.68	23.55	-	8.47	30.96	30.89	21.02	14.79	23.35	21.59	12.76	6.81	-
2L4	0:01:00		4.74	11.56	6.72	12.95	43.83	1.54	23.20	-	8.97	30.67	30.93	21.35	14.86	23.50	21.77	12.90	6.92	-
2L4	0:01:30		4.64	11.53	6.47	12.66	43.69	1.57	23.27	-	8.29	31.22	30.82	21.43	14.86	23.57	21.77	12.90	6.92	-
2L4	0:02:00		4.85	11.49	6.50	12.59	43.55	1.72	23.37	-	9.19	31.22	30.64	21.35	14.82	23.68	21.81	12.98	6.92	-
2L4	0:02:30		4.49	11.35	6.86	12.77	43.33	1.68	23.52	-	9.40	31.00	30.46	21.46	14.82	23.68	22.13	12.94	6.74	-
2L4	0:03:00		4.49	11.28	6.90	12.77	43.15	1.72	23.69	-	9.58	30.09	30.25	21.65	14.86	23.68	21.92	12.94	6.96	-
2L4	0:03:30		4.38	11.20	6.61	12.80	42.94	1.86	23.87	-	9.69	30.09	30.10	21.72	14.86	23.79	21.92	12.98	7.07	-
2L4	0:04:00		4.35	11.17	6.93	12.84	42.76	1.79	24.02	-	9.76	30.09	29.85	21.87	14.89	23.94	21.99	13.01	7.11	-
2L4	0:04:30		4.42	10.81	6.43	12.34	42.36	1.29	23.27	-	8.08	30.82	29.32	20.99	14.43	23.50	21.52	12.57	6.77	-
2L4	0:05:00		4.42	10.67	6.65	12.02	42.29	1.04	22.88	-	8.58	30.38	29.21	20.91	14.25	23.32	21.33	12.54	6.66	-
2L4	0:05:30		4.06	10.60	6.29	11.63	42.26	0.93	22.70	-	7.69	30.38	29.14	20.62	14.21	23.25	21.22	12.35	6.59	-
2L5	0:00:30		3.99	10.85	6.90	14.48	39.54	2.68	27.22	-	10.94	30.38	27.35	23.78	15.36	26.64	23.34	13.85	8.39	-
2L5	0:01:00		3.88	10.70	7.15	14.45	39.21	2.50	27.61	-	11.37	34.76	27.10	23.74	15.29	26.64	23.34	13.85	8.10	-
2L5	0:01:30		3.59	10.67	6.86	14.34	39.11	2.54	27.69	-	10.69	34.76	26.96	23.82	15.33	26.89	23.12	13.85	8.43	-
2L5	0:02:00		3.81	10.46	6.79	14.16	38.89	2.33	27.12	-	10.19	34.76	26.64	23.34	15.00	26.13	23.08	13.49	7.84	-
2L5	0:02:30		3.92	10.67	7.11	14.12	39.00	2.40	27.44	-	10.48	34.58	26.75	23.45	15.18	26.57	22.94	13.63	8.21	-
2L5	0:03:00		3.77	10.31	6.93	13.91	38.85	2.04	26.55	-	10.01	34.58	26.53	23.04	14.93	26.27	22.64	13.41	8.03	-
2L5	0:03:30		3.56	10.42	7.00	13.95	39.18	2.40	27.29	-	10.55	34.73	26.93	23.89	15.29	26.68	23.15	13.78	7.95	-
2L5	0:04:00		3.84	10.35	6.97	13.73	39.03	2.22	26.83	-	10.44	34.18	26.68	23.23	15.04	26.31	23.30	13.49	8.03	-
2L5	0:04:30		3.88	10.38	6.97	13.80	39.18	2.18	27.12	-	10.40	34.58	26.85	23.52	15.18	26.42	23.34	13.67	7.84	-
2L5	0:05:00		3.88	10.38	6.90	13.59	39.07	2.11	26.76	-	10.19	34.21	26.93	23.34	15.00	26.35	23.12	13.45	7.55	-
2L5	0:05:30		3.52	10.31	6.86	13.52	39.03	2.00	26.51	-	10.40	34.21	26.60	23.08	14.97	26.06	23.04	13.38	7.55	-
2L5	0:06:00		3.56	10.35	6.61	13.59	39.18	2.29	26.97	-	10.44	34.51	26.89	23.71	15.22	26.46	23.04	13.67	7.81	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L5	0:06:30		3.88	10.46	6.86	13.48	39.11	2.11	26.72	-	10.98	34.11	26.71	23.30	14.97	26.35	22.86	13.49	7.92	-
2L6	0:00:30		3.63	10.88	7.07	14.84	38.60	3.15	28.90	-	12.05	36.26	26.53	25.10	15.94	27.95	24.17	14.62	8.87	-
2L6	0:01:00		3.52	10.85	6.72	15.09	38.17	3.08	29.36	-	12.08	36.26	26.18	25.25	15.94	28.35	24.17	14.69	8.65	-
2L6	0:01:30		3.77	10.74	7.00	15.16	37.96	3.04	29.36	-	11.30	36.59	26.18	25.07	15.83	28.14	23.96	14.37	8.54	-
2L6	0:02:00		3.38	10.60	6.65	14.80	37.92	2.86	29.18	-	11.76	36.59	26.10	25.36	15.94	28.10	24.25	14.62	8.65	-
2L6	0:02:30		3.67	10.53	6.82	14.48	37.71	2.65	28.68	-	11.48	36.59	25.75	24.77	15.54	27.99	23.77	14.29	8.39	-
2L6	0:03:00		3.45	10.53	6.86	14.59	37.92	2.79	29.00	-	11.69	36.59	25.93	25.10	15.79	28.17	24.17	14.58	8.58	-
2L6	0:03:30		3.70	10.56	6.79	14.48	37.82	2.61	28.68	-	11.51	36.00	25.78	24.77	15.58	27.92	23.96	14.33	8.69	-
2L6	0:04:00		3.45	10.56	6.82	14.55	37.89	2.72	28.86	-	12.19	36.00	25.93	25.10	15.79	28.03	24.03	14.47	8.47	-
2L6	0:04:30		3.70	10.42	6.47	14.20	37.82	2.58	28.50	-	11.33	36.00	25.82	24.85	15.58	28.03	24.17	14.55	8.51	-
2L6	0:05:00		3.74	10.46	6.75	14.37	37.85	2.65	28.68	-	12.08	36.00	25.85	24.96	15.68	27.95	24.03	14.37	8.36	-
2L6	0:05:30		3.70	10.49	6.40	14.12	37.82	2.54	28.50	-	11.37	36.11	26.14	25.18	15.76	28.17	24.03	14.47	8.76	-
2L7	0:00:30		3.41	10.85	6.50	15.52	37.03	3.47	30.39	-	13.12	37.83	25.35	26.46	16.40	29.63	24.87	15.43	9.17	-
2L7	0:01:00		3.70	10.92	6.82	15.77	36.81	3.58	30.93	-	13.12	37.83	25.18	26.87	16.62	29.85	25.01	15.64	9.39	-
2L7	0:01:30		3.59	10.74	6.40	15.59	36.49	3.36	30.71	-	12.94	37.83	25.00	26.79	16.58	30.14	25.01	15.64	9.35	-
2L7	0:02:00		3.59	10.78	6.68	15.69	36.53	3.36	30.79	-	13.05	37.83	25.07	27.09	16.65	30.07	25.12	15.79	9.43	-
2L7	0:02:30		3.52	10.70	6.57	15.37	36.31	3.15	30.36	-	12.84	37.94	24.78	26.57	16.40	29.52	24.94	15.39	9.20	-
2L7	0:03:00		3.16	10.49	6.15	15.16	36.20	2.93	30.04	-	12.51	37.94	24.64	26.32	16.19	29.49	24.65	15.17	9.02	-
2L7	0:03:30		3.45	10.38	6.43	15.12	36.20	2.97	29.86	-	12.62	37.94	24.57	26.06	16.04	29.52	24.54	15.02	9.28	-
2L7	0:04:00		3.45	10.35	6.40	15.02	36.17	2.79	29.72	-	12.26	37.94	24.57	25.99	15.97	29.23	24.46	14.95	8.87	-
2L7	0:04:30		3.45	10.31	6.36	14.80	36.24	2.76	29.64	-	12.19	37.17	24.53	25.91	15.90	29.19	24.54	15.02	9.35	-
2L7	0:05:00		3.34	10.63	6.61	15.27	36.56	3.26	30.57	-	13.19	37.17	25.00	27.05	16.55	29.89	25.27	15.64	9.54	-
2L7	0:05:30		3.59	10.49	6.50	15.12	36.46	3.18	30.18	-	12.48	37.17	24.82	26.65	16.37	29.63	25.01	15.39	9.39	-
2L8	0:00:30		3.38	10.88	6.36	15.87	36.31	3.69	31.50	-	13.73	37.17	25.03	28.15	17.19	30.84	26.21	16.52	9.83	-
2L8	0:01:00		3.63	10.88	6.65	16.16	35.99	3.79	31.75	-	14.05	37.17	24.75	28.37	17.26	31.20	26.29	16.60	10.16	-
2L8	0:01:30		3.56	10.81	6.61	16.37	35.74	3.79	32.07	-	14.05	37.17	24.53	28.56	17.37	31.38	26.50	16.49	10.27	-
2L8	0:02:00		3.49	10.81	6.54	16.26	35.45	3.61	31.96	-	13.91	39.80	24.18	28.15	17.08	31.13	25.67	16.41	10.31	-
2L8	0:02:30		3.38	10.53	6.40	15.94	35.20	3.33	31.32	-	13.41	39.25	23.96	27.57	16.80	31.09	25.74	16.16	9.98	-
2L8	0:03:00		3.49	10.74	6.50	15.94	35.49	3.51	31.71	-	13.66	39.34	24.21	28.04	17.08	30.91	25.67	16.38	10.05	-
2L8	0:03:30		3.49	10.60	6.47	15.91	35.60	3.54	31.82	-	13.52	39.39	24.39	28.30	17.23	31.27	26.39	16.56	10.13	-
2L8	0:04:00		3.41	10.56	6.43	15.84	35.35	3.40	31.46	-	13.48	39.44	24.14	28.01	16.98	30.98	25.56	16.27	9.98	-
2L8	0:04:30		3.45	10.56	6.43	15.84	35.49	3.44	31.57	-	13.59	39.36	24.21	28.15	17.05	30.87	26.18	16.34	9.98	-
2L8	0:05:00		3.41	10.49	6.40	15.66	35.42	3.33	31.25	-	13.55	39.29	24.10	27.75	16.90	30.84	25.92	16.16	9.65	-
2L8	0:05:30		3.38	10.42	6.36	15.62	35.38	3.26	31.14	-	13.44	39.22	24.03	27.79	16.83	30.76	25.41	16.05	9.57	-
2L8	0:06:00		3.45	10.49	6.43	15.77	35.45	3.58	31.50	-	13.80	40.09	24.25	28.26	17.05	30.95	26.25	16.38	9.98	-
2L9	0:00:30		3.63	10.88	6.65	16.48	35.42	4.01	32.60	-	14.84	40.97	24.39	29.11	17.77	32.00	26.47	17.14	10.42	-
2L9	0:01:00		3.59	10.88	6.65	16.66	35.27	4.19	33.17	-	14.87	41.46	24.32	29.70	17.98	32.40	26.94	17.33	10.71	-
2L9	0:01:30		3.49	10.88	6.61	16.91	34.92	4.19	33.39	-	15.37	41.71	24.07	29.95	18.12	33.03	27.12	17.66	10.86	-
2L9	0:02:00		3.41	10.78	6.29	16.98	34.59	4.11	33.56	-	15.02	41.83	23.85	29.95	18.09	33.06	27.67	17.62	10.86	-
2L9	0:02:30		3.38	10.85	6.50	16.91	34.52	4.04	33.35	-	14.73	41.89	23.71	30.03	18.09	32.73	27.16	17.58	10.90	-
2L9	0:03:00		3.38	10.70	6.50	16.76	34.49	4.04	33.10	-	15.30	41.96	23.75	30.03	18.20	33.21	27.12	17.62	10.79	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L9	0:03:30		3.34	10.63	6.47	16.80	34.34	4.01	33.35	-	15.09	42.17	23.78	30.10	18.12	33.24	27.23	17.66	10.79	-
2L9	0:04:00		3.31	10.56	6.40	16.59	34.20	3.83	32.99	-	14.59	41.90	23.39	29.62	17.73	32.77	26.72	17.33	10.64	-
2L9	0:04:30		3.31	10.53	6.40	16.66	34.31	3.94	32.99	-	14.73	41.63	23.60	29.88	18.09	33.06	27.09	17.55	10.75	-
2L9	0:05:00		3.38	10.63	6.47	16.66	34.38	3.97	33.21	-	14.95	42.27	23.64	30.10	18.09	33.17	27.27	17.62	10.71	-
2L9	0:05:30		3.31	10.60	6.15	16.59	34.27	3.83	32.57	-	14.73	42.59	23.53	29.73	17.80	32.84	26.83	17.36	10.68	-
2L10	0:00:30		3.41	10.74	6.22	16.91	34.34	4.15	33.56	-	15.41	42.75	23.68	30.25	18.27	33.35	27.81	17.80	10.94	-
2L10	0:01:00		3.45	10.78	6.47	17.19	34.31	4.37	34.24	-	15.59	42.83	23.78	31.02	18.73	34.08	28.00	18.24	11.27	-
2L10	0:01:30		3.41	10.78	6.54	17.30	34.06	4.40	33.99	-	15.73	42.87	23.57	31.06	18.81	33.97	28.40	18.31	11.41	-
2L10	0:02:00		3.31	10.70	6.47	17.16	33.84	4.26	33.67	-	14.69	42.91	23.39	30.91	18.59	34.12	28.11	18.20	11.30	-
2L10	0:02:30		3.31	10.63	6.47	17.23	33.84	4.26	33.89	-	15.55	43.03	23.39	31.06	18.73	33.94	28.03	18.13	11.34	-
2L10	0:03:00		3.31	10.63	6.50	17.23	33.70	4.29	33.85	-	15.66	43.16	23.35	31.09	18.81	34.38	28.36	18.35	11.41	-
2L10	0:03:30		3.31	10.70	6.50	17.26	33.73	4.29	34.03	-	15.80	43.34	23.39	31.24	18.84	34.45	28.25	18.42	11.41	-
2L10	0:04:00		3.31	10.67	6.50	17.26	33.70	4.37	34.10	-	15.77	43.38	23.39	31.42	18.95	34.56	28.40	18.50	11.82	-
2L10	0:04:30		3.09	10.70	6.50	17.41	33.66	4.40	34.60	-	15.84	43.20	23.32	31.53	18.99	34.67	28.47	18.57	11.52	-
2L10	0:05:00		3.27	10.67	6.22	17.41	33.59	4.40	34.49	-	16.02	43.11	23.25	31.61	19.02	34.70	28.47	18.61	11.52	-
2L10	0:05:30		3.20	10.63	6.40	17.33	33.41	4.19	33.92	-	15.55	43.01	22.93	31.06	18.70	34.41	28.43	18.28	11.30	-
2L10	0:06:00		3.16	10.46	6.36	17.01	33.34	4.11	34.06	-	15.66	42.87	22.89	30.91	18.56	34.27	27.81	18.02	11.23	-
2L11	0:00:30		2.69	10.99	6.07	19.80	30.48	5.62	37.63	-	18.31	45.28	21.32	34.81	21.03	38.65	31.38	20.98	13.70	-
2L11	0:01:00		2.66	10.85	6.07	19.80	30.37	5.55	38.09	-	18.38	47.69	21.36	35.14	21.32	38.61	31.56	21.24	13.84	-
2L11	0:01:30		2.95	10.78	6.36	20.05	30.19	5.47	37.52	-	18.20	47.31	21.14	34.84	21.00	38.46	31.16	21.05	13.62	-
2L11	0:02:00		2.84	10.67	6.25	19.47	30.08	5.12	37.13	-	17.59	46.92	20.96	34.33	20.67	37.99	30.69	20.65	13.29	-
2L11	0:02:30		2.91	10.60	6.29	19.55	30.40	5.22	37.34	-	18.09	47.62	21.43	35.06	21.14	38.50	31.64	21.13	13.62	-
2L11	0:03:00		2.66	10.60	6.32	19.33	30.40	5.19	37.38	-	17.91	47.21	21.36	34.84	21.03	38.32	31.16	20.98	13.48	-
2L11	0:03:30		2.98	10.60	6.32	19.47	30.62	5.33	37.56	-	18.13	47.47	21.53	35.17	21.25	38.57	31.49	21.09	13.70	-
2L11	0:04:00		2.87	10.56	6.29	19.33	30.37	5.15	37.23	-	17.88	47.36	21.39	34.81	21.00	38.24	31.24	20.94	13.37	-
2L11	0:04:30		2.95	10.53	6.29	19.40	30.30	5.15	37.09	-	17.88	47.27	21.39	34.95	21.03	38.28	31.24	20.98	13.99	-
2L11	0:05:00		2.66	10.49	6.00	19.26	30.44	5.19	37.13	-	18.34	47.22	21.50	35.06	21.14	38.39	31.56	21.05	13.44	-
2L11	0:05:30		2.95	10.60	6.29	19.23	30.58	5.19	37.13	-	17.81	47.18	21.46	34.95	21.10	38.35	31.35	20.87	13.44	-
2L12	0:00:30		2.84	11.13	6.07	21.26	28.68	6.48	40.01	-	20.74	51.27	20.68	38.41	23.54	42.11	34.29	23.58	16.13	-
2L12	0:01:00		2.87	10.92	6.32	21.37	28.76	6.33	40.26	-	20.52	51.52	20.50	38.63	23.69	42.48	34.55	23.76	16.24	-
2L12	0:01:30		2.80	10.78	6.29	21.22	28.11	6.23	40.01	-	20.59	51.41	20.39	38.41	23.65	42.44	34.26	23.69	15.69	-
2L12	0:02:00		2.80	10.74	6.25	21.22	28.11	6.08	40.01	-	20.20	51.38	20.21	38.22	23.36	42.44	34.26	23.54	15.50	-
2L12	0:02:30		2.84	10.67	6.25	21.19	28.18	6.08	40.12	-	20.31	51.34	20.53	38.55	23.69	42.55	34.59	23.76	15.61	-
2L12	0:03:00		2.87	10.70	6.29	21.19	28.72	6.12	40.19	-	20.45	51.71	20.64	38.89	23.83	42.77	34.84	23.98	15.98	-
2L12	0:03:30		2.62	10.70	6.29	21.08	28.22	6.12	40.19	-	20.42	51.71	20.53	38.67	23.80	42.88	34.66	23.91	15.61	-
2L12	0:04:00		2.84	10.60	6.22	21.04	28.61	6.01	39.87	-	20.20	51.71	20.43	38.44	23.62	42.51	34.55	23.80	15.61	-
2L12	0:04:30		2.84	10.63	6.22	20.94	28.15	5.94	39.91	-	20.06	51.23	20.36	38.33	23.51	42.44	34.19	23.58	15.35	-
2L12	0:05:00		2.80	10.49	6.18	20.87	28.08	5.87	39.80	-	19.38	51.01	20.28	38.15	23.26	42.04	34.15	23.39	15.17	-
2L12	0:05:30		2.59	10.63	6.22	20.79	28.22	5.94	39.84	-	19.24	51.01	20.46	38.41	23.54	42.33	34.51	23.61	15.32	-
2L13	0:00:30		2.41	10.99	6.07	23.72	25.18	7.62	44.04	-	22.95	57.07	19.00	43.77	27.60	48.28	39.28	28.15	19.33	-
2L13	0:01:00		2.73	10.95	5.86	23.83	25.03	7.55	44.86	-	23.42	57.47	18.96	44.22	27.89	48.46	39.65	28.37	19.99	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L13	0:01:30		2.69	10.81	6.04	23.86	24.85	7.41	44.47	-	23.35	57.47	18.86	44.10	27.71	48.42	39.57	28.37	19.15	-
2L13	0:02:00		2.69	10.81	6.04	23.51	24.92	7.34	44.32	-	23.31	57.11	19.07	44.10	27.71	48.68	39.39	28.33	19.00	-
2L13	0:02:30		2.73	10.70	6.04	23.61	25.00	7.34	44.29	-	23.35	57.33	19.18	44.25	27.85	48.83	39.65	28.44	19.04	-
2L13	0:03:00		2.73	10.63	6.04	23.54	25.00	7.26	43.75	-	23.17	56.96	19.11	44.03	27.67	48.50	39.35	28.22	18.78	-
2L13	0:03:30		2.69	10.56	5.97	23.33	24.92	7.12	43.43	-	22.92	56.96	18.89	43.55	27.24	47.80	38.85	27.89	18.48	-
2L13	0:04:00		2.44	10.56	5.72	23.18	25.07	7.23	43.61	-	22.74	57.18	19.43	44.36	27.85	48.68	39.61	28.33	19.11	-
2L13	0:04:30		2.77	10.56	5.75	23.33	25.14	7.30	43.58	-	22.70	57.07	19.36	44.18	27.67	48.53	39.50	28.26	19.00	-
2L13	0:05:00		2.52	10.56	6.04	23.33	25.18	7.23	43.68	-	22.70	57.07	19.39	44.36	27.71	48.79	39.61	28.33	18.82	-
2L13	0:05:30		2.80	10.60	6.04	23.15	25.21	7.26	43.72	-	23.28	57.07	19.46	44.58	27.85	48.83	39.76	28.40	18.85	-
2L14	0:00:30		2.41	11.06	5.97	25.79	22.31	8.70	47.67	-	26.10	62.99	18.43	49.47	32.05	55.58	44.20	32.53	23.23	-
2L14	0:01:00		2.66	10.88	5.93	25.72	22.10	8.59	47.35	-	25.99	63.02	18.39	49.54	32.05	55.80	44.20	32.61	23.27	-
2L14	0:01:30		2.66	10.78	5.90	26.04	22.13	8.41	46.82	-	25.78	63.02	18.46	49.58	31.94	55.61	44.16	32.46	22.90	-
2L14	0:02:00		2.69	10.74	5.61	25.93	22.24	8.41	47.18	-	25.74	62.77	18.75	49.69	32.12	55.80	44.38	32.64	23.23	-
2L14	0:02:30		2.73	10.85	5.65	25.68	22.31	8.37	46.89	-	25.89	62.77	18.89	50.02	32.37	55.36	44.56	32.86	23.09	-
2L14	0:03:00		2.73	10.67	5.90	25.25	22.27	8.30	47.07	-	25.60	62.73	18.78	49.65	32.01	55.76	44.16	32.53	23.01	-
2L14	0:03:30		2.73	10.60	5.86	25.47	22.31	8.27	46.93	-	25.53	62.88	18.89	49.88	32.01	55.83	44.27	32.57	23.05	-
2L14	0:04:00		2.77	10.60	5.90	25.68	22.38	8.30	46.61	-	25.74	62.92	19.07	49.99	32.19	55.91	44.42	32.68	23.12	-
2L14	0:04:30		2.80	10.67	5.93	25.75	22.70	8.37	46.68	-	25.92	63.28	19.21	50.39	32.48	56.20	44.89	33.04	23.09	-
2L14	0:05:00		2.80	10.74	5.97	25.18	22.78	8.37	47.10	-	25.53	63.28	19.36	50.54	32.66	55.98	45.14	33.26	23.75	-
2L14	0:05:30		2.80	10.60	5.90	25.47	22.45	8.27	46.78	-	25.71	63.28	19.07	49.91	32.27	56.05	44.56	32.79	22.79	-
2L15	0:00:30		2.48	11.03	5.90	27.32	20.66	9.55	49.60	-	28.53	68.28	18.71	54.69	36.57	61.45	49.15	37.21	27.03	-
2L15	0:01:00		2.73	10.88	5.82	27.29	20.09	9.45	49.81	-	28.39	68.28	18.68	54.87	36.68	61.96	49.37	37.43	27.32	-
2L15	0:01:30		2.44	10.74	5.79	27.00	20.05	9.41	49.28	-	28.21	67.84	18.75	54.76	36.46	62.44	49.18	37.25	27.36	-
2L15	0:02:00		2.48	10.81	5.79	27.00	20.13	9.27	48.81	-	27.57	67.84	18.96	54.91	36.61	62.77	49.29	37.36	27.17	-
2L15	0:02:30		2.77	10.70	5.79	26.89	20.59	9.27	48.99	-	28.28	67.84	19.14	55.20	36.86	62.91	49.51	37.58	27.36	-
2L15	0:03:00		2.52	10.63	5.79	26.93	20.56	9.23	48.85	-	28.14	67.81	19.03	55.09	36.64	62.51	49.37	37.32	27.39	-
2L15	0:03:30		2.80	10.60	5.50	26.75	20.56	9.20	49.21	-	28.17	67.74	19.14	55.02	36.61	62.77	49.29	37.47	27.39	-
2L15	0:04:00		2.52	10.74	5.79	26.82	20.63	9.20	48.96	-	28.17	67.83	19.18	55.09	36.64	62.15	49.40	37.32	27.14	-
2L15	0:04:30		2.84	10.60	5.79	26.79	20.63	9.20	48.64	-	28.21	67.87	19.28	55.57	36.79	62.88	49.55	37.39	27.17	-
2L15	0:05:00		2.55	10.60	5.54	26.79	20.27	9.23	49.17	-	28.00	67.92	19.46	55.68	36.86	62.62	49.58	37.47	27.25	-
2L16	0:00:30		2.73	10.92	5.40	28.43	18.08	10.59	51.31	-	30.96	67.92	19.07	59.73	40.84	68.75	53.99	41.30	31.22	-
2L16	0:01:00		2.84	10.85	5.68	28.28	18.01	10.56	50.95	-	30.43	72.85	19.32	60.39	41.42	67.88	54.50	41.85	31.59	-
2L16	0:01:30		2.59	10.85	5.61	28.07	17.91	10.59	50.77	-	31.14	72.85	19.32	60.64	41.42	69.41	54.65	42.00	31.89	-
2L16	0:02:00		2.84	10.67	5.32	27.89	17.98	10.52	50.52	-	31.00	72.56	19.32	60.35	41.17	69.19	54.35	41.74	31.74	-
2L16	0:02:30		2.59	10.63	5.61	27.96	17.94	10.52	50.70	-	31.11	74.80	19.53	60.75	41.42	69.41	54.72	42.00	31.92	-
2L16	0:03:00		2.87	10.67	5.29	27.71	17.87	10.45	50.28	-	30.96	75.92	19.43	60.35	41.17	69.12	54.39	41.71	31.67	-
2L16	0:03:30		2.59	10.63	5.57	27.64	18.08	10.48	50.24	-	31.00	76.49	19.57	60.61	41.27	69.15	54.46	41.74	31.70	-
2L16	0:04:00		2.91	10.56	5.57	27.71	18.16	10.48	50.20	-	30.75	76.77	19.71	60.75	41.31	69.23	54.54	41.82	31.74	-
2L16	0:04:30		2.62	10.53	5.32	27.68	18.05	10.48	50.35	-	30.78	76.91	19.86	60.90	41.42	68.13	54.65	41.93	31.78	-
2L17	0:00:30		2.66	10.85	5.22	29.00	15.86	12.13	52.13	-	34.22	76.98	19.64	65.39	45.65	73.68	59.23	46.68	35.86	-
2L17	0:01:00		2.66	10.78	5.47	28.96	15.58	12.34	51.84	-	34.22	77.01	19.71	66.12	46.05	74.92	59.82	46.97	36.12	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L17	0:01:30		2.66	10.74	5.18	28.96	15.47	12.45	52.20	-	35.00	77.03	19.96	66.64	46.44	74.44	60.07	47.01	36.56	-
2L17	0:02:00		2.62	10.60	5.43	28.78	15.36	12.38	51.99	-	34.50	77.04	19.96	66.97	46.23	75.39	59.89	47.15	36.49	-
2L17	0:02:30		2.66	10.56	5.15	28.64	15.33	12.42	51.59	-	34.68	77.04	20.03	66.75	46.23	74.19	59.74	47.04	36.34	-
2L17	0:03:00		2.66	10.53	5.43	28.46	15.40	12.42	51.24	-	34.72	77.05	20.25	66.64	46.12	74.99	59.82	47.08	36.38	-
2L17	0:03:30		2.66	10.49	5.43	28.50	15.47	12.42	51.20	-	34.79	76.96	20.39	66.86	46.30	75.25	59.92	47.15	36.45	-
2L17	0:04:00		2.69	10.49	5.43	28.32	15.58	12.34	51.06	-	34.40	76.86	20.36	66.71	46.15	74.63	59.67	47.04	36.01	-
2L17	0:04:30		2.73	10.42	5.47	28.25	15.51	12.42	51.06	-	34.72	77.01	20.50	66.89	46.26	74.77	59.92	47.08	36.30	-
2L17	0:05:00		2.73	10.46	5.47	28.21	15.54	12.45	50.99	-	34.75	77.01	20.64	67.00	46.41	74.81	59.92	47.12	36.34	-
2L17	0:05:30		2.73	10.42	5.47	28.28	15.47	12.45	51.42	-	34.82	77.01	20.68	67.30	46.41	75.10	60.11	47.19	36.38	-
2L17	0:06:00		3.20	10.60	5.65	28.57	15.79	12.77	51.91	-	36.25	77.01	22.03	70.20	48.95	78.42	62.98	50.22	38.40	-
2L18	0:00:30		3.02	10.60	5.18	29.64	12.39	14.85	52.95	-	39.19	77.01	20.78	73.03	51.14	79.99	64.91	51.76	40.47	-
2L18	0:01:00		2.73	10.53	5.40	29.60	12.32	14.96	52.31	-	39.04	77.01	20.57	73.03	50.93	79.95	64.98	51.76	40.58	-
2L18	0:01:30		2.73	10.46	5.43	29.46	12.28	15.03	52.27	-	39.19	77.01	20.82	73.43	51.14	80.06	65.28	52.01	40.80	-
2L18	0:02:00		2.73	10.42	5.40	29.39	12.00	15.06	52.13	-	39.22	81.76	20.96	73.69	51.14	79.99	65.28	52.01	40.80	-
2L18	0:02:30		2.77	10.31	5.40	29.32	12.10	15.10	52.02	-	39.19	81.76	21.00	73.36	51.18	79.88	65.20	51.91	40.54	-
2L18	0:03:00		2.77	10.35	5.15	29.32	12.14	15.14	52.02	-	39.33	81.79	21.32	73.58	51.47	80.03	65.46	52.34	40.91	-
2L18	0:03:30		2.80	10.24	5.40	29.21	12.10	15.14	51.91	-	39.29	81.79	21.25	73.66	51.25	80.79	65.31	52.05	40.39	-
2L18	0:04:00		2.80	10.24	5.43	29.11	11.93	15.17	51.84	-	39.37	81.65	21.43	73.62	51.29	79.92	65.28	52.12	40.80	-
2L18	0:04:30		3.13	10.21	5.43	29.07	12.14	15.21	52.24	-	39.40	81.70	21.50	73.84	51.50	80.68	65.42	52.09	40.83	-
2L18	0:05:00		2.84	10.21	5.43	29.03	12.03	15.21	51.77	-	39.47	81.73	21.61	73.95	51.43	79.95	65.39	52.16	40.87	-
2L18	0:05:30		2.87	10.21	5.43	29.00	12.14	15.24	51.70	-	39.26	81.76	21.68	74.06	51.72	79.95	65.57	52.31	40.91	-
2L19	0:00:30		2.95	10.35	5.22	29.32	12.07	15.57	52.73	-	40.33	82.62	22.32	75.35	53.26	82.18	67.17	53.92	42.05	-
2L19	0:01:00		2.87	10.35	5.43	29.46	11.39	15.82	52.59	-	40.58	83.47	22.03	75.57	53.30	82.51	67.31	54.06	42.16	-
2L19	0:01:30		2.87	10.42	5.43	29.50	11.28	16.03	52.70	-	40.76	83.51	22.03	75.93	53.48	82.84	67.50	54.28	42.42	-
2L19	0:02:00		2.87	10.35	5.43	29.60	10.92	16.21	52.20	-	40.97	83.66	21.96	76.23	53.76	82.95	67.61	54.39	42.71	-
2L19	0:02:30		2.87	10.28	5.40	29.53	10.67	16.35	52.59	-	41.12	83.84	21.89	76.34	53.80	82.98	67.57	54.39	42.78	-
2L19	0:03:00		2.84	10.17	5.40	29.43	10.53	16.42	52.09	-	41.12	83.77	21.96	76.56	53.83	82.80	67.64	54.46	42.75	-
2L19	0:03:30		2.87	10.24	5.40	29.46	10.42	16.50	52.13	-	41.19	83.84	22.00	76.74	53.80	82.95	67.75	54.61	42.78	-
2L19	0:04:00		2.87	10.13	5.40	29.28	10.31	16.53	52.27	-	40.94	83.89	21.82	76.45	53.58	82.47	67.31	54.17	42.64	-
2L19	0:04:30		2.87	10.10	5.43	29.28	10.35	16.57	51.95	-	41.19	83.92	22.11	76.78	53.91	81.78	67.68	54.43	42.86	-
2L19	0:05:00		2.91	10.10	5.43	29.25	10.31	16.60	52.27	-	41.08	83.95	22.18	77.11	53.98	82.84	67.64	54.46	42.45	-
2L19	0:05:30		2.87	10.03	5.43	29.21	10.53	16.64	51.84	-	41.15	83.69	22.14	76.82	53.69	82.65	67.61	54.43	42.78	-
2L20	0:00:30		2.98	10.24	5.22	29.57	10.46	16.96	52.45	-	42.05	83.69	22.78	78.62	55.52	84.04	69.50	56.07	44.04	-
2L20	0:01:00		2.95	10.24	5.47	29.89	9.49	17.39	52.63	-	42.48	85.41	22.57	79.35	55.92	84.41	69.72	56.44	44.18	-
2L20	0:01:30		2.91	10.24	5.43	29.96	9.31	17.75	53.23	-	42.83	85.41	22.39	79.50	56.02	84.55	69.97	56.66	44.81	-
2L20	0:02:00		2.87	10.21	5.43	30.57	8.88	18.00	52.77	-	43.01	85.41	22.28	80.12	56.24	85.17	70.19	56.84	44.96	-
2L20	0:02:30		2.84	10.13	5.36	30.32	8.06	18.18	52.56	-	42.94	85.41	21.82	79.76	55.74	84.15	69.57	56.47	44.77	-
2L20	0:03:00		2.87	10.13	5.40	30.10	8.38	18.28	53.16	-	43.30	86.18	22.18	80.27	56.13	84.59	69.90	56.66	45.03	-
2L20	0:03:30		2.84	10.17	5.40	29.89	7.95	18.32	52.52	-	43.30	86.18	22.14	80.53	56.02	84.11	69.68	56.51	44.92	-
2L20	0:04:00		3.16	10.03	5.40	29.85	8.27	18.36	52.48	-	43.19	86.18	22.39	80.38	56.20	84.19	69.90	56.62	44.99	-
2L20	0:04:30		2.87	9.99	5.43	29.89	7.95	18.43	52.95	-	43.37	86.32	22.50	80.75	56.31	84.52	69.86	56.69	44.81	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\varepsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
2L20	0:05:00		3.20	9.99	5.15	29.85	7.84	18.50	52.91	-	43.55	86.63	22.53	80.75	56.31	84.59	70.08	56.73	45.14	-
2L20	0:05:30		2.91	9.96	5.43	29.71	7.81	18.54	52.34	-	43.30	86.79	22.50	80.82	56.17	84.08	69.75	56.58	44.99	-
2L20	0:06:00		2.91	9.96	5.43	30.21	8.16	18.64	52.63	-	43.87	86.94	23.18	82.15	57.17	85.14	71.21	57.57	45.99	-
2L21	0:00:30		2.95	10.10	5.18	30.57	6.30	19.79	53.16	-	45.48	86.94	22.57	83.95	58.46	86.45	72.23	58.63	47.09	-
2L21	0:01:00		2.91	10.03	5.43	30.64	5.80	20.07	53.52	-	45.37	86.94	22.25	83.76	58.25	87.62	72.27	58.59	47.20	-
2L21	0:01:30		2.87	9.96	5.43	30.89	5.48	20.22	53.52	-	45.44	87.93	22.18	83.80	58.36	86.41	71.97	58.48	47.20	-
2L21	0:02:00		2.91	9.88	5.18	30.53	5.30	20.32	53.09	-	45.73	87.93	22.25	84.20	58.39	86.70	72.16	58.59	47.35	-
2L21	0:02:30		2.91	9.96	5.47	30.67	5.09	20.40	53.09	-	46.09	87.93	22.36	84.50	58.54	86.56	72.34	58.74	47.46	-
2L21	0:03:00		2.91	9.88	5.47	30.67	4.98	20.54	53.70	-	45.91	88.73	22.46	84.72	58.72	87.58	72.38	58.81	47.42	-
2L21	0:03:30		2.91	9.96	5.47	30.67	4.80	20.57	53.13	-	45.62	88.69	22.32	84.64	58.64	86.52	72.16	58.74	47.53	-
2L21	0:04:00		2.91	9.85	5.18	30.57	4.69	20.65	53.16	-	45.87	88.68	22.43	84.79	58.75	87.98	72.12	58.89	47.76	-
2L21	0:04:30		2.91	9.85	5.43	30.92	4.55	20.65	53.05	-	45.69	88.67	22.32	84.79	58.68	86.56	71.97	58.70	47.57	-
2L21	0:05:00		2.91	9.81	5.47	30.57	4.48	20.72	53.09	-	45.69	88.66	22.46	85.09	58.68	86.56	71.83	58.67	47.50	-
2L21	0:05:30		2.91	9.78	5.47	30.57	4.51	20.79	53.62	-	45.80	88.66	22.53	84.79	58.82	87.40	72.19	58.74	47.68	-
2L21	0:06:00		2.98	9.85	5.25	30.71	4.48	21.00	53.62	-	46.52	90.05	23.25	86.56	59.94	87.51	73.07	59.87	48.42	-
2L22	0:00:30		2.98	9.88	5.54	30.89	4.30	21.04	53.38	-	46.37	89.39	23.00	86.15	59.58	87.36	72.99	59.73	48.27	-
2L22	0:01:00		2.95	9.85	5.47	30.67	3.98	21.22	53.23	-	46.41	89.39	22.68	86.11	59.65	87.40	72.85	59.80	48.42	-
2L22	0:01:30		2.95	9.81	5.47	31.39	4.08	21.36	53.77	-	46.80	89.39	22.71	86.63	59.69	87.51	73.03	59.80	48.57	-
2L22	0:02:00		2.98	9.81	5.47	30.78	3.47	21.58	53.30	-	47.02	89.39	22.64	86.96	59.83	88.24	73.10	59.91	48.71	-
2L22	0:02:30		3.27	9.78	5.47	30.85	3.26	21.76	53.23	-	47.02	89.39	22.57	87.33	59.79	88.97	73.54	60.02	48.93	-
2L22	0:03:00		3.27	9.78	5.22	31.32	3.04	21.90	53.80	-	47.30	89.39	22.43	87.22	59.76	89.37	73.18	59.80	48.79	-
2L22	0:03:30		3.27	9.78	5.47	30.78	2.86	21.93	53.16	-	47.20	89.39	22.39	87.70	59.65	87.62	73.25	59.80	48.86	-
2L22	0:04:00		3.31	9.74	5.47	30.78	2.76	22.11	53.62	-	47.27	89.68	22.32	87.11	59.58	87.62	73.07	59.76	48.86	-
2L22	0:04:30		2.98	9.71	5.43	30.71	2.65	22.18	53.59	-	47.30	89.68	22.46	87.95	59.54	88.60	73.18	59.69	48.86	-
2L22	0:05:00		3.02	9.71	5.18	30.60	2.61	22.22	53.59	-	47.62	89.79	22.68	87.99	59.76	87.62	73.07	59.73	48.82	-
2L22	0:05:30		3.02	9.63	5.47	30.67	2.54	22.22	53.59	-	47.62	89.79	22.75	88.21	59.86	87.65	73.29	59.84	49.01	-
2L22	0:06:00		3.34	9.67	5.15	30.64	2.47	22.40	53.52	-	47.59	89.61	22.75	88.43	59.94	89.00	73.32	59.91	49.04	-
2L23	0:00:30		3.05	9.71	5.22	30.75	2.33	22.61	53.80	-	48.16	90.52	22.82	88.65	60.51	88.09	73.83	60.79	49.56	-
2L23	0:01:00		3.02	9.78	5.43	30.85	1.90	22.90	53.66	-	48.34	84.28	22.57	89.72	60.65	89.04	74.05	61.01	49.67	-
2L23	0:01:30		3.02	9.74	5.43	31.00	1.54	23.12	53.77	-	48.84	81.15	22.39	89.90	60.65	88.27	73.87	61.01	49.78	-
2L23	0:02:00		3.02	9.74	5.43	31.03	1.33	23.29	53.84	-	48.77	79.59	22.39	90.19	60.62	88.24	74.20	61.19	50.00	-
2L23	0:02:30		3.02	9.71	5.40	30.92	1.04	23.40	53.55	-	48.55	78.81	21.64	89.50	59.83	88.82	73.14	60.13	49.23	-
2L23	0:03:00		2.87	9.38	5.11	30.42	0.57	23.19	52.31	-	47.48	78.42	19.57	87.07	57.85	85.68	70.85	58.16	47.50	-
2L23	0:03:30		2.80	9.24	5.15	30.21	0.04	22.97	52.31	-	46.77	78.23	17.61	85.38	56.56	83.53	69.13	56.99	46.10	-
2L23	0:04:00		2.73	9.06	5.04	29.78	-0.50	22.69	51.31	-	45.94	78.13	15.89	83.73	55.09	81.52	67.46	55.78	44.77	-
2U1	0:00:30		2.41	8.46	4.50	28.04	-2.26	21.15	47.39	-	42.08	78.08	10.86	75.13	48.60	75.39	59.96	50.00	40.28	-
2U1	0:01:00		2.62	8.28	4.39	27.64	-3.01	20.83	46.75	-	41.05	78.03	10.03	73.58	47.20	74.52	58.54	48.76	39.14	-
2U1	0:01:30		2.30	8.10	4.29	27.25	-3.72	20.47	46.50	-	40.19	78.03	8.96	72.00	45.80	74.19	57.05	47.56	38.73	-
2U1	0:02:00		2.30	7.96	4.18	26.82	-4.15	20.15	45.64	-	39.19	75.33	8.21	70.02	44.47	72.95	55.52	46.68	37.70	-
2U1	0:02:30		2.23	7.78	4.07	27.04	-4.66	19.79	44.57	-	38.61	73.27	7.21	68.22	43.10	71.78	54.17	45.69	37.11	-
2U1	0:03:00		2.44	7.67	3.97	26.18	-5.12	19.50	44.18	-	37.76	72.24	6.39	66.52	41.85	71.12	52.79	44.41	36.34	-

Table H.2 Calculated Strain, Shaft 10 - 2002

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage # Elev. ft	10628 +15.00	10629 +15.00	10630 +15.00	10631 -20.00	10632 -20.00	10633 -20.00	10634 -26.00	10635 -26.00	10636 -26.00	10637 -32.00	10638 -32.00	10639 -32.00	10640 -42.00	10641 -42.00	10642 -42.00	10643 -47.50	10644 -47.50	10645 -47.50
2U1	0:03:30		2.16	7.53	3.86	25.89	-6.20	19.25	43.04	-	37.11	71.20	5.57	65.35	40.48	70.10	51.44	42.95	35.49	-
2U1	0:04:00		2.08	7.49	3.64	25.22	-6.20	18.96	42.33	-	35.97	69.89	4.93	63.55	39.41	69.12	50.17	41.60	34.91	-
2U1	0:04:30		2.08	7.24	3.68	25.43	-6.80	18.57	41.58	-	35.43	69.89	4.00	61.82	37.97	67.73	48.67	40.35	34.24	-
2U2	0:00:30		2.12	7.21	3.72	24.86	-6.98	18.68	41.76	-	35.72	69.89	4.93	62.37	38.47	67.33	49.40	40.79	34.57	-
2U2	0:01:00		2.12	7.21	3.72	25.25	-7.20	18.68	41.76	-	35.72	69.89	4.61	62.56	38.37	68.31	49.18	40.68	34.43	-
2U2	0:01:30		2.16	7.17	3.75	25.40	-7.52	18.61	41.94	-	35.79	68.90	4.86	62.63	38.51	68.60	49.33	40.79	34.57	-
2U2	0:02:00		2.16	7.14	3.72	25.36	-7.52	18.64	41.94	-	35.43	68.90	4.50	62.26	38.26	67.58	49.04	40.57	34.32	-
2U2	0:02:30		2.19	7.14	3.75	24.82	-7.59	18.68	42.01	-	35.68	68.90	4.82	62.30	38.37	67.33	49.11	40.61	34.39	-
2U2	0:03:00		2.16	7.10	3.75	25.04	-7.56	18.64	41.90	-	35.25	68.68	5.07	62.19	38.37	68.50	49.11	40.61	34.50	-
2U2	0:03:30		2.16	7.14	3.75	25.25	-7.81	18.64	41.90	-	35.32	68.68	4.93	62.15	38.22	68.31	49.00	40.50	34.35	-
2U2	0:04:00		2.16	7.14	3.75	25.07	-8.13	18.54	41.87	-	35.58	68.68	4.79	62.08	38.22	68.20	48.82	40.79	34.35	-
2U3	0:00:30		1.80	6.10	2.89	22.08	-9.88	16.71	36.45	-	29.93	68.68	-1.86	50.72	29.36	58.53	39.43	31.65	27.98	-
2U3	0:01:00		1.80	6.03	2.89	22.08	-9.70	16.57	36.77	-	29.14	57.88	-1.29	50.39	29.11	58.39	39.21	31.29	28.35	-
2U3	0:01:30		2.05	5.89	2.93	21.94	-10.39	16.25	36.02	-	29.32	57.88	-2.29	49.36	28.25	56.82	38.26	30.41	27.91	-
2U3	0:02:00		2.08	5.85	2.93	21.76	-10.10	16.28	35.88	-	29.18	56.45	-1.32	49.14	28.14	57.62	38.23	30.34	28.13	-
2U3	0:02:30		2.08	5.85	2.93	21.86	-10.31	16.25	36.41	-	29.18	56.74	-1.93	49.25	28.21	57.58	38.26	30.38	28.09	-
2U3	0:03:00		2.12	5.85	2.86	21.79	-10.39	16.14	36.06	-	28.50	56.82	-1.46	49.32	28.28	57.51	38.23	30.38	28.09	-
2U3	0:03:30		2.08	5.82	2.93	21.83	-10.81	16.10	36.41	-	28.85	56.82	-1.68	49.18	28.28	57.47	38.30	30.45	28.35	-
2U3	0:04:00		2.12	5.82	2.97	21.90	-10.89	16.21	36.09	-	29.18	56.78	-1.32	49.25	28.28	57.51	38.19	30.38	28.28	-
2U4	0:00:30		1.40	3.71	1.75	16.80	-12.39	12.67	26.55	-	19.59	56.78	-9.39	29.44	14.03	38.50	21.73	15.57	15.28	-
2U4	0:01:00		1.65	3.53	1.75	16.73	-12.57	12.27	26.05	-	19.20	36.84	-9.75	28.30	13.21	37.55	20.72	14.44	15.69	-
2U4	0:01:30		1.65	3.46	1.75	16.69	-12.39	12.06	25.83	-	18.63	36.73	-9.50	28.23	13.24	37.51	20.57	14.37	16.13	-
2U4	0:02:00		1.65	3.32	1.72	16.55	-12.53	11.92	25.65	-	18.23	36.73	-9.57	27.79	12.96	37.08	20.10	14.04	16.13	-
2U4	0:02:30		1.58	3.39	1.72	16.41	-13.00	11.81	25.33	-	18.23	36.73	-9.68	27.09	12.71	36.56	19.70	13.67	15.98	-
2U4	0:03:00		1.69	3.25	1.75	16.37	-12.68	11.74	25.48	-	18.09	36.73	-9.21	27.49	12.92	36.86	20.28	13.93	16.35	-
2U4	0:03:30		1.69	3.18	1.72	16.34	-12.86	11.66	25.16	-	18.34	36.73	-9.61	26.87	12.42	36.24	19.48	13.38	16.02	-
2U4	0:04:00		1.69	3.21	1.68	16.16	-13.25	11.56	24.83	-	17.73	34.69	-10.03	26.24	12.17	35.69	19.00	13.05	15.72	-
2U5	0:00:30		0.29	0.11	0.11	1.21	-1.97	1.47	1.39	-	2.54	2.01	-0.54	1.03	0.36	0.11	0.95	0.84	-6.04	-
2U5	0:01:00		0.25	-0.04	0.04	0.78	-1.15	0.75	0.78	-	0.97	1.61	-0.64	0.55	0.07	0.15	0.55	0.55	-5.01	-
2U5	0:01:30		0.22	-0.07	0.04	0.64	-0.86	0.50	0.68	-	0.61	0.80	-0.54	0.44	0.25	0.22	0.47	0.44	-3.31	-
2U5	0:02:00		0.11	-0.04	0.04	0.54	-0.72	0.36	0.46	-	1.25	1.13	-0.11	0.29	0.22	0.26	0.33	0.33	-2.43	-
2U5	0:02:30		0.18	0.07	0.11	0.46	-0.61	0.25	0.43	-	1.14	1.06	-0.07	0.15	0.18	0.26	0.22	0.22	-1.80	-
2U5	0:03:00		0.18	0.00	0.04	0.39	-0.50	0.29	0.32	-	0.29	0.44	-0.43	0.18	0.18	0.26	0.29	0.18	-1.33	-
2U5	0:03:30		0.14	-0.07	0.04	0.36	-0.43	0.18	0.21	-	0.25	0.40	-0.39	0.18	0.18	0.22	0.15	0.11	-1.25	-
2U5	0:04:00		0.14	0.07	0.00	0.29	-0.32	0.11	0.39	-	0.29	0.33	-0.39	0.18	0.11	0.22	0.22	0.11	-0.99	-
2U5	0:04:30		0.14	-0.04	0.07	0.25	-0.29	0.11	0.14	-	0.18	0.26	0.00	0.11	0.14	0.18	0.18	0.07	-0.55	-
2U5	0:05:00		0.14	-0.04	0.00	0.18	-0.21	0.07	0.18	-	0.14	0.22	-0.36	0.04	0.11	0.15	0.18	0.04	-0.41	-
2U5	0:05:30		0.14	0.07	0.00	0.14	-0.14	0.07	0.04	-	0.21	0.18	-0.36	0.00	0.11	0.11	0.22	0.04	-0.33	-
2U5	0:06:00		0.14	0.04	0.00	0.11	-0.11	0.04	-0.04	-	0.07	0.37	0.00	0.04	-0.04	0.11	0.00	0.04	-0.22	-
2U5	0:06:30		0.07	0.04	0.00	0.07	-0.07	0.04	0.07	-	0.07	0.33	0.00	0.04	0.11	0.07	0.11	0.04	-0.18	-
2U5	0:07:00		0.14	0.00	0.00	0.04	0.00	0.00	-0.07	-	0.04	0.11	-0.32	-0.04	0.07	0.07	-0.04	0.00	-0.11	-
2U5	0:07:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-

Instrument cables for gages 10628, 10629 & 10634 not marked and were assigned position based on readings.

290

Table H.3 Calculated Strain, 4 Minute Readings, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																		
		Gage #	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637	10638	10639	10640	10641	10642	10643	10644	10645
		Elev. ft	+15.00	+15.00	+15.00	-20.00	-20.00	-20.00	-26.00	-26.00	-26.00	-32.00	-32.00	-32.00	-42.00	-42.00	-42.00	-47.50	-47.50	-47.50
L0	0:00:00	5.50	3.25	1.43	-1.14	38.85	-15.71	-1.53	-	-9.37	1.46	24.43	0.11	-1.51	-3.21	3.68	-2.63	-3.57	-	
L1	0:04:00	5.64	3.35	1.46	-1.14	39.28	-14.71	-1.25	-	-7.69	1.02	25.57	2.39	0.00	0.58	6.08	-1.06	3.79	-	
U1	0:03:00	5.17	3.18	1.36	-1.32	38.68	-15.85	-1.89	-	-9.62	0.62	23.50	-0.33	-1.22	-5.29	2.18	-2.34	-4.23	-	
U1	0:05:30	5.21	3.18	1.36	-1.36	38.68	-15.78	-1.89	-	-9.69	0.88	23.50	-0.40	-1.18	-4.96	2.18	-2.34	-3.98	-	
2L0	0:00:00	5.21	3.21	1.36	-1.32	38.64	-15.82	-1.89	-	-9.65	1.13	23.50	-0.40	-1.18	-5.33	2.18	-2.38	-3.98	-	
2L1	0:04:00	5.82	3.64	1.75	0.89	39.50	-14.24	3.10	-	-7.87	7.96	24.85	2.72	4.20	5.07	9.39	1.72	-1.07	-	
2L2	0:04:00	6.54	4.60	2.50	5.49	41.43	-10.77	11.37	-	-3.58	19.32	26.64	8.34	8.00	14.01	15.29	6.07	3.09	-	
2L3	0:04:00	8.30	9.35	4.93	12.16	46.27	-3.18	19.21	-	3.83	27.31	32.21	16.47	13.17	20.25	20.46	11.37	5.60	-	
2L4	0:04:00	4.35	11.17	6.93	12.84	42.76	1.79	24.02	-	9.76	30.09	29.85	21.87	14.89	23.94	21.99	13.01	7.11	-	
2L5	0:04:00	3.84	10.35	6.97	13.73	39.03	2.22	26.83	-	10.44	34.18	26.68	23.23	15.04	26.31	23.30	13.49	8.03	-	
2L6	0:04:00	3.45	10.56	6.82	14.55	37.89	2.72	28.86	-	12.19	36.00	25.93	25.10	15.79	28.03	24.03	14.47	8.47	-	
2L7	0:04:00	3.45	10.35	6.40	15.02	36.17	2.79	29.72	-	12.26	37.94	24.57	25.99	15.97	29.23	24.46	14.95	8.87	-	
2L8	0:04:00	3.41	10.56	6.43	15.84	35.35	3.40	31.46	-	13.48	39.44	24.14	28.01	16.98	30.98	25.56	16.27	9.98	-	
2L9	0:04:00	3.31	10.56	6.40	16.59	34.20	3.83	32.99	-	14.59	41.90	23.39	29.62	17.73	32.77	26.72	17.33	10.64	-	
2L10	0:04:00	3.31	10.67	6.50	17.26	33.70	4.37	34.10	-	15.77	43.38	23.39	31.42	18.95	34.56	28.40	18.50	11.82	-	
2L11	0:04:00	2.87	10.56	6.29	19.33	30.37	5.15	37.23	-	17.88	47.36	21.39	34.81	21.00	38.24	31.24	20.94	13.37	-	
2L12	0:04:00	2.84	10.60	6.22	21.04	28.61	6.01	39.87	-	20.20	51.71	20.43	38.44	23.62	42.51	34.55	23.80	15.61	-	
2L13	0:04:00	2.44	10.56	5.72	23.18	25.07	7.23	43.61	-	22.74	57.18	19.43	44.36	27.85	48.68	39.61	28.33	19.11	-	
2L14	0:04:00	2.77	10.60	5.90	25.68	22.38	8.30	46.61	-	25.74	62.92	19.07	49.99	32.19	55.91	44.42	32.68	23.12	-	
2L15	0:04:00	2.52	10.74	5.79	26.82	20.63	9.20	48.96	-	28.17	67.83	19.18	55.09	36.64	62.15	49.40	37.32	27.14	-	
2L16	0:04:00	2.91	10.56	5.57	27.71	18.16	10.48	50.20	-	30.75	76.77	19.71	60.75	41.31	69.23	54.54	41.82	31.74	-	
2L17	0:04:00	2.69	10.49	5.43	28.32	15.58	12.34	51.06	-	34.40	76.86	20.36	66.71	46.15	74.63	59.67	47.04	36.01	-	
2L18	0:04:00	2.80	10.24	5.43	29.11	11.93	15.17	51.84	-	39.37	81.65	21.43	73.62	51.29	79.92	65.28	52.12	40.80	-	
2L19	0:04:00	2.87	10.13	5.40	29.28	10.31	16.53	52.27	-	40.94	83.89	21.82	76.45	53.58	82.47	67.31	54.17	42.64	-	
2L20	0:04:00	3.16	10.03	5.40	29.85	8.27	18.36	52.48	-	43.19	86.18	22.39	80.38	56.20	84.19	69.90	56.62	44.99	-	
2L21	0:04:00	2.91	9.85	5.18	30.57	4.69	20.65	53.16	-	45.87	88.68	22.43	84.79	58.75	87.98	72.12	58.89	47.76	-	
2L22	0:04:00	3.31	9.74	5.47	30.78	2.76	22.11	53.62	-	47.27	89.68	22.32	87.11	59.58	87.62	73.07	59.76	48.86	-	
2L23	0:02:00	3.02	9.74	5.43	31.03	1.33	23.29	53.84	-	48.77	79.59	22.39	90.19	60.62	88.24	74.20	61.19	50.00	-	
2U1	0:03:00	2.44	7.67	3.97	26.18	-5.12	19.50	44.18	-	37.76	72.24	6.39	66.52	41.85	71.12	52.79	44.41	36.34	-	
2U2	0:03:00	2.16	7.10	3.75	25.04	-7.56	18.64	41.90	-	35.25	68.68	5.07	62.19	38.37	68.50	49.11	40.61	34.50	-	
2U3	0:03:00	2.12	5.85	2.86	21.79	-10.39	16.14	36.06	-	28.50	56.82	-1.46	49.32	28.28	57.51	38.23	30.38	28.09	-	
2U4	0:03:00	1.69	3.25	1.75	16.37	-12.68	11.74	25.48	-	18.09	36.73	-9.21	27.49	12.92	36.86	20.28	13.93	16.35	-	
2U5	0:03:00	0.18	0.00	0.04	0.39	-0.50	0.29	0.32	-	0.29	0.44	-0.43	0.18	0.18	0.26	0.29	0.18	-1.33	-	
2U5	0:06:00	0.14	0.04	0.00	0.11	-0.11	0.04	-0.04	-	0.07	0.37	0.00	0.04	-0.04	0.11	0.00	0.04	-0.22	-	

291

Table H.4 Average Calculated Strain, 4 Minute Readings, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.50	+43.92	+15.00	-20.00	-26.00	-32.00	-37.50	-42.00	-47.50
L0	0:00:00	0.00	0.00	3.39	7.34	-5.45	8.67	0.00	-0.35	-3.10
L1	0:04:00	0.00	0.00	3.49	7.81	-4.47	9.66	0.00	2.22	1.37
U1	0:03:00	0.00	0.00	3.24	7.17	-5.75	7.93	0.00	-1.44	-3.29
U1	0:05:30	0.00	0.00	3.25	7.18	-5.79	7.99	0.00	-1.32	-3.16
2L0	0:00:00	0.00	0.00	3.26	7.17	-5.77	8.08	0.00	-1.44	-3.18
2L1	0:04:00	0.00	0.00	3.74	8.72	-2.38	11.84	10.33	6.22	0.33
2L2	0:04:00	0.00	0.00	4.55	12.05	3.90	18.10	23.01	12.44	4.58
2L3	0:04:00	0.00	0.00	7.53	18.42	11.52	25.33	34.15	17.96	8.48
2L4	0:04:00	0.00	0.00	7.48	19.13	16.89	27.27	39.67	20.27	10.06
2L5	0:04:00	0.00	0.00	7.05	18.33	18.64	28.03	41.60	21.55	10.76
2L6	0:04:00	0.00	0.00	6.95	18.39	20.53	29.01	44.43	22.62	11.47
2L7	0:04:00	0.00	0.00	6.73	17.99	20.99	29.50	45.68	23.22	11.91
2L8	0:04:00	0.00	0.00	6.80	18.19	22.47	30.53	49.04	24.50	13.12
2L9	0:04:00	0.00	0.00	6.75	18.20	23.79	31.64	51.71	25.74	13.98
2L10	0:04:00	0.00	0.00	6.83	18.44	24.93	32.73	55.46	27.30	15.16
2L11	0:04:00	0.00	0.00	6.58	18.28	27.56	34.52	61.61	30.16	17.16
2L12	0:04:00	0.00	0.00	6.55	18.56	30.04	36.86	69.91	33.56	19.70
2L13	0:04:00	0.00	0.00	6.24	18.49	33.18	40.32	81.35	38.71	23.72
2L14	0:04:00	0.00	0.00	6.42	18.79	36.17	43.99	94.18	44.17	27.90
2L15	0:04:00	0.00	0.00	6.35	18.88	38.57	47.37	106.46	49.40	32.23
2L16	0:04:00	0.00	0.00	6.35	18.78	40.48	52.41	118.48	55.02	36.78
2L17	0:04:00	0.00	0.00	6.21	18.75	42.73	54.64	130.29	60.15	41.53
2L18	0:04:00	0.00	0.00	6.16	18.73	45.60	58.90	142.17	65.49	46.46
2L19	0:04:00	0.00	0.00	6.13	18.71	46.60	60.72	146.78	67.79	48.40
2L20	0:04:00	0.00	0.00	6.19	18.83	47.84	62.98	151.99	70.10	50.81
2L21	0:04:00	0.00	0.00	5.98	18.63	49.52	65.30	157.52	72.95	53.32
2L22	0:04:00	0.00	0.00	6.17	18.55	50.45	66.37	159.30	73.42	54.31
2L23	0:02:00	0.00	0.00	6.06	18.55	51.30	64.06	162.39	74.35	55.60
2U1	0:03:00	0.00	0.00	4.69	13.52	40.97	48.38	102.36	55.25	40.38
2U2	0:03:00	0.00	0.00	4.34	12.04	38.58	45.31	96.29	51.99	37.56
2U3	0:03:00	0.00	0.00	3.61	9.18	32.28	34.89	70.95	41.34	29.23
2U4	0:03:00	0.00	0.00	2.23	5.14	21.78	18.34	33.24	23.35	15.14
2U5	0:03:00	0.00	0.00	0.07	0.06	0.30	0.06	0.00	0.24	-0.57
2U5	0:06:00	0.00	0.00	0.06	0.01	0.02	0.13	0.00	0.02	-0.09

Top of Shaft Ground Surface

Top of Mid Cell

Table H.5 Shaft Load, 4 Minute Readings, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Shaft Load, tons						
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.50	+43.92	+15.00	-20.00	-26.00	-32.00	-37.50
L0	0:00:00	0.00	0.00	43.57	94.23	-68.19	108.43	0.0
L1	0:04:00	0.00	0.00	44.79	100.36	-55.89	120.87	0.0
U1	0:03:00	0.00	0.00	41.57	92.09	-71.99	99.21	0.0
U1	0:05:30	0.00	0.00	41.72	92.24	-72.43	99.97	0.0
2L0	0:00:00	0.00	0.00	41.88	92.09	-72.21	101.04	0.0
2L1	0:04:00	0.00	0.00	48.01	111.98	-29.82	148.21	129.3
2L2	0:04:00	0.00	0.00	58.42	154.82	48.74	226.47	287.9
2L3	0:04:00	0.00	0.00	96.69	236.57	144.09	316.94	427.3
2L4	0:04:00	0.00	0.00	96.13	245.74	211.31	341.22	496.4
2L5	0:04:00	0.00	0.00	90.61	235.45	233.17	350.69	520.5
2L6	0:04:00	0.00	0.00	89.22	236.20	256.84	363.00	555.9
2L7	0:04:00	0.00	0.00	86.47	231.13	262.63	369.09	571.6
2L8	0:04:00	0.00	0.00	87.39	233.72	281.16	381.98	613.6
2L9	0:04:00	0.00	0.00	86.77	233.86	297.68	395.87	647.0
2L10	0:04:00	0.00	0.00	87.69	236.92	311.97	409.55	693.9
2L11	0:04:00	0.00	0.00	84.47	234.88	344.79	431.91	770.9
2L12	0:04:00	0.00	0.00	84.16	238.38	375.82	461.19	874.7
2L13	0:04:00	0.00	0.00	80.17	237.57	415.11	504.55	1017.9
2L14	0:04:00	0.00	0.00	82.47	241.36	452.62	550.42	1178.4
2L15	0:04:00	0.00	0.00	81.55	242.56	482.55	592.66	1332.1
2L16	0:04:00	0.00	0.00	81.56	241.32	506.45	655.79	1482.4
2L17	0:04:00	0.00	0.00	79.72	240.84	534.62	683.71	1630.2
2L18	0:04:00	0.00	0.00	79.11	240.66	570.62	736.95	1778.9
2L19	0:04:00	0.00	0.00	78.81	240.35	583.13	759.76	1836.5
2L20	0:04:00	0.00	0.00	79.58	241.87	598.56	788.06	1901.7
2L21	0:04:00	0.00	0.00	76.82	239.39	619.57	817.04	1970.9
2L22	0:04:00	0.00	0.00	79.28	238.31	631.20	830.44	1993.2
2L23	0:02:00	0.00	0.00	77.90	238.30	641.93	801.54	2031.9
2U1	0:03:00	0.00	0.00	60.30	173.68	512.62	605.40	1280.7
2U2	0:03:00	0.00	0.00	55.70	154.69	482.70	566.99	1204.8
2U3	0:03:00	0.00	0.00	46.38	117.95	403.87	436.59	887.7
2U4	0:03:00	0.00	0.00	28.63	66.08	272.57	229.45	415.9
2U5	0:03:00	0.00	0.00	0.92	0.76	3.80	0.81	0.0
2U5	0:06:00	0.00	0.00	0.77	0.15	0.22	1.68	0.0
Modulus, ksi		4423.1	4423.1	4423.1	4423.1	3805.7	3805.7	3805.7
Diameter, in		86.00	86.00	86.00	86.00	91.50	91.50	91.50
		Top of Shaft	Ground Surface				Top of Mid Cell	

Table H.6 Average Segment Side Shear, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf						
		CL Elev., ft	+45.71	+29.46	-2.50	-23.00	-29.00	-34.75
		Length, ft	3.58	28.92	35.00	6.00	6.00	5.50
L0	0:00:00	0.00	-0.03	-0.01	-1.25	1.15	-0.91	
L1	0:04:00	0.00	-0.03	-0.01	-1.20	1.15	-1.00	
U1	0:03:00	0.00	-0.03	-0.01	-1.26	1.11	-0.84	
U1	0:05:30	0.00	-0.03	-0.01	-1.26	1.12	-0.84	
2L0	0:00:00	0.00	-0.03	-0.01	-1.26	1.12	-0.85	
2L1	0:04:00	0.00	-0.02	0.00	-1.10	1.16	-0.23	
2L2	0:04:00	0.00	-0.01	0.04	-0.84	1.15	0.38	
2L3	0:04:00	0.00	0.05	0.10	-0.74	1.12	0.75	
2L4	0:04:00	0.00	0.05	0.11	-0.33	0.82	1.09	
2L5	0:04:00	0.00	0.04	0.11	-0.10	0.73	1.21	
2L6	0:04:00	0.00	0.04	0.11	0.07	0.66	1.38	
2L7	0:04:00	0.00	0.04	0.11	0.14	0.66	1.45	
2L8	0:04:00	0.00	0.04	0.11	0.26	0.62	1.67	
2L9	0:04:00	0.00	0.04	0.11	0.38	0.60	1.82	
2L10	0:04:00	0.00	0.04	0.11	0.46	0.60	2.07	
2L11	0:04:00	0.00	0.03	0.11	0.71	0.52	2.49	
2L12	0:04:00	0.00	0.03	0.12	0.90	0.51	3.06	
2L13	0:04:00	0.00	0.03	0.12	1.19	0.54	3.81	
2L14	0:04:00	0.00	0.03	0.12	1.43	0.60	4.68	
2L15	0:04:00	0.00	0.03	0.13	1.64	0.68	5.53	
2L16	0:04:00	0.00	0.03	0.12	1.82	0.96	6.19	
2L17	0:04:00	0.00	0.03	0.13	2.03	0.95	7.10	
2L18	0:04:00	0.00	0.03	0.13	2.29	1.07	7.82	
2L19	0:04:00	0.00	0.03	0.13	2.38	1.15	8.09	
2L20	0:04:00	0.00	0.03	0.13	2.48	1.23	8.37	
2L21	0:04:00	0.00	0.02	0.13	2.65	1.29	8.67	
2L22	0:04:00	0.00	0.03	0.12	2.74	1.30	8.74	
2L23	0:02:00	0.00	0.02	0.13	2.81	1.03	9.25	
2U1	0:03:00	0.00	0.00	0.07	2.35	0.56	5.04	
2U2	0:03:00	0.00	-0.01	0.05	2.27	0.50	4.76	
2U3	0:03:00	0.00	-0.02	0.01	1.97	0.14	3.34	
2U4	0:03:00	0.00	-0.05	-0.03	1.40	-0.38	1.33	
2U5	0:03:00	0.00	-0.09	-0.08	-0.06	-0.10	-0.09	
2U5	0:06:00	0.00	-0.09	-0.08	-0.08	-0.07	-0.10	
Segment Wt., tons			10.83	51.10	61.84	11.30	12.00	11.00
Maximum Shear, tsf			0.00	0.05	0.13	2.81	1.30	9.25

Table H.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 10 -2002

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain							Shaft Compression				
		CL Elev., ft	+45.71	+29.46	-2.50	-23.00	-29.00	-34.75	Strain Gage		TT in	Error in	Error %
		Length, ft	3.58	28.92	35.00	6.00	6.00	5.50	Net, in	Change, in			
L0	0:00:00	0.00	1.70	5.36	0.94	1.61	4.33	0.0033	0.0000	0.0000	0.0000		
L1	0:04:00	0.00	1.74	5.65	1.67	2.60	4.83	0.0036	0.0003	0.0000	0.0003		
U1	0:03:00	0.00	1.62	5.20	0.71	1.09	3.96	0.0031	-0.0002	0.0000	-0.0002		
U1	0:05:30	0.00	1.62	5.21	0.70	1.10	3.99	0.0031	-0.0002	0.0000	-0.0002		
2L0	0:00:00	0.00	1.63	5.21	0.70	1.15	4.04	0.0032	-0.0002	0.0000	-0.0002		
2L1	0:04:00	0.00	1.87	6.23	3.17	4.73	11.09	0.0046	0.0013	0.0000	0.0013		
2L2	0:04:00	0.00	2.27	8.30	7.97	11.00	20.56	0.0070	0.0037	0.0006	0.0031	570.4%	
2L3	0:04:00	0.00	3.76	12.97	14.97	18.42	29.74	0.0111	0.0078	0.0040	0.0038	95.3%	
2L4	0:04:00	0.00	3.74	13.31	18.01	22.08	33.47	0.0120	0.0087	0.0052	0.0035	68.4%	
2L5	0:04:00	0.00	3.53	12.69	18.48	23.33	34.81	0.0119	0.0086	0.0052	0.0034	64.5%	
2L6	0:04:00	0.00	3.47	12.67	19.46	24.77	36.72	0.0121	0.0088	0.0052	0.0036	69.7%	
2L7	0:04:00	0.00	3.37	12.36	19.49	25.24	37.59	0.0121	0.0088	0.0054	0.0034	62.1%	
2L8	0:04:00	0.00	3.40	12.50	20.33	26.50	39.78	0.0124	0.0091	0.0054	0.0037	68.8%	
2L9	0:04:00	0.00	3.38	12.48	21.00	27.71	41.67	0.0127	0.0094	0.0054	0.0040	73.3%	
2L10	0:04:00	0.00	3.41	12.63	21.69	28.83	44.09	0.0130	0.0097	0.0054	0.0043	80.1%	
2L11	0:04:00	0.00	3.29	12.43	22.92	31.04	48.07	0.0134	0.0101	0.0059	0.0043	72.8%	
2L12	0:04:00	0.00	3.28	12.55	24.30	33.45	53.38	0.0141	0.0108	0.0061	0.0047	76.7%	
2L13	0:04:00	0.00	3.12	12.37	25.83	36.75	60.84	0.0148	0.0115	0.0065	0.0050	78.1%	
2L14	0:04:00	0.00	3.21	12.60	27.48	40.08	69.08	0.0158	0.0125	0.0067	0.0058	86.9%	
2L15	0:04:00	0.00	3.17	12.61	28.72	42.97	76.91	0.0166	0.0133	0.0070	0.0063	90.4%	
2L16	0:04:00	0.00	3.17	12.57	29.63	46.44	85.44	0.0175	0.0142	0.0073	0.0069	94.3%	
2L17	0:04:00	0.00	3.10	12.48	30.74	48.68	92.46	0.0181	0.0148	0.0078	0.0071	91.3%	
2L18	0:04:00	0.00	3.08	12.45	32.17	52.25	100.53	0.0190	0.0157	0.0086	0.0071	83.6%	
2L19	0:04:00	0.00	3.07	12.42	32.66	53.66	103.75	0.0193	0.0160	0.0090	0.0071	79.1%	
2L20	0:04:00	0.00	3.10	12.51	33.33	55.41	107.49	0.0198	0.0165	0.0095	0.0071	74.6%	
2L21	0:04:00	0.00	2.99	12.31	34.08	57.41	111.41	0.0201	0.0168	0.0100	0.0068	68.4%	
2L22	0:04:00	0.00	3.09	12.36	34.50	58.41	112.83	0.0204	0.0171	0.0103	0.0068	65.9%	
2L23	0:02:00	0.00	3.03	12.31	34.93	57.68	113.22	0.0204	0.0171	0.0106	0.0065	61.6%	
2U1	0:03:00	0.00	2.35	9.11	27.24	44.68	75.37	0.0148	0.0115	0.0093	0.0022	24.1%	
2U2	0:03:00	0.00	2.17	8.19	25.31	41.95	70.80	0.0137	0.0104	0.0084	0.0020	23.8%	
2U3	0:03:00	0.00	1.81	6.40	20.73	33.58	52.92	0.0107	0.0074	0.0063	0.0011	17.5%	
2U4	0:03:00	0.00	1.11	3.69	13.46	20.06	25.79	0.0061	0.0027	0.0033	-0.0005	-15.7%	
2U5	0:03:00	0.00	0.04	0.07	0.18	0.18	0.03	0.0001	-0.0032	-0.0014	-0.0019	140.2%	
2U5	0:06:00	0.00	0.03	0.04	0.01	0.08	0.07	0.0000	-0.0033	-0.0014	-0.0019	133.9%	

Table H.8 Movement at Segment Centerline, Shaft 10 - 2002

Load Interval	Elapsed Time hhmmss	Segment Movement, in							Mid Cell
		CL Elev., ft	+45.71	+29.46	-2.50	-23.00	-29.00	-34.75	-37.50
		Length, ft	3.58	28.92	35.00	6.00	6.00	5.50	-
L0	0:00:00	-0.0033	-0.0030	-0.0016	-0.0004	-0.0003	-0.0001	0.0000	
L1	0:04:00	-0.0026	-0.0023	-0.0008	0.0004	0.0006	0.0008	0.0010	
U1	0:03:00	-0.0031	-0.0028	-0.0014	-0.0003	-0.0002	-0.0001	0.0001	
U1	0:05:30	-0.0044	-0.0042	-0.0028	-0.0017	-0.0016	-0.0014	-0.0013	
2L0	0:00:00	-0.0032	-0.0029	-0.0015	-0.0004	-0.0003	-0.0001	0.0000	
2L1	0:04:00	-0.0069	-0.0066	-0.0050	-0.0036	-0.0033	-0.0027	-0.0024	
2L2	0:04:00	-0.0053	-0.0049	-0.0028	-0.0008	-0.0001	0.0010	0.0017	
2L3	0:04:00	0.0545	0.0551	0.0585	0.0618	0.0630	0.0646	0.0656	
2L4	0:04:00	0.4740	0.4746	0.4781	0.4815	0.4829	0.4848	0.4860	
2L5	0:04:00	0.6916	0.6922	0.6955	0.6989	0.7004	0.7024	0.7035	
2L6	0:04:00	0.7736	0.7742	0.7774	0.7808	0.7824	0.7845	0.7857	
2L7	0:04:00	0.8542	0.8548	0.8579	0.8612	0.8628	0.8650	0.8662	
2L8	0:04:00	0.9072	0.9078	0.9110	0.9144	0.9161	0.9183	0.9196	
2L9	0:04:00	0.9640	0.9646	0.9678	0.9712	0.9729	0.9753	0.9767	
2L10	0:04:00	1.0066	1.0072	1.0105	1.0139	1.0157	1.0182	1.0197	
2L11	0:04:00	1.1350	1.1355	1.1387	1.1422	1.1441	1.1468	1.1484	
2L12	0:04:00	1.2286	1.2292	1.2324	1.2359	1.2380	1.2409	1.2427	
2L13	0:04:00	1.3503	1.3509	1.3540	1.3575	1.3598	1.3631	1.3651	
2L14	0:04:00	1.4651	1.4657	1.4689	1.4725	1.4750	1.4787	1.4810	
2L15	0:04:00	1.5725	1.5731	1.5763	1.5800	1.5825	1.5866	1.5892	
2L16	0:04:00	1.6907	1.6913	1.6944	1.6982	1.7009	1.7054	1.7082	
2L17	0:04:00	1.8311	1.8316	1.8348	1.8385	1.8414	1.8462	1.8492	
2L18	0:04:00	2.0166	2.0171	2.0203	2.0241	2.0271	2.0323	2.0356	
2L19	0:04:00	2.1225	2.1230	2.1261	2.1299	2.1330	2.1384	2.1418	
2L20	0:04:00	2.2547	2.2552	2.2584	2.2622	2.2654	2.2710	2.2745	
2L21	0:04:00	2.4511	2.4516	2.4547	2.4585	2.4618	2.4675	2.4712	
2L22	0:04:00	2.5869	2.5875	2.5906	2.5944	2.5978	2.6036	2.6073	
2L23	0:02:00	2.6885	2.6890	2.6921	2.6959	2.6993	2.7051	2.7088	
2U1	0:03:00	2.6958	2.6962	2.6986	2.7014	2.7040	2.7081	2.7106	
2U2	0:03:00	2.6900	2.6904	2.6925	2.6951	2.6975	2.7014	2.7037	
2U3	0:03:00	2.6784	2.6787	2.6803	2.6824	2.6844	2.6873	2.6891	
2U4	0:03:00	2.6484	2.6486	2.6496	2.6509	2.6521	2.6536	2.6545	
2U5	0:03:00	2.5406	2.5407	2.5407	2.5407	2.5407	2.5407	2.5407	
2U5	0:06:00	2.5372	2.5372	2.5372	2.5373	2.5373	2.5373	2.5373	

Table H.9 Section Properties, Shaft 10 - 2002

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 14 Rebar	24	2.25	54.00
3/4" Galvanized Steel Teltale Pipe	10	0.33	3.33
No. 5 Spiral Stiffeners	2	0.31	0.61
Permanent Casing (1/2" thick, 85" ID)	1	134.30	134.30
Area of Steel =			192.247

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.77
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.59
Area of Pipe =			28.35

297

Concrete Modulus 3600 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
48.6	86.0	5808.80	192.25	28.35	5588.20	4423.06	4PVC pipe, 4hose
-20.9	91.5	6575.55	57.28	28.35	6489.92	3805.73	4PVC pipe, 4hose
-37.5	91.5	6575.55	55.95	27.47	6492.13	3801.07	4PVC pipe, 2hose

Figure H.1 Shaft Top VW Strain, Shaft 10 - 2002

298

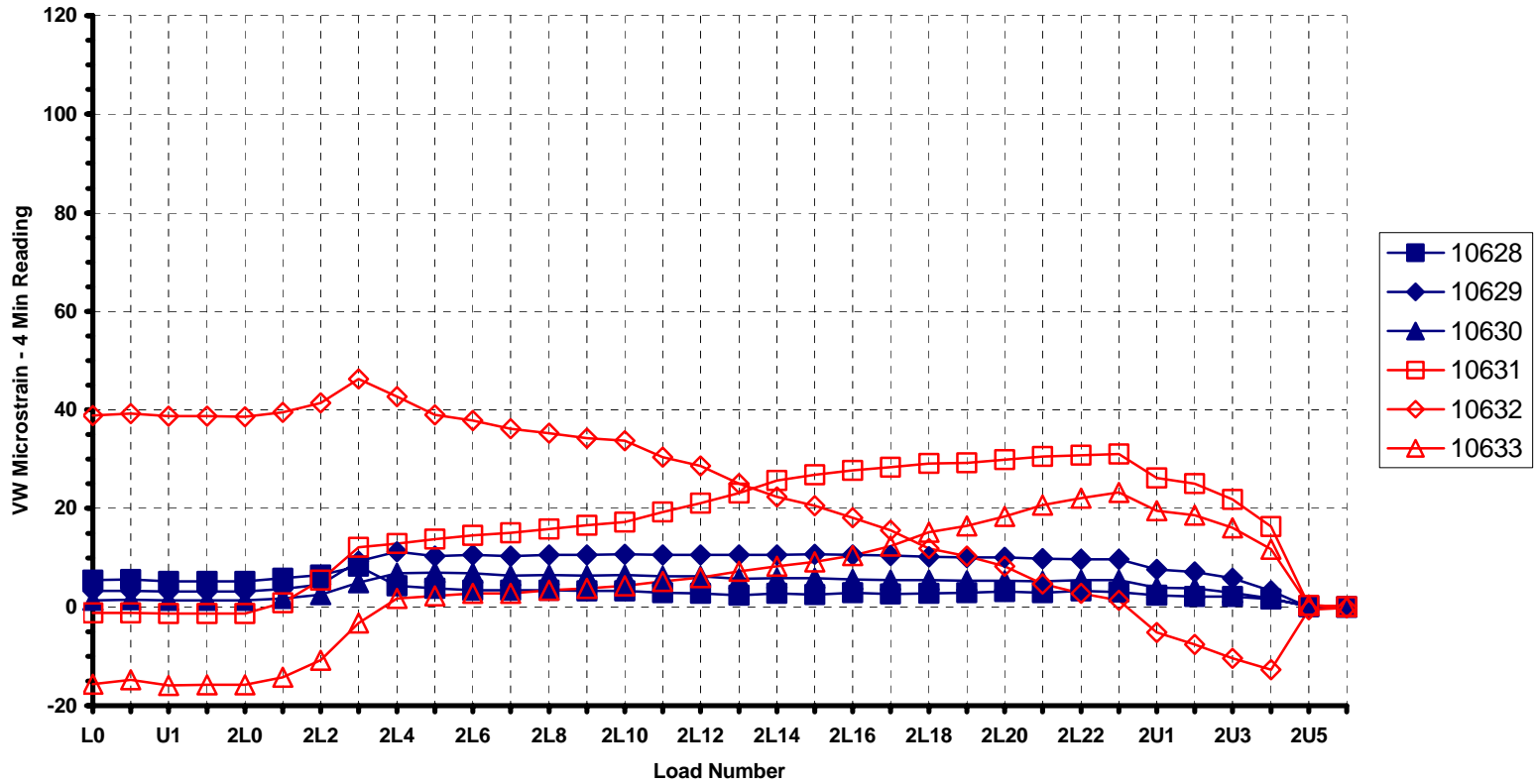


Figure H.2 Shaft Middle VW Strain, Shaft 10 - 2002

299

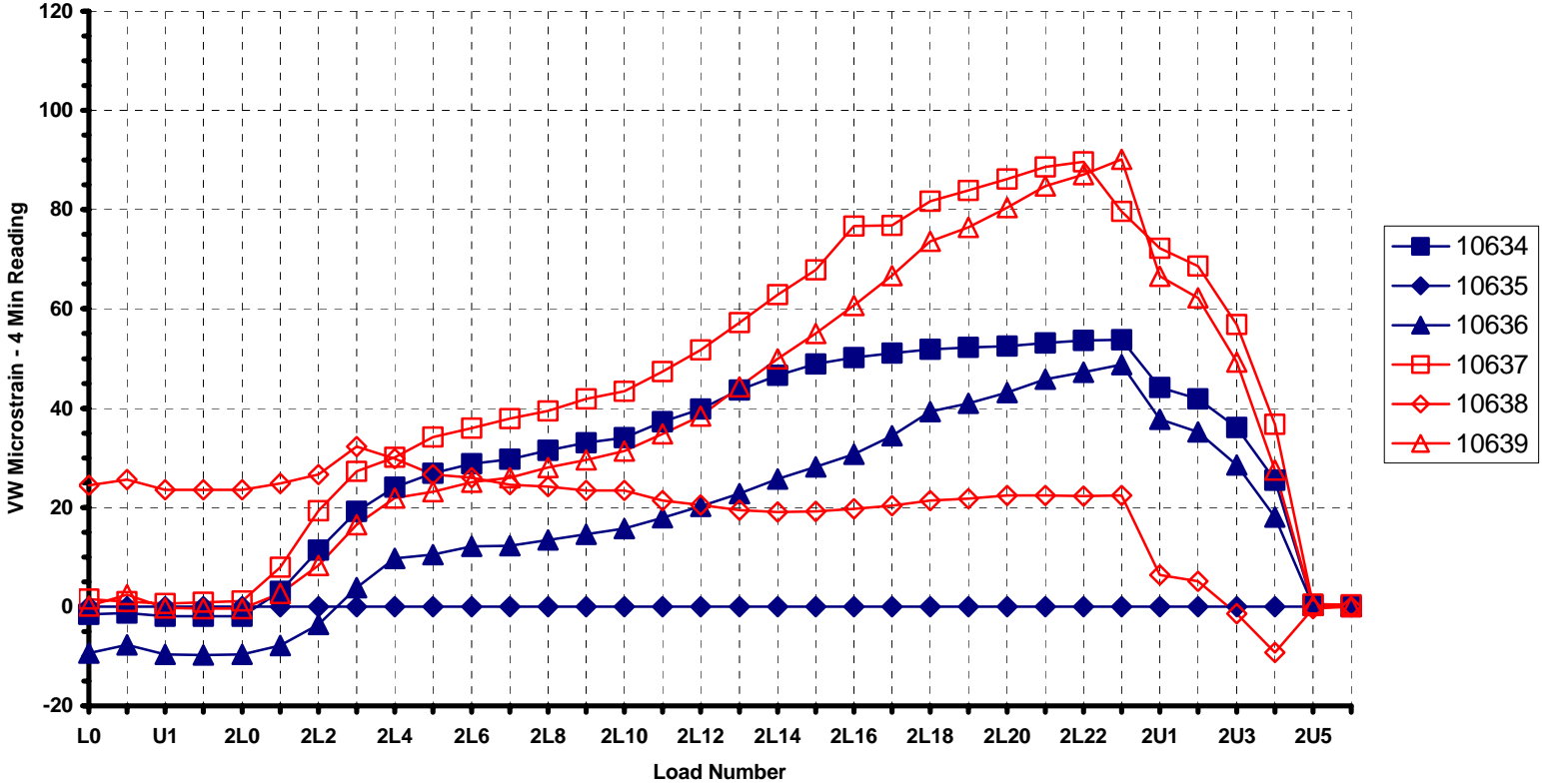


Figure H.3 Shaft Bottom VW Strain, Shaft 10 - 2002

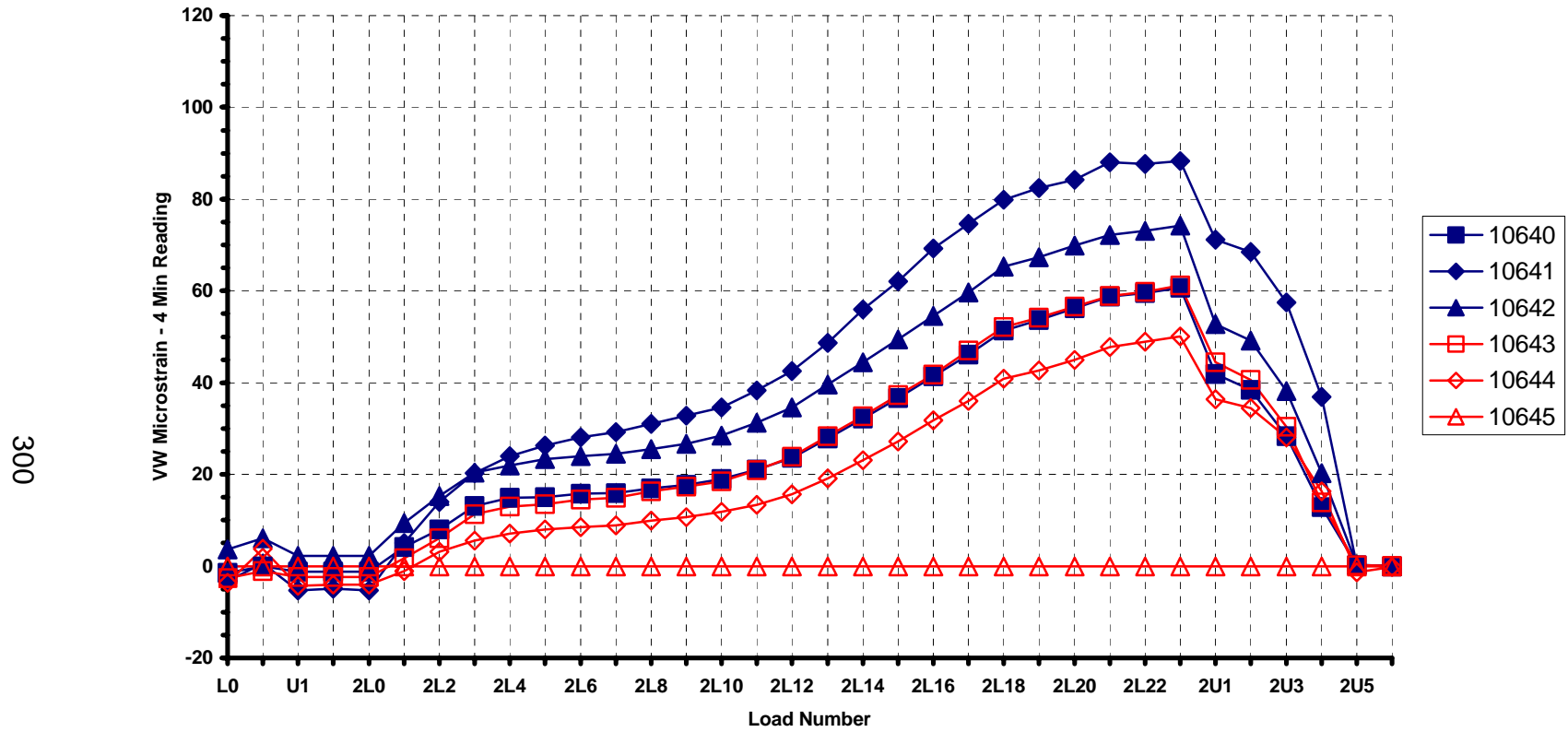


Figure H.4 Shaft Top Shear Stress vs. Movement, Shaft 10 - 2002

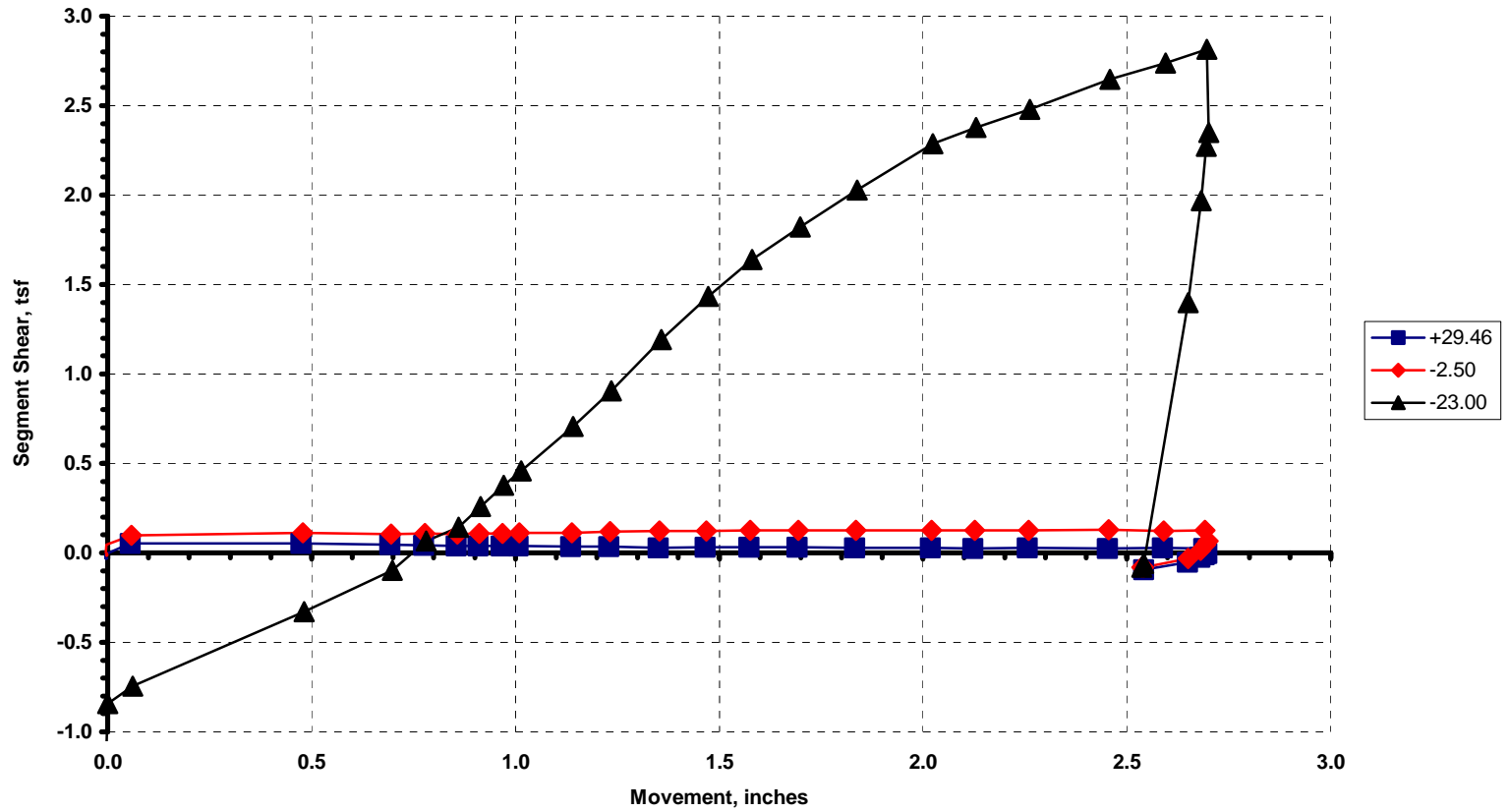
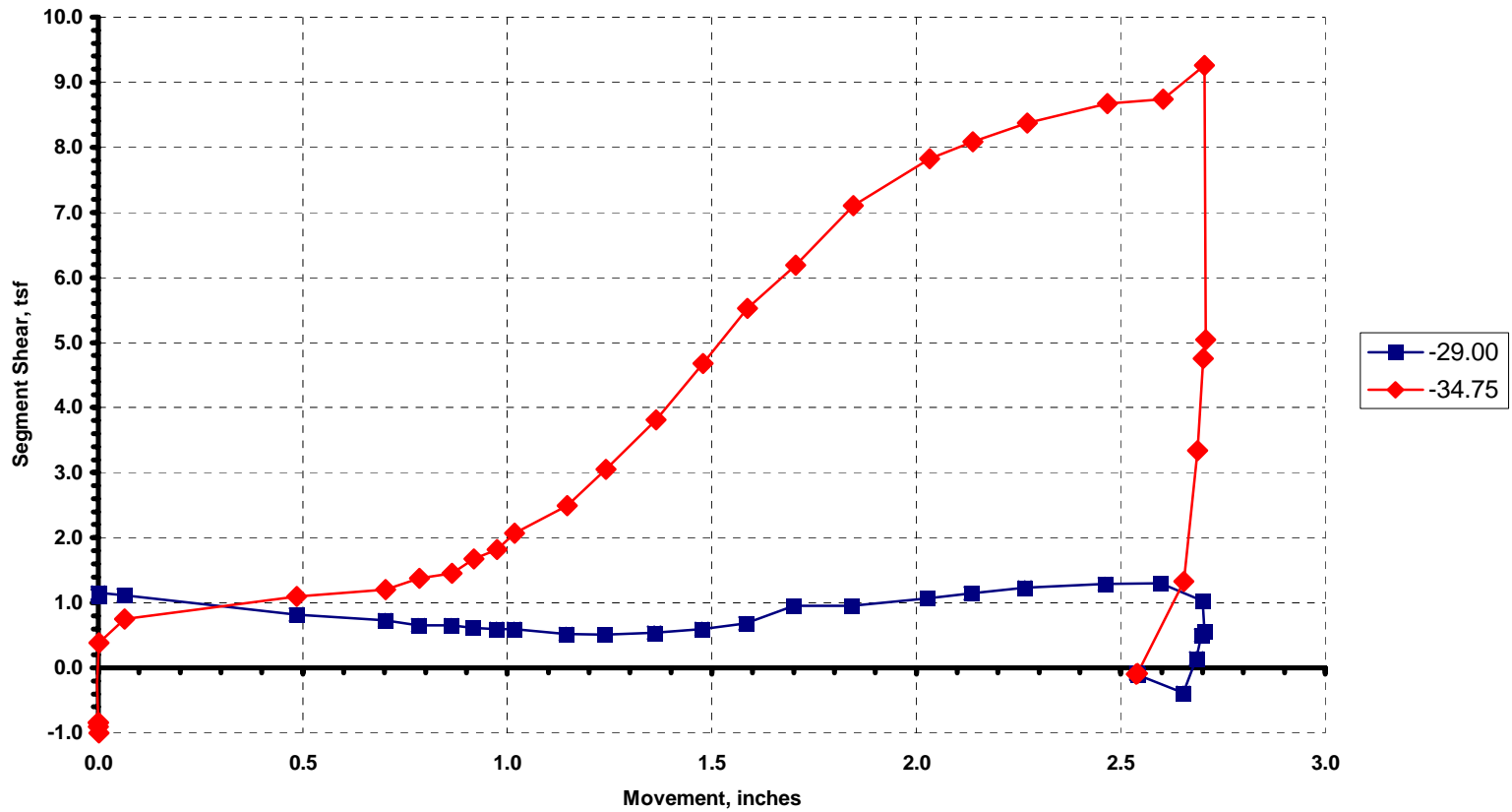


Figure H.5 Shaft Middle Shear Stress vs. Movement, Shaft 10 - 2002



302

Figure H.6 Strain Distribution, Shaft 10 - 2002

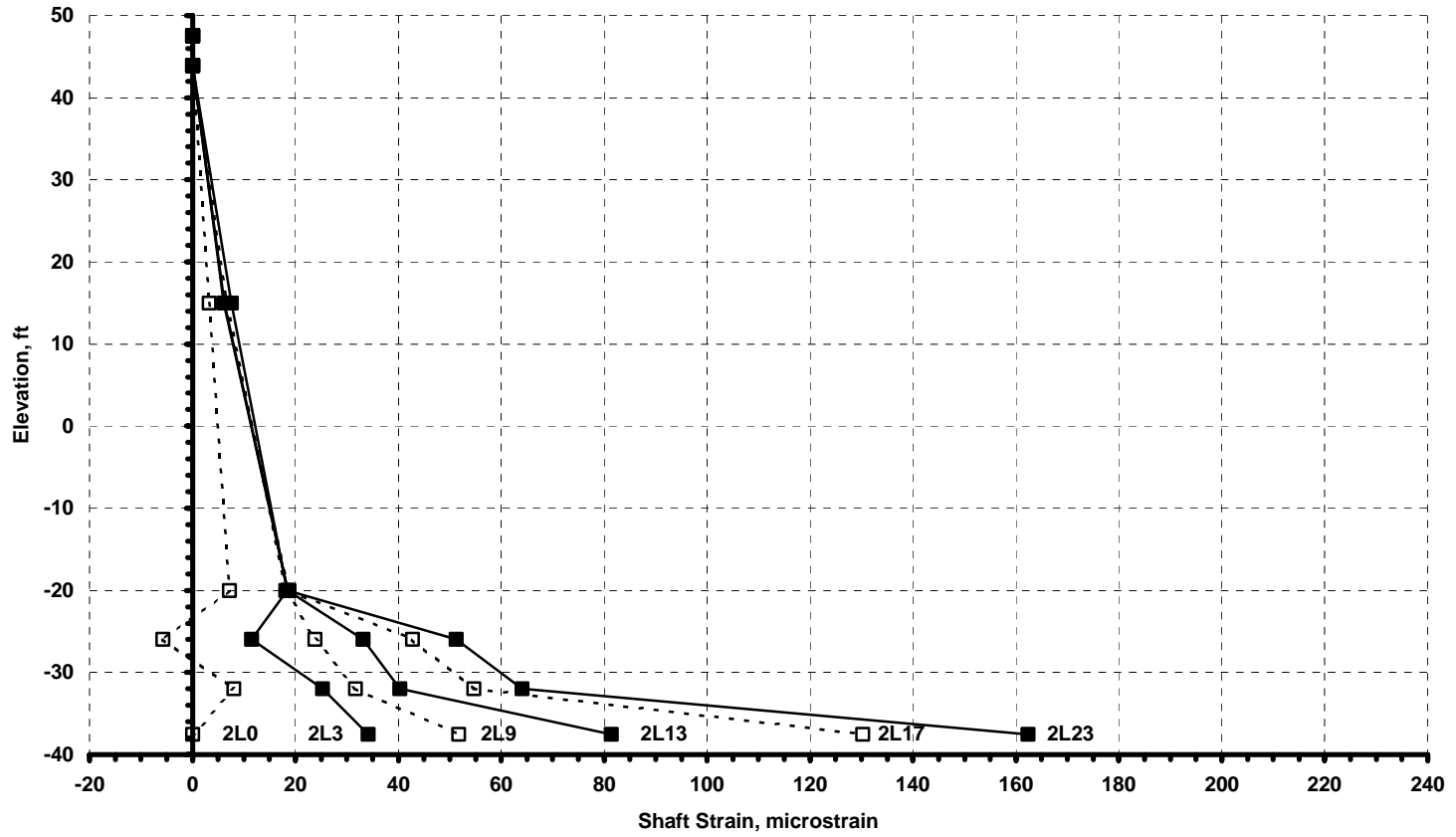


Figure H.7 Load Distribution, Shaft 10 - 2002

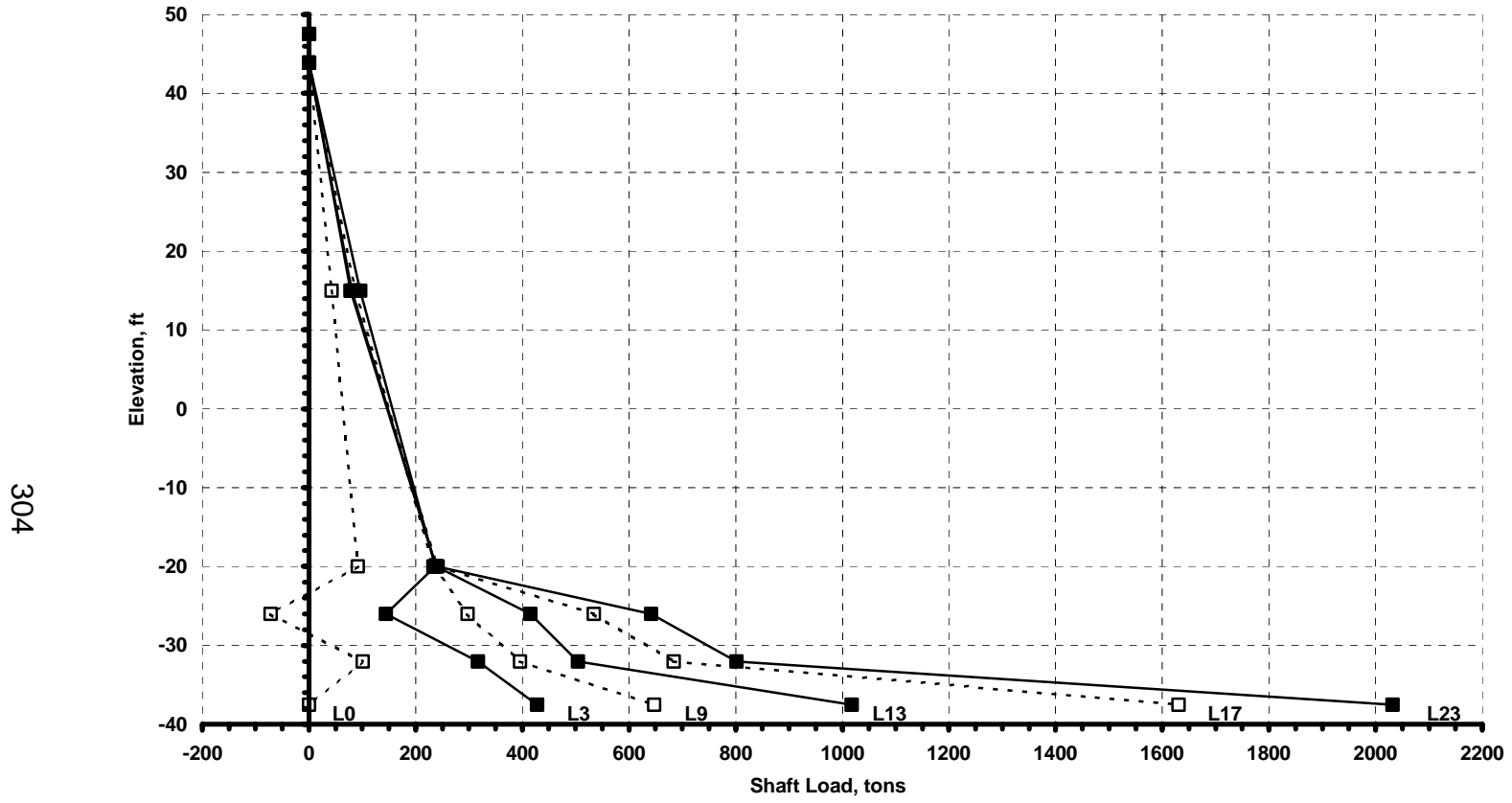


Figure H.8 Shear Stress Distribution, Shaft 10 - 2002

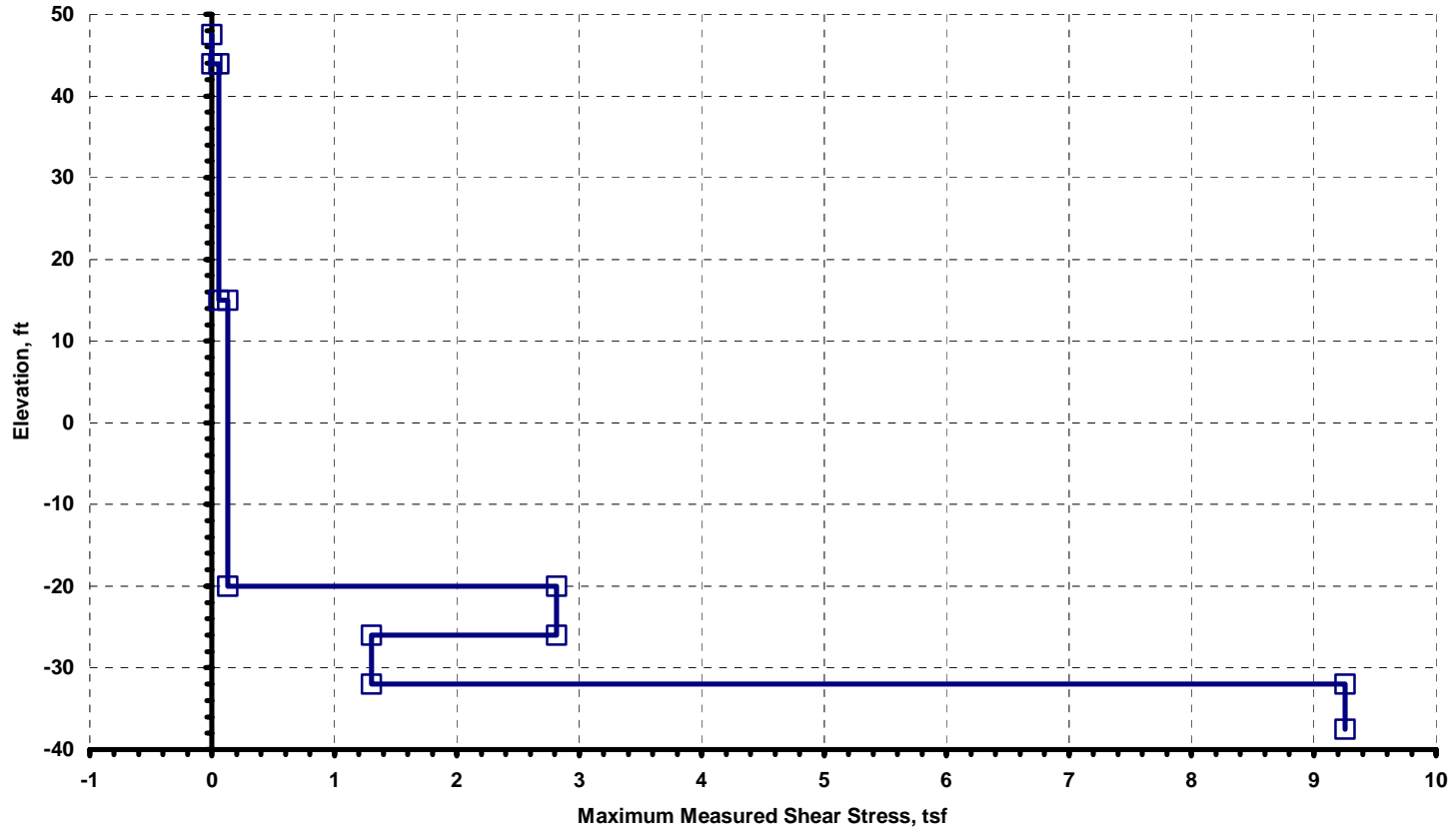


Figure H.9 Top of Shaft Indicators vs Survey Level, Stage 3 - Shaft 10 - 2002

306

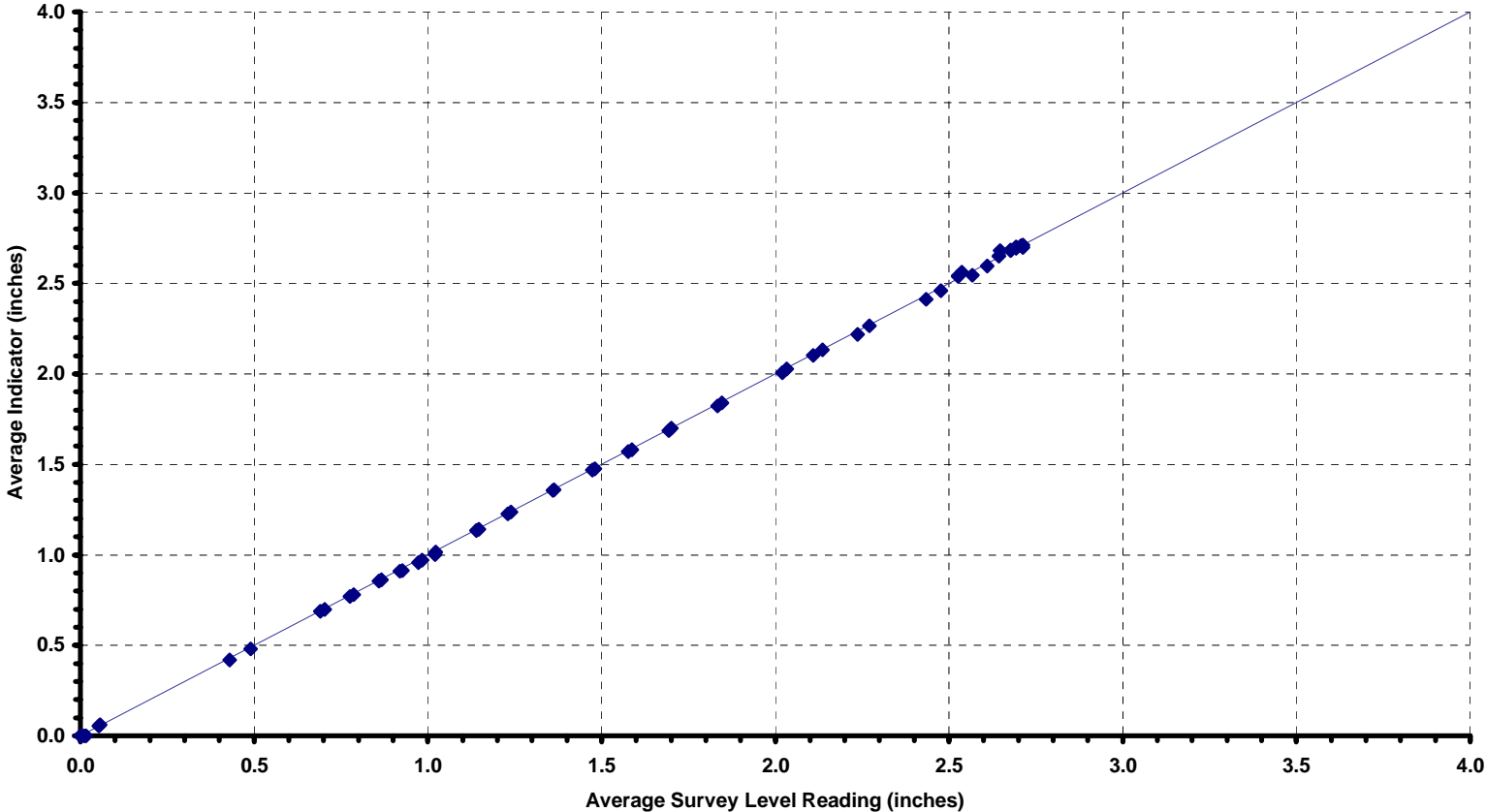


Figure H.10 Average Compression vs Load, Stage 3 - Shaft 10 - 2002

307

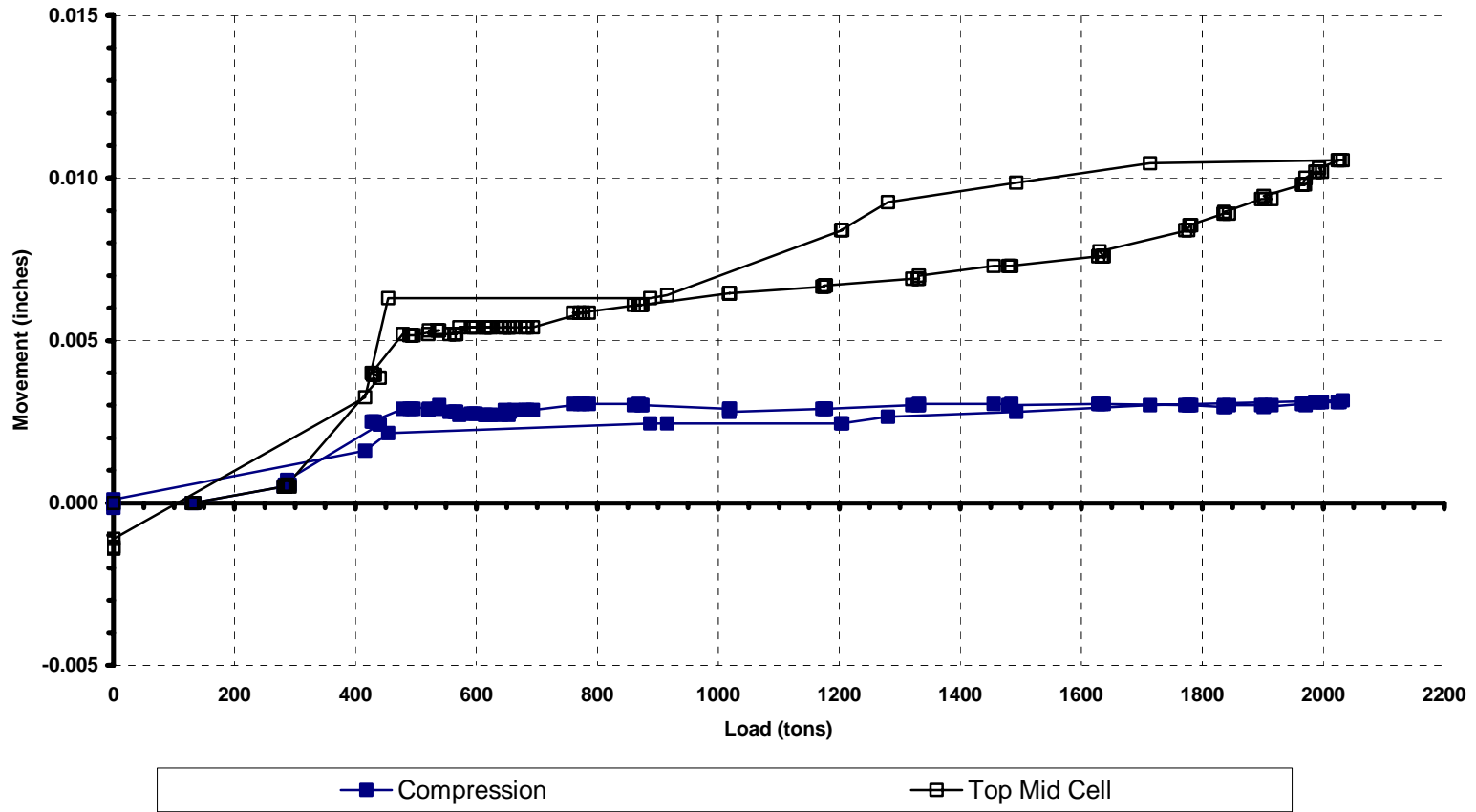
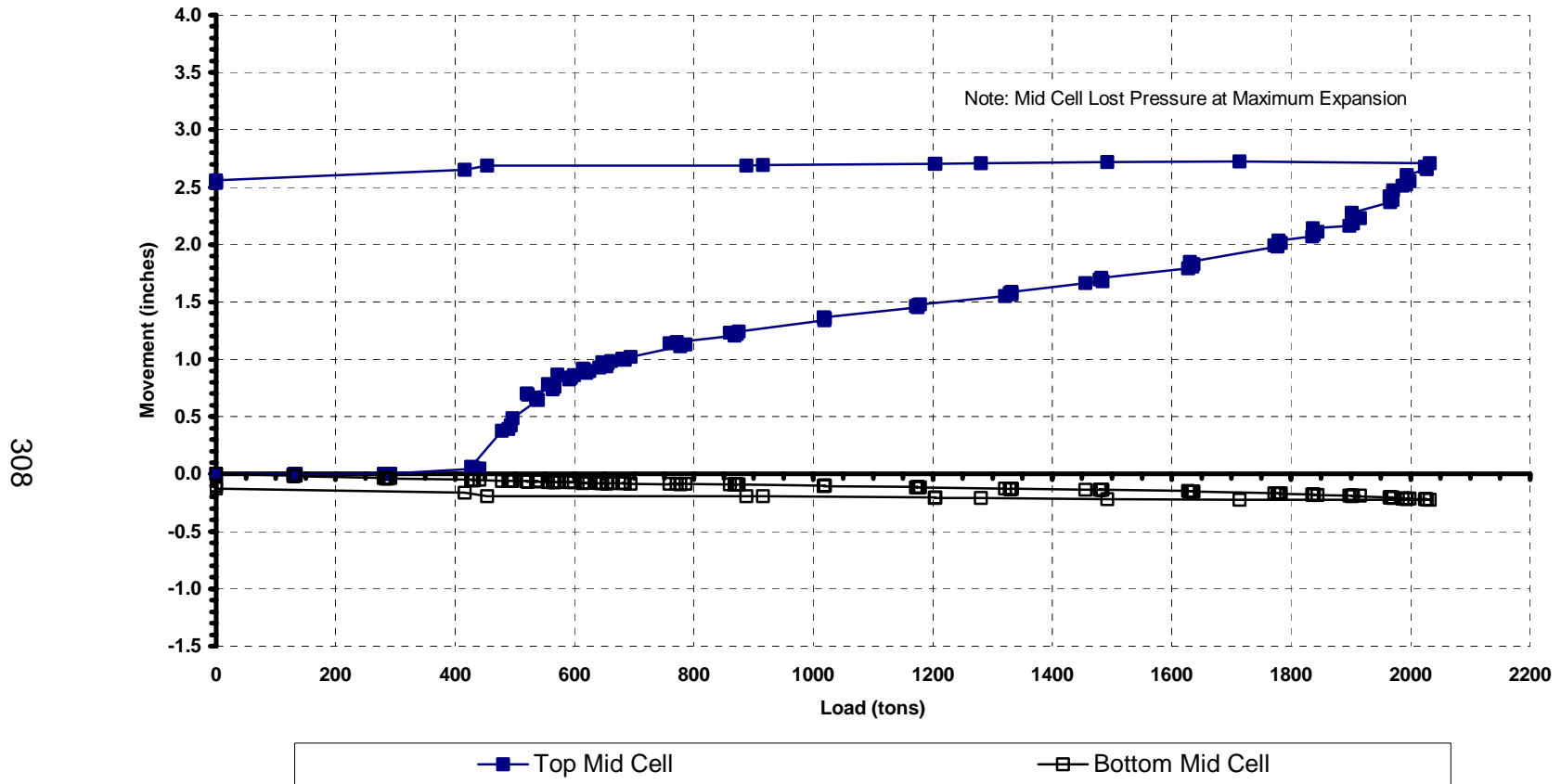


Figure H.11 Mid Cell Movement, Stage 3 - Shaft 10 - 2002



Figuer H.12 Bottom Cell Movement, Stage 3 - Shaft 10 - 2002

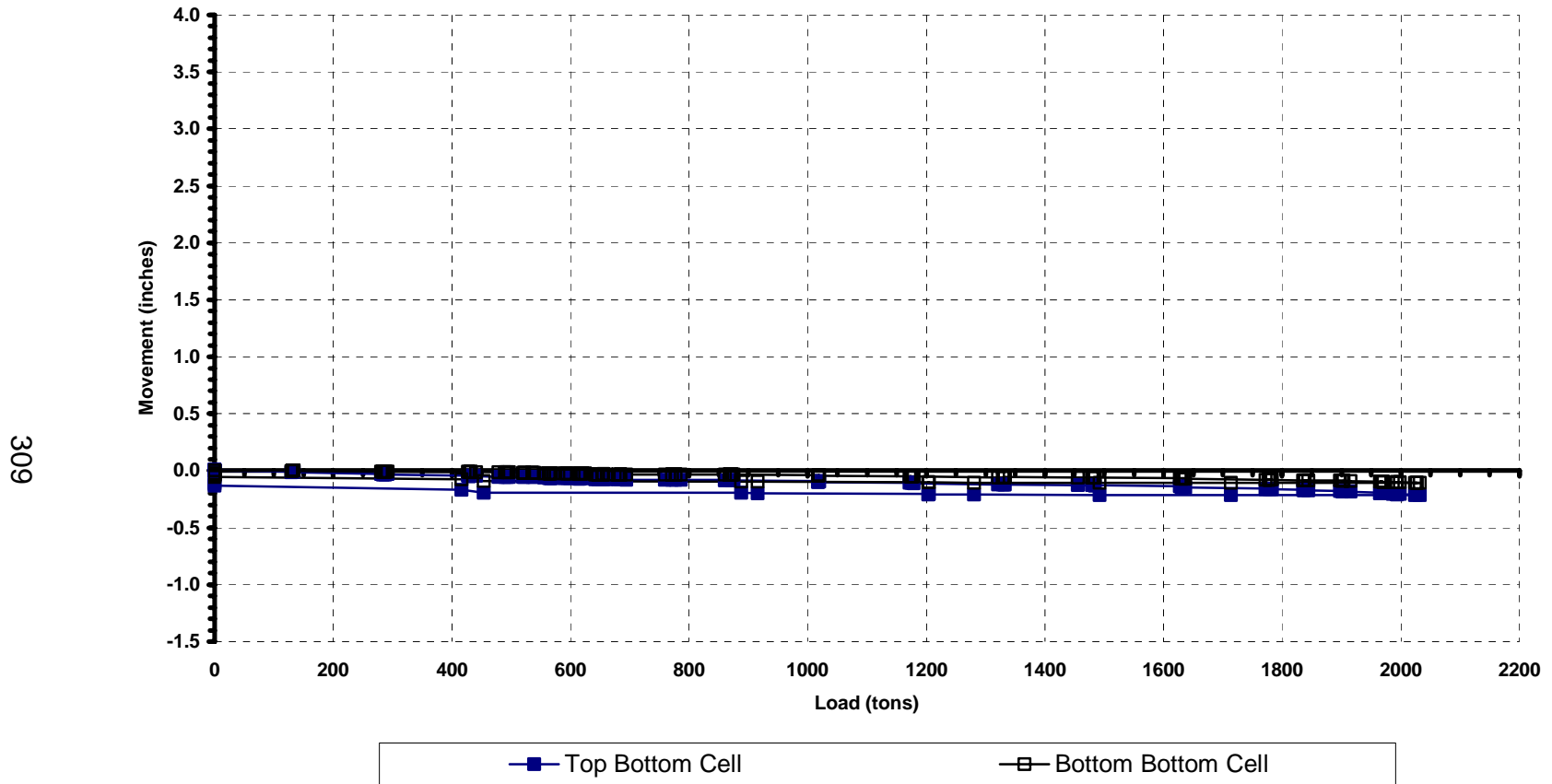
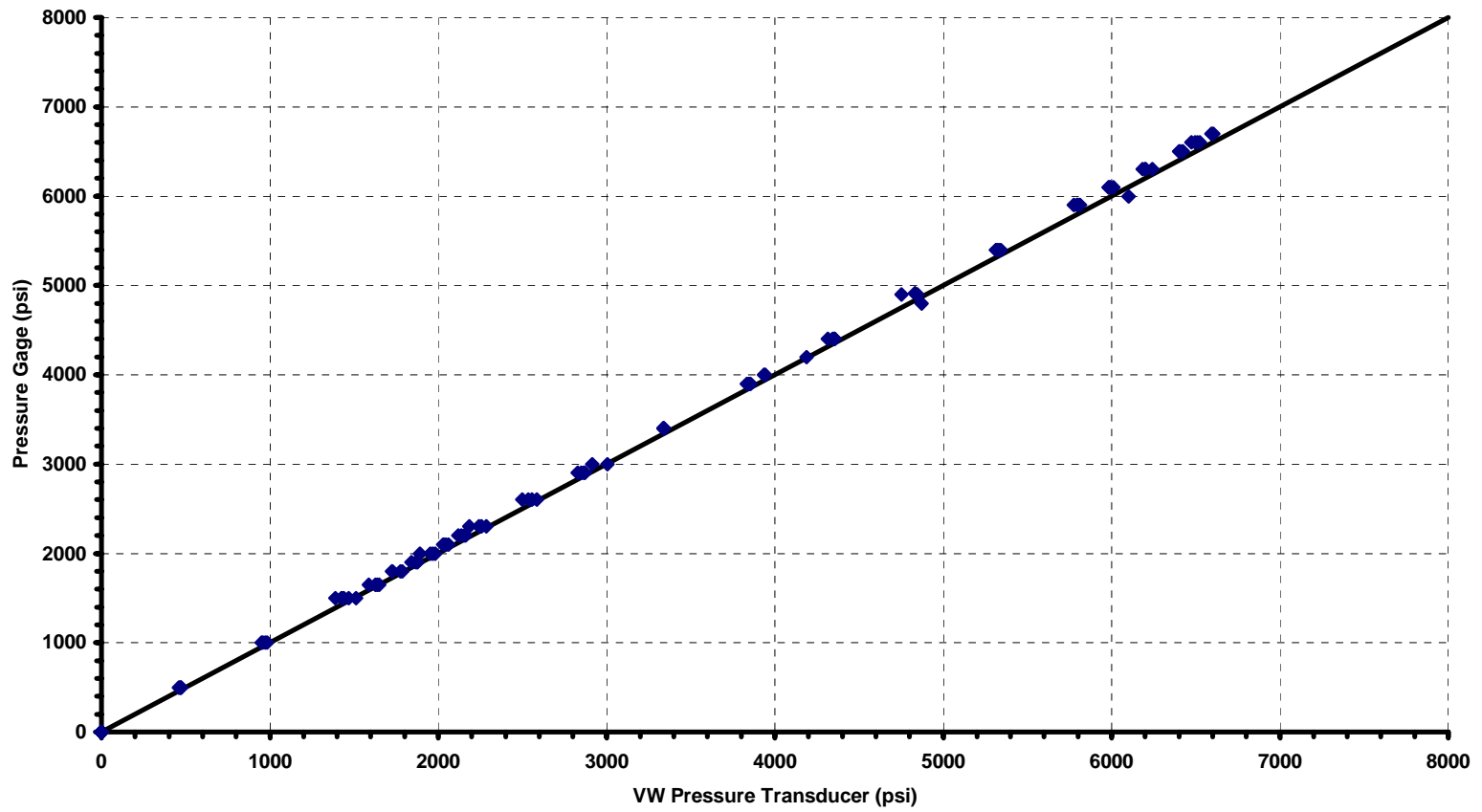


Figure H.13 VW Pressure Transducer vs Pressure Gage, Stage 3 - Shaft 10 - 2002



**APPENDIX I
TEST SHAFT 5 – ANALYSIS OF 1996 TEST**

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
L0	0:00:00	41	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:00	134	25	0.0011	0.0005	0.0008	0.0000	0.0000	0.0000
L1	0:00:30	418	112	0.0018	0.0011	0.0015	0.0000	0.0000	0.0000
L1	0:01:00	413	111	0.0025	0.0017	0.0021	0.0000	0.0000	0.0000
L1	0:01:30	426	115	0.0030	0.0022	0.0026	0.0000	0.0000	0.0000
L1	0:02:00	428	115	0.0034	0.0033	0.0034	0.0000	0.0000	0.0000
L1	0:02:30	431	116	0.0041	0.0036	0.0039	0.0000	0.0000	0.0000
L1	0:03:00	436	118	0.0052	0.0036	0.0044	0.0000	0.0000	0.0000
L1	0:03:30	441	119	0.0052	0.0037	0.0045	0.0000	0.0000	0.0000
L1	0:04:00	451	122	0.0055	0.0045	0.0050	0.0000	0.0000	0.0000
L1	0:04:30	459	125	0.0055	0.0044	0.0050	0.0000	0.0000	0.0000
L1	0:05:00	461	125	0.0055	0.0044	0.0050	0.0000	0.0000	0.0000
L2	0:00:00	764	219	0.0084	0.0067	0.0076	0.0000	0.0000	0.0000
L2	0:00:30	828	239	0.0108	0.0086	0.0097	0.0000	0.0000	0.0000
L2	0:01:00	823	237	0.0112	0.0088	0.0100	0.0000	0.0000	0.0000
L2	0:01:30	826	238	0.0117	0.0093	0.0105	0.0000	0.0000	0.0000
L2	0:02:00	812	234	0.0128	0.0099	0.0114	0.0000	0.0000	0.0000
L2	0:02:30	846	244	0.0133	0.0101	0.0117	0.0000	0.0000	0.0000
L2	0:03:00	831	240	0.0133	0.0101	0.0117	0.0000	0.0000	0.0000
L2	0:03:30	826	238	0.0133	0.0102	0.0118	0.0000	0.0000	0.0000
L2	0:04:00	825	238	0.0133	0.0103	0.0118	0.0000	0.0000	0.0000
L2	0:04:30	825	238	0.0139	0.0110	0.0125	0.0000	0.0000	0.0000
L2	0:05:00	820	236	0.0142	0.0110	0.0126	0.0000	0.0000	0.0000
L2	0:05:30	820	236	0.0142	0.0110	0.0126	0.0000	0.0000	0.0000
L3	0:00:00	1014	296	0.0168	0.0133	0.0151	0.0000	0.0000	0.0000
L3	0:00:30	1021	298	0.0174	0.0139	0.0157	0.0000	0.0000	0.0000
L3	0:01:00	1014	296	0.0182	0.0144	0.0163	0.0000	0.0000	0.0000
L3	0:01:30	1034	302	0.0184	0.0148	0.0166	0.0000	0.0000	0.0000
L3	0:02:00	1011	295	0.0189	0.0150	0.0170	0.0000	0.0000	0.0000
L3	0:02:30	1003	293	0.0198	0.0155	0.0177	0.0000	0.0000	0.0000
L3	0:03:00	993	290	0.0198	0.0155	0.0177	0.0000	0.0000	0.0000
L3	0:03:30	1006	294	0.0198	0.0157	0.0178	0.0000	0.0000	0.0000
L3	0:04:00	1018	297	0.0206	0.0160	0.0183	0.0000	0.0000	0.0000
L4	0:00:00	1124	330	0.0213	0.0173	0.0193	0.0000	0.0000	0.0000
L4	0:00:30	1209	356	0.0244	0.0199	0.0222	0.0000	0.0000	0.0000
L4	0:01:00	1215	358	0.0254	0.0209	0.0232	0.0000	0.0000	0.0000
L4	0:01:30	1204	355	0.0256	0.0213	0.0235	0.0000	0.0000	0.0000
L4	0:02:00	1219	359	0.0268	0.0221	0.0245	0.0000	0.0000	0.0000
L4	0:02:30	1219	359	0.0268	0.0225	0.0247	0.0000	0.0000	0.0000
L4	0:03:00	1202	354	0.0270	0.0227	0.0249	0.0001	0.0000	0.0001
L4	0:03:30	1217	359	0.0281	0.0236	0.0259	0.0001	0.0000	0.0001
L4	0:04:00	1215	358	0.0277	0.0245	0.0261	0.0002	0.0000	0.0001
L4	0:04:30	1210	357	0.0284	0.0242	0.0263	0.0002	0.0000	0.0001

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
L5	0:00:00	1415	420	0.0306	0.0264	0.0285	0.0003	0.0000	0.0002
L5	0:00:30	1632	487	0.0405	0.0363	0.0384	0.0006	0.0003	0.0005
L5	0:01:00	1622	484	0.0437	0.0382	0.0410	0.0006	0.0005	0.0006
L5	0:01:30	1612	481	0.0447	0.0390	0.0419	0.0007	0.0005	0.0006
L5	0:02:00	1624	484	0.0447	0.0403	0.0425	0.0007	0.0006	0.0007
L5	0:02:30	1630	486	0.0458	0.0415	0.0437	0.0007	0.0006	0.0007
L5	0:03:00	1614	481	0.0465	0.0419	0.0442	0.0007	0.0006	0.0007
L5	0:03:30	1591	474	0.0465	0.0424	0.0445	0.0007	0.0006	0.0007
L5	0:04:00	1622	484	0.0467	0.0424	0.0446	0.0007	0.0006	0.0007
L5	0:04:30	1630	486	0.0473	0.0428	0.0451	0.0007	0.0007	0.0007
L6	0:00:00	1880	563	0.0535	0.0505	0.0520	0.0007	0.0010	0.0009
L6	0:00:30	2030	609	0.0668	0.0642	0.0655	0.0008	0.0014	0.0011
L6	0:01:00	2006	602	0.0701	0.0672	0.0687	0.0009	0.0016	0.0013
L6	0:01:30	2019	606	0.0723	0.0687	0.0705	0.0009	0.0017	0.0013
L6	0:02:00	2037	611	0.0738	0.0710	0.0724	0.0009	0.0017	0.0013
L6	0:02:30	2048	615	0.0756	0.0726	0.0741	0.0009	0.0018	0.0014
L6	0:03:00	2020	606	0.0766	0.0734	0.0750	0.0009	0.0018	0.0014
L6	0:03:30	2025	608	0.0770	0.0739	0.0755	0.0009	0.0018	0.0014
L6	0:04:00	2017	605	0.0770	0.0761	0.0766	0.0009	0.0018	0.0014
L6	0:04:30	2018	606	0.0775	0.0755	0.0765	0.0009	0.0018	0.0014
L6	0:05:00	2022	607	0.0780	0.0761	0.0771	0.0009	0.0018	0.0014
L7	0:00:00	2239	674	0.0854	0.0810	0.0832	0.0009	0.0025	0.0017
L7	0:00:30	2440	736	0.1104	0.1084	0.1094	0.0009	0.0032	0.0021
L7	0:01:00	2441	736	0.1190	0.1190	0.1190	0.0011	0.0034	0.0023
L7	0:01:30	2431	733	0.1245	0.1230	0.1238	0.0011	0.0034	0.0023
L7	0:02:00	2441	736	0.1279	0.1257	0.1268	0.0011	0.0035	0.0023
L7	0:02:30	2440	736	0.1321	0.1278	0.1300	0.0011	0.0035	0.0023
L7	0:03:00	2444	737	0.1340	0.1303	0.1322	0.0011	0.0036	0.0024
L7	0:03:30	2409	726	0.1359	0.1332	0.1346	0.0011	0.0036	0.0024
L7	0:04:00	2423	731	0.1396	0.1354	0.1375	0.0011	0.0036	0.0024
L7	0:04:30	2441	736	0.1430	0.1365	0.1398	0.0011	0.0036	0.0024
L7	0:05:00	2446	738	0.1458	0.1406	0.1432	0.0011	0.0036	0.0024
L7	0:05:30	2425	731	0.1460	0.1409	0.1435	0.0011	0.0037	0.0024
L7	0:06:00	2423	731	0.1460	0.1434	0.1447	0.0011	0.0037	0.0024
L7	0:06:30	2430	733	0.1459	0.1441	0.1450	0.0011	0.0037	0.0024
L8	0:00:00	2639	797	0.1601	0.1589	0.1595	0.0011	0.0041	0.0026
L8	0:00:30	2614	790	0.1714	0.1692	0.1703	0.0011	0.0042	0.0027
L8	0:01:00	2634	796	0.1778	0.1767	0.1773	0.0011	0.0042	0.0027
L8	0:01:30	2641	798	0.1841	0.1821	0.1831	0.0011	0.0042	0.0027
L8	0:02:00	2631	795	0.1855	0.1871	0.1863	0.0011	0.0042	0.0027
L8	0:02:30	2641	798	0.1901	0.1907	0.1904	0.0011	0.0042	0.0027
L8	0:03:00	2638	797	0.1945	0.1931	0.1938	0.0011	0.0042	0.0027
L8	0:03:30	2620	791	0.1953	0.1963	0.1958	0.0011	0.0042	0.0027

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
L8	0:04:00	2631	795	0.1993	0.1981	0.1987	0.0012	0.0042	0.0027
L9	0:00:00	2724	824	0.2050	0.2031	0.2041	0.0012	0.0044	0.0028
L9	0:00:30	2714	820	0.2132	0.2123	0.2128	0.0012	0.0045	0.0029
L9	0:01:00	2722	823	0.2225	0.2188	0.2207	0.0012	0.0046	0.0029
L9	0:01:30	2739	828	0.2258	0.2248	0.2253	0.0012	0.0046	0.0029
L9	0:02:00	2714	820	0.2284	0.2299	0.2292	0.0013	0.0046	0.0030
L9	0:02:30	2732	826	0.2337	0.2328	0.2333	0.0013	0.0046	0.0030
L9	0:03:00	2748	831	0.2383	0.2371	0.2377	0.0013	0.0046	0.0030
L9	0:03:30	2745	830	0.2412	0.2401	0.2407	0.0016	0.0046	0.0031
L9	0:04:00	2736	827	0.2435	0.2422	0.2429	0.0016	0.0046	0.0031
L9	0:04:30	2732	826	0.2461	0.2444	0.2453	0.0016	0.0046	0.0031
L9	0:05:00	2729	825	0.2480	0.2469	0.2475	0.0016	0.0046	0.0031
L10	0:00:00	2840	859	0.2573	0.2571	0.2572	0.0016	0.0047	0.0032
L10	0:00:30	2832	857	0.2673	0.2670	0.2672	0.0016	0.0048	0.0032
L10	0:01:00	2827	855	0.2733	0.2739	0.2736	0.0016	0.0048	0.0032
L10	0:01:30	2853	863	0.2798	0.2805	0.2802	0.0016	0.0049	0.0033
L10	0:02:00	2850	862	0.2868	0.2863	0.2866	0.0016	0.0049	0.0033
L10	0:02:30	2854	864	0.2933	0.2918	0.2926	0.0017	0.0049	0.0033
L10	0:03:00	2854	864	0.2981	0.2966	0.2974	0.0017	0.0049	0.0033
L10	0:03:30	2845	861	0.3018	0.3004	0.3011	0.0017	0.0049	0.0033
L10	0:04:00	2840	859	0.3066	0.3045	0.3056	0.0018	0.0049	0.0034
L11	0:00:00	2921	884	0.3112	0.3104	0.3108	0.0018	0.0049	0.0034
L11	0:00:30	2934	888	0.3246	0.3240	0.3243	0.0018	0.0049	0.0034
L11	0:01:00	2926	886	0.3368	0.3358	0.3363	0.0018	0.0050	0.0034
L11	0:01:30	2924	885	0.3466	0.3450	0.3458	0.0019	0.0050	0.0035
L11	0:02:00	2941	890	0.3526	0.3518	0.3522	0.0019	0.0050	0.0035
L11	0:02:30	2954	894	0.3586	0.3589	0.3588	0.0019	0.0050	0.0035
L11	0:03:00	2939	890	0.3645	0.3639	0.3642	0.0019	0.0050	0.0035
L11	0:03:30	2950	893	0.3694	0.3689	0.3692	0.0020	0.0050	0.0035
L11	0:04:00	2954	894	0.3747	0.3741	0.3744	0.0020	0.0050	0.0035
L11	0:04:30	2952	894	0.3810	0.3788	0.3799	0.0020	0.0050	0.0035
L12	0:00:00	3029	918	0.3879	0.3888	0.3884	0.0020	0.0050	0.0035
L12	0:00:30	3024	916	0.4051	0.4051	0.4051	0.0020	0.0050	0.0035
L12	0:01:00	3037	920	0.4192	0.4191	0.4192	0.0020	0.0051	0.0036
L12	0:01:30	3037	920	0.4310	0.4311	0.4311	0.0020	0.0051	0.0036
L12	0:02:00	3040	921	0.4401	0.4400	0.4401	0.0020	0.0051	0.0036
L12	0:02:30	3029	918	0.4460	0.4468	0.4464	0.0021	0.0051	0.0036
L12	0:03:00	3041	921	0.4540	0.4534	0.4537	0.0021	0.0051	0.0036
L12	0:03:30	3042	922	0.4597	0.4598	0.4598	0.0021	0.0051	0.0036
L12	0:04:00	3033	919	0.4634	0.4663	0.4649	0.0021	0.0051	0.0036
L12	0:04:30	3039	921	0.4718	0.4712	0.4715	0.0021	0.0051	0.0036
L13	0:00:00	3139	951	0.4900	0.4886	0.4893	0.0021	0.0051	0.0036
L13	0:00:30	3127	948	0.5078	0.5079	0.5079	0.0021	0.0051	0.0036

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
L13	0:01:00	3135	950	0.5237	0.5237	0.5237	0.0021	0.0051	0.0036
L13	0:01:30	3126	947	0.5389	0.5358	0.5374	0.0021	0.0051	0.0036
L13	0:02:00	3121	946	0.5477	0.5463	0.5470	0.0021	0.0051	0.0036
L13	0:02:30	3134	950	0.5566	0.5559	0.5563	0.0021	0.0051	0.0036
L13	0:03:00	3148	954	0.5648	0.5642	0.5645	0.0021	0.0051	0.0036
L13	0:03:30	3122	946	0.5716	0.5711	0.5714	0.0021	0.0051	0.0036
L13	0:04:00	3135	950	0.5788	0.5762	0.5775	0.0021	0.0051	0.0036
L13	0:04:30	3129	948	0.5856	0.5816	0.5836	0.0021	0.0051	0.0036
L14	0:00:00	3217	976	0.5995	0.5970	0.5983	0.0021	0.0051	0.0036
L14	0:00:30	3217	976	0.6227	0.6200	0.6214	0.0021	0.0051	0.0036
L14	0:01:00	3212	974	0.6427	0.6410	0.6419	0.0021	0.0051	0.0036
L14	0:01:30	3232	980	0.6605	0.6578	0.6592	0.0021	0.0051	0.0036
L14	0:02:00	3236	982	0.6747	0.6717	0.6732	0.0021	0.0051	0.0036
L14	0:02:30	3230	980	0.6858	0.6814	0.6836	0.0021	0.0051	0.0036
L14	0:03:00	3225	978	0.6938	0.6911	0.6925	0.0021	0.0051	0.0036
L14	0:03:30	3246	985	0.7009	0.7002	0.7006	0.0021	0.0051	0.0036
L14	0:04:00	3217	976	0.7091	0.7067	0.7079	0.0021	0.0051	0.0036
L14	0:04:30	3238	982	0.7165	0.7129	0.7147	0.0021	0.0051	0.0036
L14	0:05:00	3240	983	0.7224	0.7195	0.7210	0.0021	0.0051	0.0036
L15	0:00:00	3310	1004	0.7372	0.7356	0.7364	0.0021	0.0051	0.0036
L15	0:00:30	3315	1006	0.7628	0.7611	0.7620	0.0021	0.0051	0.0036
L15	0:01:00	3324	1009	0.7884	0.7863	0.7874	0.0021	0.0051	0.0036
L15	0:01:30	3308	1004	0.8117	0.8104	0.8111	0.0021	0.0051	0.0036
L15	0:02:00	3321	1008	0.8341	0.8326	0.8334	0.0021	0.0051	0.0036
L15	0:02:30	3350	1017	0.8538	0.8523	0.8531	0.0021	0.0051	0.0036
L15	0:03:00	3344	1015	0.8666	0.8639	0.8653	0.0021	0.0051	0.0036
L15	0:03:30	3332	1011	0.8793	0.8754	0.8774	0.0021	0.0051	0.0036
L15	0:04:00	3329	1010	0.8884	0.8868	0.8876	0.0021	0.0051	0.0036
L16	0:00:00	3414	1036	0.9020	0.9022	0.9021	0.0021	0.0051	0.0036
L16	0:00:30	3414	1036	0.9387	0.9374	0.9381	0.0021	0.0051	0.0036
L16	0:01:00	3414	1036	0.9724	0.9712	0.9718	0.0021	0.0051	0.0036
L16	0:01:30	3446	1046	1.0003	0.9989	0.9996	0.0021	0.0051	0.0036
L16	0:02:00	3432	1042	1.0186	1.0169	1.0178	0.0021	0.0051	0.0036
L16	0:02:30	3433	1042	1.0336	1.0311	1.0324	0.0021	0.0051	0.0036
L16	0:03:00	3442	1045	1.0433	1.0414	1.0424	0.0021	0.0051	0.0036
L16	0:03:30	3424	1039	1.0522	1.0511	1.0517	0.0021	0.0051	0.0036
L16	0:04:00	3442	1045	1.0624	1.0593	1.0609	0.0021	0.0051	0.0036
L16	0:04:30	3437	1043	1.0709	1.0672	1.0691	0.0021	0.0051	0.0036
L17	0:00:00	3527	1071	1.0806	1.0784	1.0795	0.0021	0.0051	0.0036
L17	0:00:30	3509	1066	1.1076	1.1053	1.1065	0.0021	0.0051	0.0036
L17	0:01:00	3527	1071	1.1316	1.1296	1.1306	0.0021	0.0051	0.0036
L17	0:01:30	3545	1077	1.1535	1.1519	1.1527	0.0021	0.0051	0.0036
L17	0:02:00	3546	1077	1.1732	1.1718	1.1725	0.0021	0.0051	0.0036

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
L17	0:02:30	3540	1075	1.1908	1.1895	1.1902	0.0021	0.0051	0.0036
L17	0:03:00	3542	1076	1.2031	1.2023	1.2027	0.0021	0.0051	0.0036
L17	0:03:30	3533	1073	1.2129	1.2121	1.2125	0.0021	0.0051	0.0036
L17	0:04:00	3527	1071	1.2209	1.2196	1.2203	0.0021	0.0051	0.0036
L17	0:04:30	3530	1072	1.2269	1.2257	1.2263	0.0021	0.0051	0.0036
L17	0:00:00	3527	1071	1.2329	1.2312	1.2321	0.0021	0.0051	0.0036
U1	0:00:30	3019	915	1.2347	1.2312	1.2330	0.0021	0.0051	0.0036
U1	0:01:00	3042	922	1.2347	1.2308	1.2328	0.0021	0.0051	0.0036
U1	0:01:30	3065	929	1.2347	1.2308	1.2328	0.0021	0.0051	0.0036
U1	0:02:00	3037	920	1.2346	1.2308	1.2327	0.0021	0.0051	0.0036
U1	0:02:30	3031	918	1.2346	1.2308	1.2327	0.0021	0.0051	0.0036
U1	0:03:00	3021	915	1.2347	1.2310	1.2329	0.0021	0.0051	0.0036
U1	0:03:30	3016	914	1.2348	1.2310	1.2329	0.0021	0.0051	0.0036
U1	0:04:00	3009	912	1.2348	1.2310	1.2329	0.0021	0.0051	0.0036
U1	0:04:30	2998	908	1.2348	1.2310	1.2329	0.0021	0.0051	0.0036
U2	0:00:00	2774	839	1.2348	1.2312	1.2330	0.0021	0.0051	0.0036
U2	0:00:30	2544	768	1.2348	1.2301	1.2325	0.0021	0.0051	0.0036
U2	0:01:00	2539	766	1.2348	1.2299	1.2324	0.0021	0.0051	0.0036
U2	0:01:30	2545	768	1.2348	1.2299	1.2324	0.0021	0.0051	0.0036
U2	0:02:00	2547	769	1.2348	1.2301	1.2325	0.0021	0.0051	0.0036
U2	0:02:30	2545	768	1.2348	1.2302	1.2325	0.0021	0.0051	0.0036
U2	0:03:00	2547	769	1.2348	1.2302	1.2325	0.0021	0.0051	0.0036
U3	0:00:00	2026	608	1.2332	1.2275	1.2304	0.0021	0.0051	0.0036
U3	0:00:30	1998	600	1.2328	1.2275	1.2302	0.0021	0.0051	0.0036
U3	0:01:00	2015	605	1.2328	1.2274	1.2301	0.0021	0.0051	0.0036
U3	0:01:30	2015	605	1.2328	1.2274	1.2301	0.0021	0.0051	0.0036
U3	0:02:00	2021	607	1.2328	1.2273	1.2301	0.0021	0.0051	0.0036
U3	0:02:30	2024	608	1.2327	1.2273	1.2300	0.0021	0.0051	0.0036
U3	0:03:00	2024	608	1.2327	1.2265	1.2296	0.0021	0.0051	0.0036
U4	0:00:00	1538	458	1.2293	1.2232	1.2263	0.0021	0.0051	0.0036
U4	0:00:30	1547	461	1.2289	1.2229	1.2259	0.0021	0.0051	0.0036
U4	0:01:00	1559	464	1.2282	1.2228	1.2255	0.0021	0.0051	0.0036
U4	0:01:30	1561	465	1.2281	1.2228	1.2255	0.0021	0.0051	0.0036
U4	0:02:00	1512	450	1.2281	1.2228	1.2255	0.0021	0.0051	0.0036
U4	0:02:30	1515	451	1.2281	1.2228	1.2255	0.0021	0.0051	0.0036
U5	0:00:00	1014	296	1.2226	1.2162	1.2194	0.0021	0.0051	0.0036
U5	0:00:30	1050	307	1.2213	1.2158	1.2186	0.0021	0.0051	0.0036
U5	0:01:00	1059	310	1.2204	1.2158	1.2181	0.0021	0.0051	0.0036
U5	0:01:30	1069	313	1.2194	1.2157	1.2176	0.0021	0.0051	0.0036
U5	0:02:00	1073	314	1.2185	1.2150	1.2168	0.0021	0.0051	0.0036
U5	0:02:30	1076	315	1.2185	1.2149	1.2167	0.0021	0.0051	0.0036
U5	0:03:00	1079	316	1.2185	1.2149	1.2167	0.0021	0.0051	0.0036
U6	0:00:00	532	147	1.2053	1.1990	1.2022	0.0020	0.0051	0.0036

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
U6	0:00:30	526	145	1.2033	1.1973	1.2003	0.0020	0.0051	0.0036
U6	0:01:00	531	147	1.2023	1.1964	1.1994	0.0020	0.0051	0.0036
U6	0:01:30	539	149	1.2021	1.1958	1.1990	0.0020	0.0051	0.0036
U6	0:02:00	540	150	1.2013	1.1958	1.1986	0.0020	0.0051	0.0036
U6	0:02:30	142	27	1.1817	1.1750	1.1784	0.0019	0.0050	0.0035
U7	0:00:00	38	0	1.1528	1.1504	1.1516	0.0018	0.0047	0.0033
U7	0:00:30	31	0	1.1497	1.1442	1.1470	0.0018	0.0047	0.0033
U7	0:01:00	36	0	1.1466	1.1422	1.1444	0.0018	0.0046	0.0032
U7	0:01:30	33	0	1.1458	1.1414	1.1436	0.0018	0.0046	0.0032
U7	0:02:00	34	0	1.1445	1.1405	1.1425	0.0018	0.0046	0.0032
U7	0:02:30	33	0	1.1427	1.1403	1.1415	0.0017	0.0046	0.0032
U7	0:03:00	33	0	1.1418	1.1392	1.1405	0.0017	0.0046	0.0032
U7	0:03:30	33	0	1.1418	1.1392	1.1405	0.0017	0.0046	0.0032
U7	0:04:00	31	0	1.1418	1.1389	1.1404	0.0017	0.0046	0.0032
U7	0:04:30	33	0	1.1418	1.1384	1.1401	0.0017	0.0046	0.0032
U7	0:05:00	33	0	1.1415	1.1383	1.1399	0.0017	0.0046	0.0032
U7	0:05:30	33	0	1.1407	1.1383	1.1395	0.0017	0.0046	0.0032
U7	0:06:00	31	0	1.1407	1.1381	1.1394	0.0017	0.0046	0.0032
U7	0:06:30	33	0	1.1407	1.1381	1.1394	0.0017	0.0046	0.0032
U7	0:07:00	31	0	1.1407	1.1381	1.1394	0.0017	0.0046	0.0032
U7	0:07:30	32	0	1.1407	1.1381	1.1394	0.0017	0.0046	0.0032
U7	0:08:00	29	0	1.1397	1.1373	1.1385	0.0017	0.0046	0.0032
2L0	0:00:00	26	0	1.1456	1.1415	1.1436	0.0016	0.0044	0.0030
2L1	0:00:00	85	9	1.1458	1.1422	1.1440	0.0016	0.0044	0.0030
2L1	0:00:00	379	100	1.1488	1.1449	1.1469	0.0016	0.0044	0.0030
2L1	0:00:00	777	223	1.1511	1.1489	1.1500	0.0016	0.0044	0.0030
2L1	0:00:30	1017	297	1.1544	1.1519	1.1532	0.0016	0.0044	0.0030
2L1	0:01:00	1019	297	1.1544	1.1521	1.1533	0.0016	0.0044	0.0030
2L1	0:01:30	999	291	1.1550	1.1528	1.1539	0.0016	0.0044	0.0030
2L1	0:02:00	996	290	1.1550	1.1528	1.1539	0.0016	0.0044	0.0030
2L1	0:02:30	996	290	1.1547	1.1534	1.1541	0.0016	0.0044	0.0030
2L2	0:00:00	1665	497	1.1694	1.1741	1.1718	0.0016	0.0044	0.0030
2L2	0:00:30	2000	600	1.1874	1.1921	1.1898	0.0016	0.0044	0.0030
2L2	0:01:00	1998	600	1.1906	1.1918	1.1912	0.0016	0.0044	0.0030
2L2	0:01:30	2013	604	1.1922	1.1918	1.1920	0.0016	0.0044	0.0030
2L2	0:02:00	2013	604	1.1930	1.1917	1.1924	0.0016	0.0044	0.0030
2L2	0:02:30	1995	599	1.1913	1.1938	1.1926	0.0016	0.0044	0.0030
2L2	0:03:00	1992	598	1.1931	1.1947	1.1939	0.0016	0.0044	0.0030
2L3	0:00:00	2414	728	1.2089	1.2070	1.2080	0.0016	0.0044	0.0030
2L3	0:00:30	2522	761	1.2188	1.2170	1.2179	0.0016	0.0044	0.0030
2L3	0:01:00	2517	760	1.2204	1.2192	1.2198	0.0016	0.0044	0.0030
2L3	0:01:30	2517	760	1.2214	1.2213	1.2214	0.0016	0.0044	0.0030
2L3	0:02:00	2520	761	1.2221	1.2229	1.2225	0.0016	0.0044	0.0030

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
2L3	0:02:30	2512	758	1.2237	1.2226	1.2232	0.0016	0.0044	0.0030
2L4	0:00:00	2744	830	1.2299	1.2288	1.2294	0.0016	0.0044	0.0030
2L4	0:00:30	3023	916	1.2642	1.2614	1.2628	0.0016	0.0044	0.0030
2L4	0:01:00	3009	911	1.2716	1.2723	1.2720	0.0016	0.0044	0.0030
2L4	0:01:30	3017	914	1.2773	1.2755	1.2764	0.0016	0.0044	0.0030
2L4	0:02:00	2999	908	1.2803	1.2786	1.2795	0.0016	0.0044	0.0030
2L4	0:02:30	3016	913	1.2832	1.2809	1.2821	0.0016	0.0044	0.0030
2L4	0:03:00	2983	903	1.2845	1.2828	1.2837	0.0016	0.0044	0.0030
2L5	0:00:00	3329	1010	1.3375	1.3431	1.3403	0.0016	0.0045	0.0031
2L5	0:00:30	3558	1081	1.4408	1.4437	1.4423	0.0016	0.0046	0.0031
2L5	0:01:00	3509	1066	1.4954	1.4980	1.4967	0.0016	0.0046	0.0031
2L5	0:01:30	3510	1066	1.5140	1.5159	1.5150	0.0016	0.0046	0.0031
2L5	0:02:00	3515	1068	1.5275	1.5274	1.5275	0.0016	0.0046	0.0031
2L5	0:02:30	3514	1067	1.5364	1.5368	1.5366	0.0016	0.0046	0.0031
2L6	0:00:00	3615	1098	1.5625	1.5693	1.5659	0.0016	0.0046	0.0031
2L6	0:00:30	3617	1099	1.5984	1.6004	1.5994	0.0016	0.0046	0.0031
2L6	0:01:00	3617	1099	1.6197	1.6228	1.6213	0.0016	0.0046	0.0031
2L6	0:01:30	3621	1100	1.6356	1.6366	1.6361	0.0016	0.0046	0.0031
2L6	0:02:00	3630	1103	1.6450	1.6486	1.6468	0.0016	0.0046	0.0031
2L6	0:02:30	3618	1099	1.6556	1.6555	1.6556	0.0016	0.0046	0.0031
2L6	0:03:00	3633	1104	1.6618	1.6644	1.6631	0.0016	0.0046	0.0031
2L7	0:00:00	3760	1143	1.6720	1.6765	1.6743	0.0016	0.0046	0.0031
2L7	0:00:30	3742	1138	1.7169	1.7190	1.7180	0.0016	0.0046	0.0031
2L7	0:01:00	3733	1135	1.7541	1.7535	1.7538	0.0016	0.0046	0.0031
2L7	0:01:30	3729	1134	1.7746	1.7774	1.7760	0.0016	0.0046	0.0031
2L7	0:02:00	3708	1127	1.7976	1.8005	1.7991	0.0016	0.0046	0.0031
2L7	0:02:30	3698	1124	1.8168	1.8222	1.8195	0.0016	0.0046	0.0031
2L7	0:03:00	3716	1130	1.8350	1.8437	1.8394	0.0016	0.0046	0.0031
2L7	0:03:30	3728	1133	1.8606	1.8689	1.8648	0.0016	0.0046	0.0031
2L7	0:04:00	3656	1111	1.8783	1.8867	1.8825	0.0016	0.0046	0.0031
2U1	0:00:00	3017	914	1.8786	1.8853	1.8820	0.0016	0.0046	0.0031
2U1	0:00:30	3014	913	1.8786	1.8853	1.8820	0.0016	0.0046	0.0031
2U1	0:01:00	3006	910	1.8785	1.8854	1.8820	0.0016	0.0046	0.0031
2U1	0:01:30	2756	833	1.8785	1.8825	1.8805	0.0016	0.0046	0.0031
2U2	0:00:00	2044	614	1.8744	1.8793	1.8769	0.0016	0.0046	0.0031
2U2	0:00:30	2051	616	1.8744	1.8793	1.8769	0.0016	0.0046	0.0031
2U2	0:01:00	2059	618	1.8744	1.8793	1.8769	0.0016	0.0046	0.0031
2U2	0:01:30	2062	619	1.8744	1.8793	1.8769	0.0016	0.0046	0.0031
2U2	0:02:00	2060	619	1.8744	1.8793	1.8769	0.0016	0.0046	0.0031
2U2	0:02:30	2064	620	1.8745	1.8796	1.8771	0.0016	0.0047	0.0032
2U2	0:03:00	2060	619	1.8747	1.8798	1.8773	0.0016	0.0047	0.0032
2U2	0:03:30	2063	620	1.8736	1.8802	1.8769	0.0016	0.0047	0.0032
2U2	0:04:00	2065	620	1.8743	1.8801	1.8772	0.0016	0.0047	0.0032

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Bottom Cell		Top of Shaft Movement			Compression		
		Pressure (psi)	Load (tons)	A (inches)	B (inches)	Average (inches)	X (inches)	Y (inches)	Avg. Rdg (inches)
2U2	0:04:30	2063	620	1.8742	1.8801	1.8772	0.0016	0.0047	0.0032
2U3	0:00:00	1025	299	1.8628	1.8690	1.8659	0.0016	0.0047	0.0032
2U3	0:00:30	1045	305	1.8628	1.8679	1.8654	0.0016	0.0047	0.0032
2U3	0:01:00	1053	308	1.8628	1.8678	1.8653	0.0016	0.0047	0.0032
2U3	0:01:30	999	291	1.8628	1.8673	1.8651	0.0016	0.0047	0.0032
2U3	0:02:00	1009	294	1.8618	1.8670	1.8644	0.0016	0.0047	0.0032
2U3	0:02:30	935	272	1.8609	1.8655	1.8632	0.0016	0.0047	0.0032
2U4	0:00:00	23	0	1.8237	1.8259	1.8248	0.0016	0.0047	0.0032
2U4	0:00:30	21	0	1.8196	1.8208	1.8202	0.0016	0.0047	0.0032
2U4	0:01:00	24	0	1.8174	1.8198	1.8186	0.0016	0.0047	0.0032
2U4	0:01:30	16	0	1.8170	1.8187	1.8179	0.0016	0.0047	0.0032
2U4	0:02:00	21	0	1.8158	1.8180	1.8169	0.0016	0.0047	0.0032
2U4	0:02:30	18	0	1.8157	1.8177	1.8167	0.0016	0.0047	0.0032
2U4	0:03:00	21	0	1.8146	1.8172	1.8159	0.0016	0.0047	0.0032
2U4	0:03:30	19	0	1.8146	1.8170	1.8158	0.0016	0.0047	0.0032

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G (inches)	H (inches)	Avg. Rdg (inches)	Mvmt. (inches)	9750 (inches)	9753 (inches)	Mvmt. (inches)	C (inches)	D (inches)	Avg. Rdg (inches)	Mvmt. (inches)	9752 (inches)	9751 (inches)	Mvmt. (inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:00	0.0000	0.0000	0.0000	0.0008	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0008	0.0003	0.0003	0.0003
L1	0:00:30	0.0000	0.0000	0.0000	0.0015	0.0011	0.0002	0.0007	0.0000	0.0000	0.0000	0.0015	-0.0005	0.0000	-0.0002
L1	0:01:00	0.0000	0.0000	0.0000	0.0021	0.0015	0.0006	0.0011	0.0000	0.0000	0.0000	0.0021	-0.0007	-0.0004	-0.0006
L1	0:01:30	0.0000	0.0000	0.0000	0.0026	0.0019	0.0007	0.0013	0.0000	0.0000	0.0000	0.0026	-0.0009	-0.0005	-0.0007
L1	0:02:00	0.0000	0.0000	0.0000	0.0034	0.0019	0.0014	0.0017	0.0000	0.0000	0.0000	0.0034	-0.0013	-0.0006	-0.0009
L1	0:02:30	0.0000	0.0000	0.0000	0.0039	0.0028	0.0013	0.0021	0.0000	0.0000	0.0000	0.0039	-0.0013	-0.0006	-0.0010
L1	0:03:00	0.0000	0.0000	0.0000	0.0044	0.0032	0.0013	0.0023	0.0002	0.0000	0.0001	0.0045	-0.0013	-0.0009	-0.0011
L1	0:03:30	0.0000	0.0000	0.0000	0.0045	0.0033	0.0013	0.0023	0.0002	0.0000	0.0001	0.0046	-0.0013	-0.0009	-0.0011
L1	0:04:00	0.0000	0.0000	0.0000	0.0050	0.0035	0.0014	0.0025	0.0004	0.0000	0.0002	0.0052	-0.0014	-0.0008	-0.0011
L1	0:04:30	0.0000	0.0000	0.0000	0.0050	0.0038	0.0015	0.0026	0.0004	0.0000	0.0002	0.0052	-0.0014	-0.0008	-0.0011
L1	0:05:00	0.0000	0.0000	0.0000	0.0050	0.0041	0.0017	0.0029	0.0004	0.0000	0.0002	0.0052	-0.0016	-0.0011	-0.0014
L2	0:00:00	0.0004	0.0004	0.0004	0.0080	0.0078	0.0029	0.0053	0.0011	0.0000	0.0006	0.0081	-0.0037	-0.0036	-0.0037
L2	0:00:30	0.0007	0.0007	0.0007	0.0104	0.0092	0.0034	0.0063	0.0016	0.0000	0.0008	0.0105	-0.0044	-0.0044	-0.0044
L2	0:01:00	0.0008	0.0008	0.0008	0.0108	0.0099	0.0036	0.0068	0.0021	0.0000	0.0011	0.0111	-0.0049	-0.0050	-0.0049
L2	0:01:30	0.0008	0.0008	0.0008	0.0113	0.0106	0.0035	0.0070	0.0022	0.0000	0.0011	0.0116	-0.0052	-0.0063	-0.0057
L2	0:02:00	0.0010	0.0010	0.0010	0.0124	0.0111	0.0037	0.0074	0.0023	0.0000	0.0012	0.0125	-0.0055	-0.0066	-0.0061
L2	0:02:30	0.0010	0.0010	0.0010	0.0127	0.0116	0.0037	0.0076	0.0024	0.0000	0.0012	0.0129	-0.0058	-0.0070	-0.0064
L2	0:03:00	0.0010	0.0010	0.0010	0.0127	0.0118	0.0038	0.0078	0.0024	0.0000	0.0012	0.0129	-0.0057	-0.0071	-0.0064
L2	0:03:30	0.0010	0.0010	0.0010	0.0128	0.0119	0.0039	0.0079	0.0024	0.0000	0.0012	0.0130	-0.0058	-0.0072	-0.0065
L2	0:04:00	0.0010	0.0010	0.0010	0.0128	0.0120	0.0040	0.0080	0.0024	0.0000	0.0012	0.0130	-0.0059	-0.0072	-0.0066
L2	0:04:30	0.0010	0.0010	0.0010	0.0135	0.0124	0.0041	0.0083	0.0025	0.0000	0.0013	0.0137	-0.0061	-0.0072	-0.0067
L2	0:05:00	0.0011	0.0011	0.0011	0.0137	0.0125	0.0041	0.0083	0.0025	0.0000	0.0013	0.0139	-0.0061	-0.0073	-0.0067
L2	0:05:30	0.0011	0.0011	0.0011	0.0137	0.0129	0.0044	0.0086	0.0025	0.0000	0.0013	0.0139	-0.0061	-0.0075	-0.0068
L3	0:00:00	0.0016	0.0016	0.0016	0.0167	0.0155	0.0051	0.0103	0.0040	0.0000	0.0020	0.0171	-0.0099	-0.0094	-0.0096
L3	0:00:30	0.0018	0.0018	0.0018	0.0175	0.0164	0.0054	0.0109	0.0044	0.0000	0.0022	0.0179	-0.0118	-0.0108	-0.0113
L3	0:01:00	0.0019	0.0019	0.0019	0.0182	0.0171	0.0055	0.0113	0.0045	0.0000	0.0023	0.0186	-0.0128	-0.0115	-0.0122
L3	0:01:30	0.0020	0.0020	0.0020	0.0186	0.0175	0.0057	0.0116	0.0045	0.0000	0.0023	0.0189	-0.0136	-0.0120	-0.0128
L3	0:02:00	0.0020	0.0020	0.0020	0.0190	0.0179	0.0059	0.0119	0.0046	0.0000	0.0023	0.0193	-0.0140	-0.0123	-0.0131
L3	0:02:30	0.0021	0.0021	0.0021	0.0198	0.0182	0.0060	0.0121	0.0047	0.0000	0.0024	0.0200	-0.0141	-0.0125	-0.0133
L3	0:03:00	0.0021	0.0021	0.0021	0.0198	0.0184	0.0061	0.0122	0.0047	0.0000	0.0024	0.0200	-0.0141	-0.0125	-0.0133
L3	0:03:30	0.0021	0.0021	0.0021	0.0199	0.0187	0.0062	0.0125	0.0047	0.0000	0.0024	0.0201	-0.0142	-0.0124	-0.0133
L3	0:04:00	0.0021	0.0021	0.0021	0.0204	0.0194	0.0065	0.0130	0.0047	0.0000	0.0024	0.0207	-0.0145	-0.0125	-0.0135
L4	0:00:00	0.0025	0.0025	0.0025	0.0218	0.0213	0.0085	0.0149	0.0060	0.0000	0.0030	0.0223	-0.0172	-0.0131	-0.0151
L4	0:00:30	0.0031	0.0031	0.0031	0.0253	0.0233	0.0109	0.0171	0.0072	0.0000	0.0036	0.0258	-0.0199	-0.0147	-0.0173
L4	0:01:00	0.0033	0.0033	0.0033	0.0265	0.0243	0.0124	0.0183	0.0074	0.0000	0.0037	0.0269	-0.0217	-0.0156	-0.0187
L4	0:01:30	0.0033	0.0033	0.0033	0.0268	0.0248	0.0130	0.0189	0.0074	0.0000	0.0037	0.0272	-0.0226	-0.0163	-0.0195
L4	0:02:00	0.0035	0.0035	0.0035	0.0280	0.0256	0.0138	0.0197	0.0081	0.0000	0.0041	0.0285	-0.0237	-0.0170	-0.0203
L4	0:02:30	0.0035	0.0035	0.0035	0.0282	0.0259	0.0144	0.0201	0.0081	0.0000	0.0041	0.0287	-0.0241	-0.0172	-0.0206
L4	0:03:00	0.0035	0.0035	0.0035	0.0284	0.0262	0.0146	0.0204	0.0082	0.0000	0.0041	0.0290	-0.0244	-0.0172	-0.0208
L4	0:03:30	0.0036	0.0036	0.0036	0.0295	0.0268	0.0155	0.0211	0.0082	0.0000	0.0041	0.0300	-0.0248	-0.0173	-0.0210
L4	0:04:00	0.0036	0.0036	0.0036	0.0297	0.0271	0.0164	0.0218	0.0083	0.0000	0.0042	0.0303	-0.0254	-0.0174	-0.0214
L4	0:04:30	0.0036	0.0036	0.0036	0.0299	0.0276	0.0164	0.0220	0.0083	0.0000	0.0042	0.0305	-0.0254	-0.0174	-0.0214

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time h:mm:ss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L5	0:00:00	0.0047	0.0047	0.0047	0.0332	0.0330	0.0231	0.0281	0.0101	0.0000	0.0051	0.0336	-0.0315	-0.0202	-0.0258
L5	0:00:30	0.0064	0.0064	0.0064	0.0448	0.0407	0.0314	0.0361	0.0132	0.0060	0.0096	0.0480	-0.0424	-0.0272	-0.0348
L5	0:01:00	0.0067	0.0067	0.0067	0.0477	0.0435	0.0326	0.0381	0.0137	0.0060	0.0099	0.0508	-0.0460	-0.0305	-0.0383
L5	0:01:30	0.0067	0.0067	0.0067	0.0486	0.0445	0.0332	0.0389	0.0138	0.0060	0.0099	0.0518	-0.0479	-0.0320	-0.0400
L5	0:02:00	0.0068	0.0068	0.0068	0.0493	0.0448	0.0347	0.0398	0.0138	0.0060	0.0099	0.0524	-0.0498	-0.0325	-0.0412
L5	0:02:30	0.0069	0.0069	0.0069	0.0506	0.0458	0.0362	0.0410	0.0146	0.0060	0.0103	0.0540	-0.0515	-0.0332	-0.0424
L5	0:03:00	0.0069	0.0069	0.0069	0.0511	0.0463	0.0364	0.0414	0.0146	0.0060	0.0103	0.0545	-0.0520	-0.0335	-0.0427
L5	0:03:30	0.0069	0.0069	0.0069	0.0514	0.0465	0.0367	0.0416	0.0146	0.0060	0.0103	0.0548	-0.0526	-0.0336	-0.0431
L5	0:04:00	0.0069	0.0069	0.0069	0.0515	0.0470	0.0369	0.0419	0.0146	0.0060	0.0103	0.0549	-0.0535	-0.0340	-0.0437
L5	0:04:30	0.0069	0.0069	0.0069	0.0520	0.0476	0.0373	0.0424	0.0146	0.0060	0.0103	0.0554	-0.0544	-0.0345	-0.0444
L6	0:00:00	0.0090	0.0090	0.0090	0.0610	0.0590	0.0537	0.0563	0.0178	0.0060	0.0119	0.0639	-0.0648	-0.0406	-0.0527
L6	0:00:30	0.0104	0.0104	0.0104	0.0759	0.0686	0.0635	0.0660	0.0206	0.0060	0.0133	0.0788	-0.0769	-0.0494	-0.0631
L6	0:01:00	0.0104	0.0104	0.0104	0.0791	0.0716	0.0656	0.0686	0.0206	0.0060	0.0133	0.0820	-0.0820	-0.0535	-0.0678
L6	0:01:30	0.0106	0.0106	0.0106	0.0811	0.0731	0.0669	0.0700	0.0207	0.0060	0.0134	0.0839	-0.0857	-0.0564	-0.0710
L6	0:02:00	0.0108	0.0108	0.0108	0.0832	0.0750	0.0695	0.0722	0.0215	0.0060	0.0138	0.0862	-0.0907	-0.0626	-0.0766
L6	0:02:30	0.0109	0.0109	0.0109	0.0850	0.0766	0.0707	0.0737	0.0215	0.0060	0.0138	0.0879	-0.0939	-0.0663	-0.0801
L6	0:03:00	0.0109	0.0109	0.0109	0.0859	0.0775	0.0711	0.0743	0.0215	0.0060	0.0138	0.0888	-0.0956	-0.0684	-0.0820
L6	0:03:30	0.0109	0.0109	0.0109	0.0864	0.0779	0.0715	0.0747	0.0215	0.0060	0.0138	0.0892	-0.0971	-0.0697	-0.0834
L6	0:04:00	0.0109	0.0109	0.0109	0.0875	0.0778	0.0746	0.0762	0.0215	0.0060	0.0138	0.0903	-0.0987	-0.0698	-0.0843
L6	0:04:30	0.0109	0.0109	0.0109	0.0874	0.0784	0.0745	0.0764	0.0215	0.0060	0.0138	0.0903	-0.0993	-0.0707	-0.0850
L6	0:05:00	0.0109	0.0109	0.0109	0.0880	0.0788	0.0749	0.0769	0.0215	0.0060	0.0138	0.0908	-0.1002	-0.0718	-0.0860
L7	0:00:00	0.0109	0.0126	0.0118	0.0950	0.0953	0.0897	0.0925	0.0242	0.0104	0.0173	0.1005	-0.1084	-0.0795	-0.0940
L7	0:00:30	0.0118	0.0145	0.0132	0.1226	0.1184	0.1136	0.1160	0.0280	0.0104	0.0192	0.1286	-0.1351	-0.0961	-0.1156
L7	0:01:00	0.0122	0.0148	0.0135	0.1325	0.1260	0.1201	0.1231	0.0281	0.0104	0.0193	0.1383	-0.1567	-0.1094	-0.1330
L7	0:01:30	0.0122	0.0149	0.0136	0.1373	0.1300	0.1249	0.1275	0.0288	0.0104	0.0196	0.1434	-0.1702	-0.1202	-0.1452
L7	0:02:00	0.0122	0.0149	0.0136	0.1404	0.1333	0.1289	0.1311	0.0288	0.0104	0.0196	0.1464	-0.1807	-0.1291	-0.1549
L7	0:02:30	0.0123	0.0149	0.0136	0.1436	0.1369	0.1293	0.1331	0.0288	0.0104	0.0196	0.1496	-0.1904	-0.1397	-0.1651
L7	0:03:00	0.0123	0.0151	0.0137	0.1459	0.1387	0.1327	0.1357	0.0288	0.0104	0.0196	0.1518	-0.2008	-0.1482	-0.1745
L7	0:03:30	0.0123	0.0151	0.0137	0.1483	0.1387	0.1356	0.1371	0.0288	0.0104	0.0196	0.1542	-0.2121	-0.1541	-0.1831
L7	0:04:00	0.0123	0.0151	0.0137	0.1512	0.1387	0.1369	0.1378	0.0288	0.0104	0.0196	0.1571	-0.2130	-0.1582	-0.1856
L7	0:04:30	0.0123	0.0151	0.0137	0.1535	0.1449	0.1369	0.1409	0.0289	0.0107	0.0198	0.1596	-0.2160	-0.1633	-0.1897
L7	0:05:00	0.0124	0.0152	0.0138	0.1570	0.1451	0.1369	0.1410	0.0297	0.0107	0.0202	0.1634	-0.2201	-0.1629	-0.1915
L7	0:05:30	0.0124	0.0152	0.0138	0.1573	0.1450	0.1398	0.1424	0.0297	0.0107	0.0202	0.1637	-0.2236	-0.1636	-0.1936
L7	0:06:00	0.0124	0.0152	0.0138	0.1585	0.1451	0.1425	0.1438	0.0297	0.0107	0.0202	0.1649	-0.2271	-0.1650	-0.1960
L7	0:06:30	0.0124	0.0152	0.0138	0.1588	0.1469	0.1454	0.1462	0.0297	0.0107	0.0202	0.1652	-0.2310	-0.1676	-0.1993
L8	0:00:00	0.0132	0.0164	0.0148	0.1743	0.1638	0.1619	0.1629	0.0317	0.0107	0.0212	0.1807	-0.2540	-0.1826	-0.2183
L8	0:00:30	0.0133	0.0165	0.0149	0.1852	0.1730	0.1710	0.1720	0.0318	0.0107	0.0213	0.1916	-0.2898	-0.1997	-0.2447
L8	0:01:00	0.0134	0.0165	0.0150	0.1922	0.1789	0.1782	0.1786	0.0327	0.0107	0.0217	0.1990	-0.3265	-0.2197	-0.2731
L8	0:01:30	0.0134	0.0165	0.0150	0.1981	0.1834	0.1834	0.1834	0.0327	0.0107	0.0217	0.2048	-0.3588	-0.2383	-0.2985
L8	0:02:00	0.0134	0.0165	0.0150	0.2013	0.1866	0.1880	0.1873	0.0327	0.0107	0.0217	0.2080	-0.3868	-0.2553	-0.3210
L8	0:02:30	0.0134	0.0165	0.0150	0.2054	0.1908	0.1910	0.1909	0.0327	0.0107	0.0217	0.2121	-0.4122	-0.2725	-0.3424
L8	0:03:00	0.0135	0.0165	0.0150	0.2088	0.1934	0.1935	0.1935	0.0327	0.0107	0.0217	0.2155	-0.4349	-0.2885	-0.3617
L8	0:03:30	0.0135	0.0165	0.0150	0.2108	0.1950	0.1964	0.1957	0.0327	0.0107	0.0217	0.2175	-0.4560	-0.3033	-0.3797

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hh:mm:ss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L8	0:04:00	0.0136	0.0165	0.0151	0.2138	0.1972	0.1984	0.1978	0.0328	0.0107	0.0218	0.2205	-0.4737	-0.3178	-0.3958
L9	0:00:00	0.0141	0.0169	0.0155	0.2196	0.2058	0.2051	0.2055	0.0338	0.0107	0.0223	0.2263	-0.5069	-0.3394	-0.4232
L9	0:00:30	0.0142	0.0171	0.0157	0.2284	0.2142	0.2137	0.2140	0.0339	0.0107	0.0223	0.2351	-0.5545	-0.3658	-0.4601
L9	0:01:00	0.0142	0.0172	0.0157	0.2364	0.2224	0.2195	0.2210	0.0347	0.0107	0.0227	0.2434	-0.5983	-0.3927	-0.4955
L9	0:01:30	0.0142	0.0172	0.0157	0.2410	0.2257	0.2271	0.2264	0.0347	0.0107	0.0227	0.2480	-0.6360	-0.4149	-0.5254
L9	0:02:00	0.0142	0.0172	0.0157	0.2449	0.2290	0.2330	0.2310	0.0347	0.0107	0.0227	0.2519	-0.6683	-0.4354	-0.5518
L9	0:02:30	0.0142	0.0172	0.0157	0.2490	0.2333	0.2365	0.2349	0.0347	0.0107	0.0227	0.2560	-0.6954	-0.4556	-0.5755
L9	0:03:00	0.0142	0.0172	0.0157	0.2534	0.2367	0.2406	0.2387	0.0347	0.0107	0.0227	0.2604	-0.7219	-0.4745	-0.5982
L9	0:03:30	0.0142	0.0172	0.0157	0.2564	0.2400	0.2432	0.2416	0.0347	0.0107	0.0227	0.2634	-0.7452	-0.4938	-0.6195
L9	0:04:00	0.0142	0.0172	0.0157	0.2586	0.2422	0.2450	0.2436	0.0347	0.0107	0.0227	0.2656	-0.7644	-0.5093	-0.6368
L9	0:04:30	0.0142	0.0172	0.0157	0.2610	0.2445	0.2471	0.2458	0.0347	0.0107	0.0227	0.2680	-0.7814	-0.5236	-0.6525
L9	0:05:00	0.0142	0.0172	0.0157	0.2632	0.2475	0.2504	0.2490	0.0347	0.0107	0.0227	0.2702	-0.7989	-0.5380	-0.6685
L10	0:00:00	0.0145	0.0176	0.0161	0.2733	0.2591	0.2620	0.2606	0.0356	0.0107	0.0232	0.2804	-0.8334	-0.5621	-0.6978
L10	0:00:30	0.0146	0.0176	0.0161	0.2833	0.2681	0.2709	0.2695	0.0356	0.0107	0.0232	0.2903	-0.8707	-0.5888	-0.7298
L10	0:01:00	0.0146	0.0176	0.0161	0.2897	0.2730	0.2784	0.2757	0.0356	0.0107	0.0232	0.2968	-0.9044	-0.6145	-0.7595
L10	0:01:30	0.0146	0.0176	0.0161	0.2963	0.2785	0.2855	0.2820	0.0356	0.0107	0.0232	0.3033	-0.9377	-0.6406	-0.7891
L10	0:02:00	0.0146	0.0176	0.0161	0.3027	0.2883	0.2909	0.2896	0.0356	0.0107	0.0232	0.3097	-0.9704	-0.6668	-0.8186
L10	0:02:30	0.0146	0.0176	0.0161	0.3087	0.2950	0.2963	0.2957	0.0356	0.0107	0.0232	0.3157	-1.0005	-0.6920	-0.8463
L10	0:03:00	0.0146	0.0176	0.0161	0.3135	0.2983	0.3004	0.2994	0.0357	0.0107	0.0232	0.3206	-1.0231	-0.7116	-0.8673
L10	0:03:30	0.0146	0.0176	0.0161	0.3172	0.3019	0.3045	0.3032	0.0357	0.0107	0.0232	0.3243	-1.0430	-0.7295	-0.8862
L10	0:04:00	0.0146	0.0176	0.0161	0.3217	0.3053	0.3077	0.3065	0.0357	0.0107	0.0232	0.3288	-1.0606	-0.7457	-0.9031
L11	0:00:00	0.0146	0.0177	0.0162	0.3270	0.3143	0.3169	0.3156	0.0368	0.0107	0.0238	0.3346	-1.0834	-0.7648	-0.9241
L11	0:00:30	0.0147	0.0178	0.0163	0.3406	0.3280	0.3300	0.3290	0.0368	0.0107	0.0238	0.3481	-1.1153	-0.7904	-0.9528
L11	0:01:00	0.0147	0.0178	0.0163	0.3526	0.3385	0.3409	0.3397	0.0369	0.0107	0.0238	0.3601	-1.1486	-0.8146	-0.9816
L11	0:01:30	0.0147	0.0178	0.0163	0.3621	0.3469	0.3489	0.3479	0.0369	0.0107	0.0238	0.3696	-1.1782	-0.8375	-1.0078
L11	0:02:00	0.0147	0.0178	0.0163	0.3685	0.3537	0.3556	0.3547	0.0369	0.0107	0.0238	0.3760	-1.2044	-0.8587	-1.0315
L11	0:02:30	0.0147	0.0178	0.0163	0.3750	0.3596	0.3623	0.3610	0.0370	0.0107	0.0239	0.3826	-1.2302	-0.8788	-1.0545
L11	0:03:00	0.0147	0.0178	0.0163	0.3805	0.3652	0.3662	0.3657	0.0370	0.0107	0.0239	0.3881	-1.2510	-0.8968	-1.0739
L11	0:03:30	0.0147	0.0178	0.0163	0.3854	0.3704	0.3723	0.3714	0.0370	0.0107	0.0239	0.3930	-1.2712	-0.9136	-1.0924
L11	0:04:00	0.0147	0.0178	0.0163	0.3907	0.3757	0.3795	0.3776	0.0370	0.0107	0.0239	0.3983	-1.2906	-0.9297	-1.1102
L11	0:04:30	0.0148	0.0178	0.0163	0.3962	0.3812	0.3831	0.3822	0.0370	0.0107	0.0239	0.4038	-1.3069	-0.9443	-1.1256
L12	0:00:00	0.0148	0.0178	0.0163	0.4047	0.3931	0.3962	0.3947	0.0379	0.0107	0.0243	0.4127	-1.3317	-0.9627	-1.1472
L12	0:00:30	0.0148	0.0179	0.0164	0.4215	0.4094	0.4116	0.4105	0.0379	0.0107	0.0243	0.4294	-1.3601	-0.9839	-1.1720
L12	0:01:00	0.0149	0.0179	0.0164	0.4356	0.4231	0.4253	0.4242	0.0379	0.0107	0.0243	0.4435	-1.3891	-1.0058	-1.1975
L12	0:01:30	0.0149	0.0179	0.0164	0.4475	0.4334	0.4356	0.4345	0.0380	0.0107	0.0244	0.4554	-1.4163	-1.0257	-1.2210
L12	0:02:00	0.0149	0.0179	0.0164	0.4565	0.4423	0.4447	0.4435	0.0380	0.0107	0.0244	0.4644	-1.4427	-1.0451	-1.2439
L12	0:02:30	0.0149	0.0179	0.0164	0.4628	0.4497	0.4513	0.4505	0.0380	0.0107	0.0244	0.4708	-1.4650	-1.0627	-1.2639
L12	0:03:00	0.0149	0.0179	0.0164	0.4701	0.4566	0.4578	0.4572	0.0380	0.0107	0.0244	0.4781	-1.4867	-1.0798	-1.2833
L12	0:03:30	0.0149	0.0179	0.0164	0.4762	0.4613	0.4652	0.4632	0.0380	0.0107	0.0244	0.4841	-1.5066	-1.0941	-1.3004
L12	0:04:00	0.0149	0.0179	0.0164	0.4813	0.4655	0.4729	0.4692	0.0380	0.0107	0.0244	0.4892	-1.5266	-1.1092	-1.3179
L12	0:04:30	0.0149	0.0179	0.0164	0.4879	0.4733	0.4778	0.4756	0.0380	0.0107	0.0244	0.4959	-1.5445	-1.1241	-1.3343
L13	0:00:00	0.0150	0.0179	0.0165	0.5058	0.4943	0.4978	0.4960	0.0388	0.0107	0.0248	0.5141	-1.5740	-1.1474	-1.3607
L13	0:00:30	0.0150	0.0179	0.0165	0.5243	0.5122	0.5171	0.5146	0.0388	0.0107	0.0248	0.5326	-1.6051	-1.1695	-1.3873

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L13	0:01:00	0.0150	0.0179	0.0165	0.5402	0.5272	0.5321	0.5297	0.0388	0.0107	0.0248	0.5485	-1.6360	-1.1929	-1.4145
L13	0:01:30	0.0150	0.0179	0.0165	0.5538	0.5402	0.5425	0.5413	0.0388	0.0107	0.0248	0.5621	-1.6648	-1.2147	-1.4398
L13	0:02:00	0.0150	0.0179	0.0165	0.5635	0.5497	0.5524	0.5511	0.0388	0.0107	0.0248	0.5718	-1.6956	-1.2347	-1.4652
L13	0:02:30	0.0150	0.0179	0.0165	0.5727	0.5583	0.5616	0.5599	0.0388	0.0107	0.0248	0.5810	-1.7228	-1.2540	-1.4884
L13	0:03:00	0.0150	0.0179	0.0165	0.5810	0.5669	0.5697	0.5683	0.0388	0.0107	0.0248	0.5893	-1.7478	-1.2738	-1.5108
L13	0:03:30	0.0150	0.0179	0.0165	0.5878	0.5725	0.5763	0.5744	0.0388	0.0107	0.0248	0.5961	-1.7687	-1.2911	-1.5299
L13	0:04:00	0.0150	0.0179	0.0165	0.5940	0.5770	0.5843	0.5806	0.0388	0.0107	0.0248	0.6023	-1.7880	-1.3062	-1.5471
L13	0:04:30	0.0151	0.0179	0.0165	0.6001	0.5845	0.5886	0.5865	0.0388	0.0107	0.0248	0.6084	-1.8053	-1.3233	-1.5643
L14	0:00:00	0.0151	0.0179	0.0165	0.6148	0.6033	0.6074	0.6054	0.0388	0.0107	0.0248	0.6230	-1.8288	-1.3467	-1.5878
L14	0:00:30	0.0153	0.0179	0.0166	0.6380	0.6266	0.6302	0.6284	0.0388	0.0107	0.0248	0.6461	-1.8544	-1.3718	-1.6131
L14	0:01:00	0.0153	0.0179	0.0166	0.6585	0.6513	0.6500	0.6507	0.0388	0.0107	0.0248	0.6666	-1.8812	-1.3962	-1.6387
L14	0:01:30	0.0153	0.0179	0.0166	0.6758	0.6649	0.6663	0.6656	0.0388	0.0107	0.0248	0.6839	-1.9052	-1.4202	-1.6627
L14	0:02:00	0.0153	0.0179	0.0166	0.6898	0.6774	0.6782	0.6778	0.0388	0.0107	0.0248	0.6980	-1.9351	-1.4415	-1.6883
L14	0:02:30	0.0153	0.0179	0.0166	0.7002	0.6872	0.6885	0.6878	0.0388	0.0107	0.0248	0.7084	-1.9610	-1.4616	-1.7113
L14	0:03:00	0.0153	0.0179	0.0166	0.7091	0.6961	0.6977	0.6969	0.0388	0.0107	0.0248	0.7172	-1.9845	-1.4800	-1.7348
L14	0:03:30	0.0153	0.0179	0.0166	0.7172	0.7041	0.7059	0.7050	0.0388	0.0107	0.0248	0.7253	-2.0050	-1.4970	-1.7510
L14	0:04:00	0.0153	0.0179	0.0166	0.7245	0.7113	0.7124	0.7119	0.0388	0.0107	0.0248	0.7327	-2.0248	-1.5136	-1.7692
L14	0:04:30	0.0153	0.0179	0.0166	0.7313	0.7181	0.7176	0.7179	0.0388	0.0107	0.0248	0.7395	-2.0425	-1.5288	-1.7857
L14	0:05:00	0.0153	0.0179	0.0166	0.7376	0.7239	0.7247	0.7243	0.0388	0.0107	0.0248	0.7457	-2.0598	-1.5428	-1.8013
L15	0:00:00	0.0153	0.0179	0.0166	0.7530	0.7451	0.7464	0.7457	0.0398	0.0107	0.0253	0.7617	-2.0842	-1.5630	-1.8236
L15	0:00:30	0.0153	0.0179	0.0166	0.7786	0.7707	0.7725	0.7716	0.0398	0.0107	0.0253	0.7872	-2.1104	-1.5830	-1.8467
L15	0:01:00	0.0153	0.0179	0.0166	0.8040	0.7956	0.7972	0.7964	0.0398	0.0107	0.0253	0.8126	-2.1397	-1.6033	-1.8715
L15	0:01:30	0.0153	0.0179	0.0166	0.8277	0.8213	0.8209	0.8211	0.0398	0.0107	0.0253	0.8363	-2.1686	-1.6238	-1.8962
L15	0:02:00	0.0153	0.0179	0.0166	0.8500	0.8421	0.8426	0.8424	0.0398	0.0107	0.0253	0.8586	-2.1973	-1.6466	-1.9220
L15	0:02:30	0.0153	0.0179	0.0166	0.8697	0.8604	0.8589	0.8597	0.0398	0.0107	0.0253	0.8783	-2.2248	-1.6725	-1.9487
L15	0:03:00	0.0153	0.0179	0.0166	0.8819	0.8713	0.8702	0.8707	0.0398	0.0107	0.0253	0.8905	-2.2487	-1.6873	-1.9680
L15	0:03:30	0.0153	0.0179	0.0166	0.8940	0.8870	0.8812	0.8841	0.0398	0.0107	0.0253	0.9026	-2.2721	-1.7017	-1.9869
L15	0:04:00	0.0153	0.0179	0.0166	0.9042	0.8943	0.8939	0.8941	0.0398	0.0107	0.0253	0.9129	-2.2951	-1.7139	-2.0045
L16	0:00:00	0.0153	0.0179	0.0166	0.9187	0.9148	0.9178	0.9163	0.0407	0.0107	0.0257	0.9278	-2.3235	-1.7287	-2.0261
L16	0:00:30	0.0153	0.0179	0.0166	0.9547	0.9509	0.9523	0.9516	0.0407	0.0107	0.0257	0.9638	-2.3588	-1.7453	-2.0521
L16	0:01:00	0.0153	0.0179	0.0166	0.9884	0.9837	0.9846	0.9842	0.0408	0.0107	0.0258	0.9976	-2.3942	-1.7634	-2.0788
L16	0:01:30	0.0153	0.0179	0.0166	1.0162	1.0102	1.0109	1.0106	0.0408	0.0107	0.0258	1.0254	-2.4278	-1.7798	-2.1038
L16	0:02:00	0.0153	0.0179	0.0166	1.0344	1.0252	1.0265	1.0258	0.0408	0.0107	0.0258	1.0435	-2.4560	-1.7934	-2.1247
L16	0:02:30	0.0153	0.0179	0.0166	1.0490	1.0404	1.0402	1.0403	0.0408	0.0107	0.0258	1.0581	-2.4821	-1.8195	-2.1508
L16	0:03:00	0.0153	0.0179	0.0166	1.0590	1.0498	1.0505	1.0502	0.0408	0.0107	0.0258	1.0681	-2.5060	-1.8216	-2.1638
L16	0:03:30	0.0153	0.0179	0.0166	1.0683	1.0580	1.0605	1.0592	0.0408	0.0107	0.0258	1.0774	-2.5331	-1.8487	-2.1909
L16	0:04:00	0.0153	0.0179	0.0166	1.0775	1.0671	1.0682	1.0677	0.0408	0.0107	0.0258	1.0866	-2.5518	-1.8427	-2.1973
L16	0:04:30	0.0153	0.0179	0.0166	1.0857	1.0749	1.0757	1.0753	0.0408	0.0107	0.0258	1.0948	-2.5706	-1.8528	-2.2117
L17	0:00:00	0.0153	0.0179	0.0166	1.0961	1.0907	1.0928	1.0917	0.0408	0.0107	0.0258	1.1053	-2.5944	-1.8766	-2.2355
L17	0:00:30	0.0153	0.0179	0.0166	1.1231	1.1168	1.1180	1.1174	0.0414	0.0107	0.0261	1.1325	-2.6217	-1.8751	-2.2484
L17	0:01:00	0.0153	0.0179	0.0166	1.1472	1.1405	1.1420	1.1413	0.0414	0.0107	0.0261	1.1567	-2.6527	-1.9061	-2.2794
L17	0:01:30	0.0153	0.0179	0.0166	1.1693	1.1626	1.1655	1.1641	0.0414	0.0107	0.0261	1.1788	-2.6800	-1.9334	-2.3067
L17	0:02:00	0.0153	0.0179	0.0166	1.1891	1.1808	1.1842	1.1825	0.0414	0.0107	0.0261	1.1986	-2.7094	-1.9139	-2.3117

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L17	0:02:30	0.0153	0.0179	0.0166	1.2068	1.1997	1.2010	1.2003	0.0414	0.0107	0.0261	1.2162	-2.7386	-1.9431	-2.3409
L17	0:03:00	0.0153	0.0179	0.0166	1.2193	1.2103	1.2129	1.2116	0.0414	0.0107	0.0261	1.2288	-2.7661	-1.9393	-2.3527
L17	0:03:30	0.0153	0.0179	0.0166	1.2291	1.2192	1.2221	1.2207	0.0414	0.0107	0.0261	1.2386	-2.7895	-1.9502	-2.3699
L17	0:04:00	0.0153	0.0179	0.0166	1.2369	1.2263	1.2305	1.2284	0.0414	0.0107	0.0261	1.2463	-2.8102	-1.9615	-2.3859
L17	0:04:30	0.0152	0.0179	0.0166	1.2429	1.2323	1.2360	1.2341	0.0414	0.0107	0.0261	1.2524	-2.8298	-1.9725	-2.4012
L17	0:00:00	0.0151	0.0179	0.0165	1.2486	1.2370	1.2405	1.2387	0.0414	0.0107	0.0261	1.2581	-2.8470	-1.9823	-2.4147
U1	0:00:30	0.0148	0.0179	0.0164	1.2493	1.2371	1.2404	1.2388	0.0414	0.0107	0.0261	1.2590	-2.8490	-1.9837	-2.4164
U1	0:01:00	0.0148	0.0179	0.0164	1.2491	1.2371	1.2403	1.2387	0.0414	0.0107	0.0261	1.2588	-2.8490	-1.9840	-2.4165
U1	0:01:30	0.0148	0.0179	0.0164	1.2491	1.2371	1.2403	1.2387	0.0414	0.0107	0.0261	1.2588	-2.8486	-1.9838	-2.4162
U1	0:02:00	0.0147	0.0179	0.0163	1.2490	1.2371	1.2402	1.2386	0.0414	0.0107	0.0261	1.2588	-2.8490	-1.9843	-2.4167
U1	0:02:30	0.0147	0.0179	0.0163	1.2490	1.2373	1.2402	1.2388	0.0414	0.0107	0.0261	1.2588	-2.8487	-1.9840	-2.4164
U1	0:03:00	0.0147	0.0179	0.0163	1.2492	1.2376	1.2401	1.2389	0.0414	0.0107	0.0261	1.2589	-2.8496	-1.9846	-2.4171
U1	0:03:30	0.0147	0.0179	0.0163	1.2492	1.2376	1.2401	1.2388	0.0414	0.0107	0.0261	1.2590	-2.8496	-1.9851	-2.4174
U1	0:04:00	0.0147	0.0179	0.0163	1.2492	1.2375	1.2400	1.2388	0.0414	0.0107	0.0261	1.2590	-2.8498	-1.9848	-2.4173
U1	0:04:30	0.0147	0.0179	0.0163	1.2492	1.2376	1.2399	1.2388	0.0414	0.0107	0.0261	1.2590	-2.8505	-1.9848	-2.4177
U2	0:00:00	0.0145	0.0177	0.0161	1.2491	1.2371	1.2399	1.2385	0.0414	0.0107	0.0261	1.2591	-2.8501	-1.9848	-2.4175
U2	0:00:30	0.0144	0.0177	0.0161	1.2485	1.2371	1.2397	1.2384	0.0414	0.0107	0.0261	1.2585	-2.8504	-1.9845	-2.4175
U2	0:01:00	0.0143	0.0177	0.0160	1.2484	1.2371	1.2397	1.2384	0.0414	0.0107	0.0261	1.2584	-2.8504	-1.9844	-2.4174
U2	0:01:30	0.0143	0.0177	0.0160	1.2484	1.2371	1.2397	1.2384	0.0414	0.0107	0.0261	1.2584	-2.8500	-1.9843	-2.4172
U2	0:02:00	0.0143	0.0177	0.0160	1.2485	1.2371	1.2397	1.2384	0.0414	0.0107	0.0261	1.2585	-2.8503	-1.9844	-2.4174
U2	0:02:30	0.0142	0.0177	0.0160	1.2485	1.2371	1.2397	1.2384	0.0414	0.0107	0.0261	1.2586	-2.8502	-1.9847	-2.4175
U2	0:03:00	0.0142	0.0177	0.0160	1.2485	1.2361	1.2390	1.2375	0.0414	0.0107	0.0261	1.2586	-2.8498	-1.9841	-2.4170
U3	0:00:00	0.0139	0.0171	0.0155	1.2459	1.2354	1.2385	1.2369	0.0411	0.0107	0.0259	1.2563	-2.8501	-1.9841	-2.4171
U3	0:00:30	0.0139	0.0171	0.0155	1.2457	1.2353	1.2383	1.2368	0.0411	0.0107	0.0259	1.2561	-2.8496	-1.9843	-2.4170
U3	0:01:00	0.0139	0.0171	0.0155	1.2456	1.2353	1.2382	1.2368	0.0411	0.0107	0.0259	1.2560	-2.8498	-1.9843	-2.4171
U3	0:01:30	0.0139	0.0171	0.0155	1.2456	1.2352	1.2383	1.2368	0.0411	0.0107	0.0259	1.2560	-2.8496	-1.9838	-2.4167
U3	0:02:00	0.0139	0.0171	0.0155	1.2456	1.2352	1.2382	1.2367	0.0411	0.0107	0.0259	1.2560	-2.8495	-1.9838	-2.4167
U3	0:02:30	0.0138	0.0171	0.0155	1.2455	1.2352	1.2382	1.2367	0.0411	0.0107	0.0259	1.2559	-2.8495	-1.9839	-2.4167
U3	0:03:00	0.0134	0.0164	0.0149	1.2445	1.2331	1.2367	1.2349	0.0408	0.0107	0.0258	1.2554	-2.8494	-1.9821	-2.4158
U4	0:00:00	0.0133	0.0164	0.0149	1.2411	1.2324	1.2362	1.2343	0.0404	0.0107	0.0256	1.2518	-2.8493	-1.9815	-2.4154
U4	0:00:30	0.0133	0.0164	0.0149	1.2408	1.2321	1.2358	1.2339	0.0404	0.0107	0.0256	1.2515	-2.8498	-1.9811	-2.4155
U4	0:01:00	0.0132	0.0163	0.0148	1.2403	1.2319	1.2360	1.2339	0.0403	0.0107	0.0255	1.2510	-2.8495	-1.9811	-2.4153
U4	0:01:30	0.0132	0.0163	0.0148	1.2402	1.2319	1.2359	1.2339	0.0403	0.0107	0.0255	1.2510	-2.8495	-1.9811	-2.4153
U4	0:02:00	0.0132	0.0163	0.0148	1.2402	1.2318	1.2359	1.2338	0.0403	0.0107	0.0255	1.2510	-2.8492	-1.9809	-2.4151
U4	0:02:30	0.0132	0.0163	0.0148	1.2402	1.2317	1.2359	1.2338	0.0403	0.0107	0.0255	1.2510	-2.8492	-1.9811	-2.4152
U5	0:00:00	0.0125	0.0151	0.0138	1.2332	1.2264	1.2320	1.2292	0.0393	0.0107	0.0250	1.2444	-2.8493	-1.9772	-2.4133
U5	0:00:30	0.0124	0.0151	0.0138	1.2323	1.2257	1.2317	1.2287	0.0392	0.0107	0.0250	1.2435	-2.8492	-1.9770	-2.4131
U5	0:01:00	0.0124	0.0151	0.0138	1.2319	1.2249	1.2316	1.2283	0.0392	0.0107	0.0250	1.2431	-2.8489	-1.9767	-2.4128
U5	0:01:30	0.0124	0.0151	0.0138	1.2313	1.2247	1.2309	1.2278	0.0392	0.0107	0.0250	1.2425	-2.8488	-1.9763	-2.4126
U5	0:02:00	0.0123	0.0150	0.0137	1.2304	1.2243	1.2314	1.2279	0.0391	0.0107	0.0249	1.2417	-2.8488	-1.9757	-2.4123
U5	0:02:30	0.0123	0.0150	0.0137	1.2304	1.2244	1.2315	1.2279	0.0391	0.0107	0.0249	1.2416	-2.8488	-1.9760	-2.4124
U5	0:03:00	0.0123	0.0150	0.0137	1.2304	1.2221	1.2294	1.2257	0.0391	0.0107	0.0249	1.2416	-2.8476	-1.9744	-2.4110
U6	0:00:00	0.0110	0.0128	0.0119	1.2141	1.2085	1.2126	1.2105	0.0380	0.0107	0.0244	1.2265	-2.8365	-1.9690	-2.4028

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hh:mm:ss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
U6	0:00:30	0.0109	0.0126	0.0118	1.2121	1.2065	1.2107	1.2086	0.0378	0.0107	0.0243	1.2246	-2.8349	-1.9674	-2.4012
U6	0:01:00	0.0109	0.0126	0.0118	1.2111	1.2057	1.2102	1.2079	0.0378	0.0107	0.0243	1.2236	-2.8341	-1.9659	-2.4000
U6	0:01:30	0.0109	0.0126	0.0118	1.2107	1.2052	1.2097	1.2075	0.0377	0.0107	0.0242	1.2232	-2.8341	-1.9653	-2.3997
U6	0:02:00	0.0109	0.0126	0.0118	1.2103	1.2047	1.2097	1.2072	0.0377	0.0107	0.0242	1.2228	-2.8341	-1.9643	-2.3992
U6	0:02:30	0.0094	0.0090	0.0092	1.1876	1.1657	1.1811	1.1734	0.0343	0.0107	0.0225	1.2009	-2.7465	-1.8725	-2.3095
U7	0:00:00	0.0086	0.0080	0.0083	1.1599	1.1509	1.1663	1.1586	0.0324	0.0107	0.0216	1.1732	-2.7041	-1.8346	-2.2694
U7	0:00:30	0.0085	0.0079	0.0082	1.1552	1.1462	1.1616	1.1539	0.0324	0.0107	0.0216	1.1685	-2.6912	-1.8228	-2.2570
U7	0:01:00	0.0084	0.0077	0.0081	1.1525	1.1440	1.1604	1.1522	0.0323	0.0107	0.0215	1.1659	-2.6849	-1.8164	-2.2507
U7	0:01:30	0.0084	0.0077	0.0081	1.1517	1.1427	1.1592	1.1510	0.0323	0.0107	0.0215	1.1651	-2.6809	-1.8133	-2.2471
U7	0:02:00	0.0084	0.0077	0.0081	1.1506	1.1416	1.1590	1.1503	0.0323	0.0107	0.0215	1.1640	-2.6783	-1.8105	-2.2444
U7	0:02:30	0.0083	0.0077	0.0080	1.1495	1.1403	1.1584	1.1493	0.0323	0.0107	0.0215	1.1630	-2.6761	-1.8088	-2.2425
U7	0:03:00	0.0083	0.0076	0.0080	1.1485	1.1398	1.1582	1.1490	0.0322	0.0107	0.0215	1.1620	-2.6747	-1.8078	-2.2413
U7	0:03:30	0.0083	0.0076	0.0080	1.1485	1.1397	1.1582	1.1489	0.0322	0.0107	0.0215	1.1620	-2.6735	-1.8070	-2.2403
U7	0:04:00	0.0083	0.0076	0.0080	1.1483	1.1393	1.1575	1.1484	0.0322	0.0107	0.0215	1.1618	-2.6724	-1.8065	-2.2395
U7	0:04:30	0.0083	0.0076	0.0080	1.1481	1.1388	1.1572	1.1480	0.0321	0.0107	0.0214	1.1615	-2.6728	-1.8048	-2.2388
U7	0:05:00	0.0083	0.0076	0.0080	1.1479	1.1386	1.1570	1.1478	0.0321	0.0107	0.0214	1.1613	-2.6720	-1.8046	-2.2383
U7	0:05:30	0.0083	0.0076	0.0080	1.1475	1.1382	1.1569	1.1476	0.0321	0.0107	0.0214	1.1609	-2.6698	-1.8038	-2.2368
U7	0:06:00	0.0083	0.0076	0.0080	1.1474	1.1381	1.1568	1.1475	0.0321	0.0107	0.0214	1.1608	-2.6687	-1.8024	-2.2356
U7	0:06:30	0.0083	0.0076	0.0080	1.1474	1.1382	1.1572	1.1477	0.0321	0.0107	0.0214	1.1608	-2.6681	-1.8027	-2.2354
U7	0:07:00	0.0083	0.0076	0.0080	1.1474	1.1380	1.1572	1.1476	0.0321	0.0107	0.0214	1.1608	-2.6676	-1.8012	-2.2344
U7	0:07:30	0.0083	0.0076	0.0080	1.1474	1.1380	1.1572	1.1476	0.0321	0.0107	0.0214	1.1608	-2.6691	-1.8010	-2.2351
U7	0:08:00	0.0082	0.0076	0.0079	1.1464	1.1372	1.1569	1.1470	0.0320	0.0107	0.0214	1.1599	-2.6659	-1.8002	-2.2331
2L0	0:00:00	0.0077	0.0072	0.0075	1.1510	1.1372	1.1569	1.1470	0.0315	0.0108	0.0212	1.1647	-2.6659	-1.8002	-2.2331
2L1	0:00:00	0.0077	0.0072	0.0075	1.1515	1.1373	1.1576	1.1474	0.0315	0.0108	0.0212	1.1652	-2.6689	-1.8098	-2.2394
2L1	0:00:00	0.0077	0.0072	0.0075	1.1543	1.1374	1.1608	1.1491	0.0315	0.0108	0.0212	1.1680	-2.7447	-1.8511	-2.2979
2L1	0:00:00	0.0077	0.0074	0.0076	1.1576	1.1376	1.1671	1.1523	0.0315	0.0108	0.0212	1.1712	-2.8085	-1.8815	-2.3450
2L1	0:00:30	0.0078	0.0078	0.0078	1.1610	1.1375	1.1678	1.1526	0.0315	0.0108	0.0212	1.1743	-2.8236	-1.8924	-2.3580
2L1	0:01:00	0.0078	0.0078	0.0078	1.1611	1.1378	1.1676	1.1527	0.0315	0.0108	0.0212	1.1744	-2.8265	-1.8952	-2.3609
2L1	0:01:30	0.0078	0.0078	0.0078	1.1617	1.1378	1.1675	1.1526	0.0315	0.0108	0.0212	1.1751	-2.8277	-1.8960	-2.3619
2L1	0:02:00	0.0078	0.0078	0.0078	1.1617	1.1379	1.1674	1.1526	0.0315	0.0108	0.0212	1.1751	-2.8283	-1.8965	-2.3624
2L1	0:02:30	0.0078	0.0078	0.0078	1.1619	1.1376	1.1678	1.1527	0.0315	0.0108	0.0212	1.1752	-2.8290	-1.8969	-2.3629
2L2	0:00:00	0.0093	0.0116	0.0105	1.1822	1.1472	1.1971	1.1721	0.0320	0.0108	0.0214	1.1932	-2.8751	-1.9177	-2.3964
2L2	0:00:30	0.0101	0.0127	0.0114	1.2012	1.1589	1.2073	1.1831	0.0329	0.0108	0.0219	1.2116	-2.8915	-1.9258	-2.4086
2L2	0:01:00	0.0102	0.0127	0.0115	1.2027	1.1633	1.2080	1.1856	0.0330	0.0108	0.0219	1.2131	-2.8941	-1.9294	-2.4117
2L2	0:01:30	0.0102	0.0127	0.0115	1.2035	1.1657	1.2079	1.1868	0.0330	0.0108	0.0219	1.2139	-2.8952	-1.9321	-2.4136
2L2	0:02:00	0.0102	0.0127	0.0115	1.2038	1.1671	1.2078	1.1874	0.0331	0.0108	0.0220	1.2143	-2.8962	-1.9334	-2.4148
2L2	0:02:30	0.0102	0.0127	0.0115	1.2040	1.1681	1.2090	1.1885	0.0331	0.0108	0.0220	1.2145	-2.8978	-1.9340	-2.4159
2L2	0:03:00	0.0102	0.0127	0.0115	1.2054	1.1696	1.2111	1.1903	0.0331	0.0108	0.0220	1.2159	-2.8999	-1.9344	-2.4172
2L3	0:00:00	0.0115	0.0146	0.0131	1.2210	1.1768	1.2267	1.2017	0.0347	0.0108	0.0228	1.2307	-2.9154	-1.9452	-2.4303
2L3	0:00:30	0.0116	0.0147	0.0132	1.2311	1.1834	1.2347	1.2090	0.0349	0.0108	0.0229	1.2408	-2.9244	-1.9502	-2.4373
2L3	0:01:00	0.0116	0.0147	0.0132	1.2330	1.1869	1.2367	1.2118	0.0350	0.0108	0.0229	1.2427	-2.9275	-1.9527	-2.4401
2L3	0:01:30	0.0117	0.0147	0.0132	1.2346	1.1897	1.2388	1.2142	0.0350	0.0108	0.0229	1.2443	-2.9304	-1.9545	-2.4424
2L3	0:02:00	0.0117	0.0147	0.0132	1.2357	1.1913	1.2408	1.2160	0.0351	0.0108	0.0230	1.2455	-2.9324	-1.9548	-2.4436

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2L3	0:02:30	0.0117	0.0147	0.0132	1.2364	1.1923	1.2407	1.2165	0.0351	0.0108	0.0230	1.2461	-2.9331	-1.9562	-2.4446
2L4	0:00:00	0.0123	0.0157	0.0140	1.2434	1.1977	1.2548	1.2262	0.0370	0.0108	0.0239	1.2533	-2.9434	-1.9637	-2.4535
2L4	0:00:30	0.0126	0.0160	0.0143	1.2771	1.2135	1.2706	1.2420	0.0383	0.0108	0.0246	1.2874	-2.9621	-1.9725	-2.4673
2L4	0:01:00	0.0126	0.0160	0.0143	1.2863	1.2242	1.2895	1.2568	0.0383	0.0108	0.0246	1.2965	-2.9704	-1.9761	-2.4732
2L4	0:01:30	0.0127	0.0160	0.0144	1.2908	1.2313	1.2966	1.2639	0.0383	0.0108	0.0246	1.3010	-2.9745	-1.9802	-2.4774
2L4	0:02:00	0.0127	0.0160	0.0144	1.2938	1.2356	1.3009	1.2682	0.0383	0.0108	0.0246	1.3040	-2.9778	-1.9829	-2.4804
2L4	0:02:30	0.0127	0.0160	0.0144	1.2964	1.2390	1.3043	1.2716	0.0383	0.0108	0.0246	1.3066	-2.9804	-1.9854	-2.4829
2L4	0:03:00	0.0127	0.0160	0.0144	1.2980	1.2415	1.2994	1.2704	0.0383	0.0108	0.0246	1.3082	-2.9827	-1.9869	-2.4848
2L5	0:00:00	0.0133	0.0168	0.0151	1.3554	1.3034	1.3857	1.3445	0.0407	0.0108	0.0258	1.3661	-3.0057	-1.9979	-2.5018
2L5	0:00:30	0.0133	0.0171	0.0152	1.4575	1.4013	1.4783	1.4398	0.0414	0.0108	0.0261	1.4684	-3.0388	-2.0104	-2.5246
2L5	0:01:00	0.0134	0.0171	0.0153	1.5120	1.4383	1.5177	1.4780	0.0421	0.0108	0.0265	1.5232	-3.0669	-2.0223	-2.5446
2L5	0:01:30	0.0134	0.0171	0.0153	1.5302	1.4548	1.5328	1.4938	0.0421	0.0108	0.0265	1.5414	-3.0866	-2.0348	-2.5607
2L5	0:02:00	0.0134	0.0171	0.0153	1.5427	1.4666	1.5430	1.5048	0.0421	0.0108	0.0265	1.5539	-3.1029	-2.0460	-2.5744
2L5	0:02:30	0.0134	0.0171	0.0153	1.5519	1.4774	1.5528	1.5151	0.0421	0.0108	0.0265	1.5631	-3.1186	-2.0571	-2.5879
2L6	0:00:00	0.0134	0.0171	0.0153	1.5812	1.5171	1.5925	1.5548	0.0421	0.0108	0.0265	1.5924	-3.1463	-2.0693	-2.6078
2L6	0:00:30	0.0134	0.0171	0.0153	1.6147	1.5448	1.6202	1.5825	0.0421	0.0108	0.0265	1.6259	-3.1686	-2.0811	-2.6249
2L6	0:01:00	0.0134	0.0171	0.0153	1.6365	1.5606	1.6412	1.6009	0.0421	0.0108	0.0265	1.6477	-3.1903	-2.0922	-2.6413
2L6	0:01:30	0.0134	0.0171	0.0153	1.6514	1.5748	1.6554	1.6151	0.0421	0.0108	0.0265	1.6626	-3.2104	-2.1031	-2.6568
2L6	0:02:00	0.0134	0.0171	0.0153	1.6621	1.5833	1.6664	1.6248	0.0421	0.0108	0.0265	1.6733	-3.2290	-2.1139	-2.6715
2L6	0:02:30	0.0134	0.0171	0.0153	1.6708	1.5897	1.6728	1.6312	0.0421	0.0107	0.0264	1.6820	-3.2455	-2.1258	-2.6856
2L6	0:03:00	0.0134	0.0171	0.0153	1.6784	1.5977	1.6808	1.6392	0.0421	0.0107	0.0264	1.6895	-3.2620	-2.1368	-2.6994
2L7	0:00:00	0.0134	0.0173	0.0154	1.6896	1.6206	1.7049	1.6627	0.0431	0.0107	0.0269	1.7012	-3.2846	-2.1499	-2.7173
2L7	0:00:30	0.0134	0.0174	0.0154	1.7334	1.6618	1.7413	1.7015	0.0432	0.0107	0.0270	1.7449	-3.3101	-2.1663	-2.7382
2L7	0:01:00	0.0135	0.0174	0.0155	1.7693	1.6945	1.7749	1.7347	0.0432	0.0107	0.0270	1.7808	-3.3379	-2.1840	-2.7610
2L7	0:01:30	0.0135	0.0174	0.0155	1.7915	1.7150	1.7985	1.7567	0.0432	0.0107	0.0270	1.8030	-3.3646	-2.2015	-2.7831
2L7	0:02:00	0.0135	0.0174	0.0155	1.8145	1.7399	1.8220	1.7809	0.0432	0.0108	0.0270	1.8261	-3.3874	-2.2193	-2.8034
2L7	0:02:30	0.0135	0.0174	0.0155	1.8350	1.7579	1.8422	1.8000	0.0432	0.0108	0.0270	1.8465	-3.4123	-2.2389	-2.8256
2L7	0:03:00	0.0135	0.0174	0.0155	1.8548	1.7778	1.8666	1.8222	0.0432	0.0108	0.0270	1.8664	-3.4392	-2.2567	-2.8479
2L7	0:03:30	0.0135	0.0174	0.0155	1.8802	1.8011	1.8916	1.8463	0.0432	0.0108	0.0270	1.8918	-3.4612	-2.2728	-2.8670
2L7	0:04:00	0.0135	0.0174	0.0155	1.8980	1.8128	1.9041	1.8584	0.0432	0.0108	0.0270	1.9095	-3.4738	-2.2821	-2.8780
2U1	0:00:00	0.0135	0.0174	0.0155	1.8974	1.8138	1.9037	1.8587	0.0432	0.0108	0.0270	1.9090	-3.4742	-2.2830	-2.8786
2U1	0:00:30	0.0135	0.0174	0.0155	1.8974	1.8142	1.9034	1.8588	0.0432	0.0108	0.0270	1.9090	-3.4745	-2.2835	-2.8790
2U1	0:01:00	0.0135	0.0174	0.0155	1.8974	1.8143	1.9033	1.8588	0.0432	0.0108	0.0270	1.9090	-3.4746	-2.2837	-2.8792
2U1	0:01:30	0.0130	0.0173	0.0152	1.8957	1.8144	1.9012	1.8578	0.0429	0.0108	0.0269	1.9074	-3.4744	-2.2833	-2.8788
2U2	0:00:00	0.0130	0.0170	0.0150	1.8919	1.8139	1.9008	1.8573	0.0427	0.0108	0.0268	1.9036	-3.4744	-2.2828	-2.8786
2U2	0:00:30	0.0130	0.0170	0.0150	1.8919	1.8142	1.9008	1.8575	0.0427	0.0108	0.0268	1.9036	-3.4744	-2.2827	-2.8785
2U2	0:01:00	0.0130	0.0170	0.0150	1.8919	1.8142	1.9010	1.8576	0.0427	0.0108	0.0268	1.9036	-3.4744	-2.2828	-2.8786
2U2	0:01:30	0.0130	0.0170	0.0150	1.8919	1.8143	1.9008	1.8575	0.0427	0.0108	0.0268	1.9036	-3.4743	-2.2828	-2.8785
2U2	0:02:00	0.0130	0.0170	0.0150	1.8919	1.8143	1.9007	1.8575	0.0427	0.0108	0.0268	1.9036	-3.4743	-2.2828	-2.8785
2U2	0:02:30	0.0129	0.0173	0.0151	1.8922	1.8143	1.9005	1.8574	0.0427	0.0108	0.0268	1.9038	-3.4743	-2.2827	-2.8785
2U2	0:03:00	0.0129	0.0173	0.0151	1.8924	1.8144	1.9005	1.8574	0.0427	0.0110	0.0269	1.9041	-3.4743	-2.2828	-2.8785
2U2	0:03:30	0.0129	0.0173	0.0151	1.8920	1.8146	1.9005	1.8575	0.0427	0.0110	0.0269	1.9038	-3.4744	-2.2825	-2.8785
2U2	0:04:00	0.0129	0.0173	0.0151	1.8923	1.8148	1.9005	1.8576	0.0427	0.0110	0.0269	1.9041	-3.4743	-2.2824	-2.8784

Table I.1 Adjusted Indicator Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref. Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref. Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9753	Mvmt.	C	D	Avg. Rdg	Mvmt.	9752	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2U2	0:04:30	0.0129	0.0173	0.0151	1.8923	1.8146	1.8994	1.8570	0.0427	0.0110	0.0269	1.9040	-3.4736	-2.2811	-2.8773
2U3	0:00:00	0.0121	0.0157	0.0139	1.8798	1.8144	1.8953	1.8548	0.0419	0.0110	0.0265	1.8924	-3.4652	-2.2764	-2.8708
2U3	0:00:30	0.0120	0.0157	0.0139	1.8792	1.8144	1.8948	1.8546	0.0418	0.0110	0.0264	1.8918	-3.4647	-2.2760	-2.8704
2U3	0:01:00	0.0120	0.0157	0.0139	1.8792	1.8144	1.8947	1.8545	0.0418	0.0110	0.0264	1.8917	-3.4643	-2.2759	-2.8701
2U3	0:01:30	0.0120	0.0157	0.0139	1.8789	1.8143	1.8947	1.8545	0.0418	0.0110	0.0264	1.8915	-3.4633	-2.2756	-2.8694
2U3	0:02:00	0.0119	0.0157	0.0138	1.8782	1.8143	1.8946	1.8544	0.0416	0.0110	0.0263	1.8907	-3.4631	-2.2754	-2.8693
2U3	0:02:30	0.0113	0.0138	0.0126	1.8758	1.8137	1.8809	1.8473	0.0416	0.0110	0.0263	1.8895	-3.3928	-2.2471	-2.8200
2U4	0:00:00	0.0095	0.0108	0.0102	1.8350	1.8122	1.8628	1.8375	0.0340	0.0110	0.0225	1.8473	-3.2911	-2.1450	-2.7181
2U4	0:00:30	0.0093	0.0105	0.0099	1.8301	1.8122	1.8573	1.8347	0.0339	0.0110	0.0225	1.8427	-3.2711	-2.1302	-2.7007
2U4	0:01:00	0.0093	0.0105	0.0099	1.8285	1.8119	1.8569	1.8344	0.0339	0.0110	0.0225	1.8411	-3.2609	-2.1216	-2.6912
2U4	0:01:30	0.0092	0.0105	0.0099	1.8277	1.8118	1.8561	1.8339	0.0339	0.0110	0.0225	1.8403	-3.2535	-2.1166	-2.6850
2U4	0:02:00	0.0091	0.0105	0.0098	1.8267	1.8118	1.8554	1.8336	0.0339	0.0110	0.0225	1.8394	-3.2489	-2.1124	-2.6807
2U4	0:02:30	0.0091	0.0105	0.0098	1.8265	1.8118	1.8550	1.8334	0.0339	0.0110	0.0225	1.8392	-3.2455	-2.1102	-2.6778
2U4	0:03:00	0.0090	0.0105	0.0098	1.8257	1.8119	1.8548	1.8333	0.0339	0.0110	0.0225	1.8384	-3.2430	-2.1082	-2.6756
2U4	0:03:30	0.0090	0.0105	0.0098	1.8256	1.8117	1.8546	1.8331	0.0338	0.0110	0.0224	1.8382	-3.2408	-2.1067	-2.6738

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L0	0:00:00		-2.68	-1.35	-4.30	-6.35	-5.81	-9.70	-4.77	-26.93	-13.75	-27.46	-43.80	-19.27	-0.58	4.61	-28.26	-48.20
L1	0:00:00		-2.64	-1.23	-4.27	-6.24	-5.63	-9.56	-4.58	-26.59	-13.15	-26.72	-42.64	-17.98	3.08	7.47	-24.72	-45.27
L1	0:00:30		-2.31	-1.23	-3.97	-6.05	-5.44	-9.38	-4.21	-26.26	-12.75	-26.16	-42.29	-17.13	4.09	8.49	-23.32	-43.87
L1	0:01:00		-2.20	-1.16	-3.86	-6.05	-5.48	-9.12	-4.13	-26.07	-12.45	-25.76	-41.72	-16.51	5.43	9.79	-22.34	-42.85
L1	0:01:30		-2.46	-1.12	-3.82	-6.05	-5.25	-9.05	-3.98	-26.00	-12.27	-25.57	-41.09	-16.21	6.19	10.35	-21.75	-42.18
L1	0:02:00		-2.38	-1.12	-3.79	-5.87	-5.33	-9.01	-3.79	-25.85	-12.12	-25.38	-41.05	-15.95	6.81	10.99	-21.22	-41.68
L1	0:02:30		-2.46	-1.12	-3.79	-5.98	-5.21	-9.01	-3.76	-25.82	-11.97	-25.20	-40.84	-15.66	7.32	11.41	-20.73	-41.19
L1	0:03:00		-2.20	-1.08	-3.71	-5.83	-5.18	-8.94	-3.76	-25.70	-11.93	-25.09	-40.59	-15.40	7.82	11.80	-20.49	-40.80
L1	0:03:30		-2.20	-1.05	-3.90	-5.94	-5.10	-8.98	-3.72	-25.59	-11.78	-25.01	-40.21	-15.10	8.00	12.26	-20.17	-40.59
L1	0:04:00		-2.23	-1.05	-3.68	-5.76	-5.14	-8.94	-3.57	-25.56	-11.78	-24.94	-40.35	-15.03	8.15	12.26	-19.89	-40.35
L1	0:04:30		-2.20	-1.01	-3.68	-5.90	-5.10	-8.98	-3.53	-25.56	-11.67	-24.83	-40.00	-14.95	8.48	12.50	-19.86	-40.13
L1	0:05:00		-2.35	-0.97	-3.53	-5.76	-4.88	-8.69	-3.19	-25.22	-11.12	-24.05	-38.90	-13.55	11.52	15.11	-16.56	-37.21
L2	0:00:00		-2.05	-0.67	-2.98	-5.42	-4.24	-8.14	-2.07	-23.97	-9.30	-21.93	-35.17	-9.90	16.08	19.62	-11.73	-31.69
L2	0:00:30		-2.01	-0.60	-2.94	-5.02	-4.01	-7.92	-1.62	-23.49	-8.63	-21.18	-33.79	-8.49	17.46	20.99	-10.30	-30.00
L2	0:01:00		-1.97	-0.56	-2.72	-5.20	-4.01	-7.67	-1.47	-23.34	-8.34	-20.85	-33.16	-7.98	18.04	21.34	-9.70	-29.43
L2	0:01:30		-1.86	-0.52	-2.65	-5.13	-3.94	-7.74	-1.35	-23.26	-8.15	-20.63	-32.84	-7.61	18.25	21.62	-9.46	-29.08
L2	0:02:00		-1.75	-0.52	-2.87	-5.13	-3.94	-7.71	-1.39	-23.23	-8.08	-20.55	-33.05	-7.57	18.36	21.62	-9.49	-28.97
L2	0:02:30		-1.82	-0.49	-2.76	-4.87	-3.86	-7.52	-1.24	-23.04	-7.74	-20.40	-32.63	-7.02	18.83	22.08	-8.89	-28.41
L2	0:03:00		-1.71	-0.49	-2.76	-4.83	-3.86	-7.63	-1.20	-23.00	-7.82	-20.29	-32.17	-6.98	18.83	22.29	-9.03	-28.41
L2	0:03:30		-1.90	-0.49	-2.79	-4.87	-3.75	-7.60	-1.16	-23.00	-7.82	-20.25	-32.10	-6.94	18.80	22.05	-8.96	-28.45
L2	0:04:00		-1.94	-0.49	-2.65	-5.09	-3.90	-7.60	-1.20	-22.97	-7.82	-20.29	-32.07	-6.90	18.76	22.22	-9.10	-28.45
L2	0:04:30		-1.94	-0.45	-2.65	-5.09	-3.75	-7.60	-1.20	-23.00	-7.78	-20.25	-32.38	-6.83	18.80	22.05	-9.14	-28.45
L2	0:05:00		-1.94	-0.41	-2.65	-5.05	-3.79	-7.60	-1.20	-22.97	-7.67	-20.29	-32.00	-6.87	18.83	22.22	-8.96	-28.38
L2	0:05:30		-1.86	-0.34	-2.43	-4.94	-3.56	-7.34	-0.68	-22.41	-6.82	-19.21	-30.55	-4.91	21.62	24.33	-5.71	-25.28
L3	0:00:00		-1.49	-0.19	-2.06	-4.65	-3.15	-6.87	0.00	-21.56	-5.63	-17.91	-28.08	-2.81	23.11	26.24	-4.06	-23.02
L3	0:00:30		-1.41	-0.11	-1.95	-4.54	-3.04	-6.76	0.23	-21.27	-5.30	-17.43	-27.52	-2.10	23.36	26.24	-3.78	-22.46
L3	0:01:00		-1.49	-0.07	-1.91	-4.24	-2.93	-6.65	0.34	-21.23	-5.15	-17.32	-27.17	-1.59	23.65	26.87	-3.47	-22.11
L3	0:01:30		-1.41	-0.04	-1.84	-4.17	-2.93	-6.58	0.45	-21.08	-5.00	-17.02	-26.75	-1.26	23.62	26.62	-3.33	-21.76
L3	0:02:00		-1.45	-0.07	-1.88	-4.50	-2.89	-6.65	0.45	-21.04	-4.89	-17.10	-26.57	-1.37	23.47	26.80	-3.47	-21.90
L3	0:02:30		-1.56	-0.07	-1.88	-4.50	-2.96	-6.62	0.45	-21.12	-4.93	-17.06	-26.57	-1.26	23.54	26.41	-3.57	-21.97
L3	0:03:00		-1.56	-0.04	-1.91	-4.17	-2.85	-6.62	0.45	-21.08	-4.97	-16.98	-26.64	-1.22	23.40	26.41	-3.36	-21.86
L3	0:03:30		-1.45	-0.04	-1.99	-4.46	-2.81	-6.58	0.53	-21.04	-4.89	-16.95	-26.29	-1.14	23.98	26.73	-3.12	-21.51
L3	0:04:00		-1.45	-0.07	-1.95	-4.43	-2.81	-6.58	0.53	-20.97	-4.82	-16.91	-26.32	-1.07	23.91	26.83	-2.77	-21.33
L4	0:00:00		-1.30	0.19	-1.51	-4.06	-2.21	-6.18	1.62	-19.68	-3.22	-14.90	-22.98	2.44	26.91	29.72	0.56	-17.53
L4	0:00:30		-1.19	0.34	-1.18	-3.87	-1.95	-5.74	2.14	-19.23	-2.41	-13.86	-21.42	4.06	27.89	30.78	1.86	-15.91
L4	0:01:00		-1.12	0.37	-1.14	-3.80	-1.80	-5.60	2.33	-18.94	-2.08	-13.42	-20.61	4.80	28.25	30.92	2.38	-15.35
L4	0:01:30		-1.08	0.45	-1.03	-3.39	-1.76	-5.52	2.44	-18.71	-1.93	-13.19	-20.19	5.17	28.54	31.31	2.66	-14.89
L4	0:02:00		-1.01	0.49	-0.96	-3.39	-1.69	-5.27	2.55	-18.64	-1.67	-12.97	-19.77	5.61	28.69	31.48	2.94	-14.40
L4	0:02:30		-1.04	0.49	-1.03	-3.62	-1.65	-5.45	2.52	-18.49	-1.63	-12.90	-19.66	5.61	28.61	31.31	2.63	-14.58
L4	0:03:00		-1.08	0.52	-0.96	-3.69	-1.73	-5.56	2.59	-18.64	-1.48	-13.01	-19.59	5.54	28.32	31.24	2.63	-14.72
L4	0:03:30		-1.08	0.56	-0.99	-3.32	-1.65	-5.27	2.59	-18.53	-1.33	-12.78	-19.35	5.87	28.76	31.55	3.01	-14.12
L4	0:04:00		-1.01	0.49	-0.88	-3.28	-1.61	-5.38	2.59	-18.46	-1.33	-12.71	-19.13	5.94	28.69	31.48	2.98	-14.15
L4	0:04:30		-1.08	0.49	-1.03	-3.62	-1.61	-5.34	2.67	-18.34	-1.48	-12.67	-19.06	5.94	28.72	31.48	3.05	-14.12

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L5	0:00:00	-0.41	1.23	0.48	-2.21	0.19	-3.34	5.71	-14.61	3.37	-6.65	-9.73	16.14	36.36	38.63	12.64	-3.52	
L5	0:00:30	0.04	1.72	1.29	-1.55	1.16	-2.69	6.91	-12.80	5.26	-4.05	-5.53	19.72	38.18	40.18	15.13	-0.46	
L5	0:01:00	0.11	1.83	1.43	-1.55	1.31	-2.51	7.06	-12.35	5.52	-3.72	-4.62	20.12	38.25	40.36	14.57	-0.35	
L5	0:01:30	0.11	1.83	1.47	-1.51	1.35	-2.44	7.44	-12.32	5.67	-3.61	-4.37	20.27	38.32	40.11	14.85	-0.07	
L5	0:02:00	0.26	1.83	1.51	-1.55	1.39	-2.29	7.51	-12.09	5.82	-3.38	-3.88	20.49	38.47	40.39	14.95	0.39	
L5	0:02:30	0.30	1.91	1.54	-1.37	1.46	-2.22	7.63	-11.91	5.97	-3.16	-3.42	20.79	38.57	40.74	15.09	0.70	
L5	0:03:00	0.19	1.91	1.58	-1.44	1.43	-2.04	7.36	-11.95	6.00	-3.27	-3.31	20.64	38.36	40.43	14.99	0.39	
L5	0:03:30	0.22	1.87	1.51	-1.29	1.39	-2.29	7.51	-11.95	5.82	-3.34	-3.45	20.57	37.99	39.97	14.81	0.18	
L5	0:04:00	0.15	1.94	1.58	-1.40	1.46	-1.96	7.59	-11.84	6.04	-3.16	-3.14	20.79	38.76	40.53	15.23	0.81	
L5	0:04:30	0.15	1.91	1.73	-1.18	1.54	-2.14	7.78	-11.61	6.37	-2.71	-2.26	21.79	40.39	41.84	17.30	2.68	
L6	0:00:00	1.15	3.03	3.79	0.74	4.05	0.73	11.34	-5.99	12.27	4.39	9.34	31.64	46.00	47.58	26.26	12.99	
L6	0:00:30	1.45	3.51	4.49	1.18	4.91	1.60	12.36	-4.36	13.41	5.91	12.47	33.49	46.94	48.25	27.28	14.96	
L6	0:01:00	1.49	3.51	4.60	1.40	4.99	1.78	12.43	-4.18	13.78	6.10	13.21	33.82	47.27	48.56	27.59	15.49	
L6	0:01:30	1.53	3.66	4.74	1.44	5.10	1.74	12.58	-3.96	14.23	6.21	13.78	34.04	47.52	48.77	27.45	15.56	
L6	0:02:00	1.60	3.70	4.89	1.62	5.33	2.29	12.92	-3.44	14.75	6.76	14.94	34.78	48.25	49.27	28.19	16.55	
L6	0:02:30	1.68	3.78	5.00	1.96	5.48	2.40	13.07	-3.11	14.90	6.95	15.61	35.04	48.21	49.37	28.12	16.62	
L6	0:03:00	1.64	3.81	4.96	1.77	5.33	2.44	13.00	-3.14	14.90	6.80	15.54	34.82	47.99	49.06	27.74	16.41	
L6	0:03:30	1.68	3.81	5.00	1.99	5.40	2.40	12.96	-3.14	14.93	6.80	15.75	34.82	48.06	49.09	27.84	16.48	
L6	0:04:00	1.64	3.85	5.00	1.77	5.36	2.44	12.96	-3.18	14.97	6.88	15.79	34.82	48.10	49.16	27.84	16.72	
L6	0:04:30	1.75	3.89	5.04	1.81	5.40	2.47	12.96	-3.14	15.01	6.80	16.00	34.86	48.14	49.16	27.98	16.69	
L6	0:05:00	1.64	3.85	5.04	2.07	5.40	2.51	13.00	-3.03	14.86	6.95	16.32	35.23	49.48	49.83	29.31	17.74	
L7	0:00:00	2.53	4.94	7.24	3.73	7.91	5.12	16.64	2.48	20.05	13.08	26.50	43.24	54.58	54.90	39.22	28.31	
L7	0:00:30	3.13	5.76	8.49	5.02	9.23	6.58	18.22	5.25	21.86	15.27	30.76	45.67	54.98	55.32	41.39	31.86	
L7	0:01:00	3.28	5.94	8.71	5.28	9.49	7.09	18.37	5.73	22.34	15.65	31.89	45.90	55.31	55.22	41.64	32.85	
L7	0:01:30	3.20	6.02	8.83	5.39	9.53	7.05	18.44	5.95	22.64	15.72	32.77	45.93	55.24	55.01	41.78	33.16	
L7	0:02:00	3.24	6.06	8.86	5.53	9.56	7.16	18.52	6.21	22.94	15.83	33.26	46.19	55.56	55.32	41.92	33.52	
L7	0:02:30	3.28	6.17	8.97	5.68	9.64	7.41	18.60	6.32	23.05	15.98	33.79	46.30	56.14	55.50	42.09	33.76	
L7	0:03:00	3.31	6.17	8.97	5.76	9.71	7.56	18.71	6.62	23.27	16.39	34.57	46.64	56.10	55.82	42.62	34.54	
L7	0:03:30	3.31	6.13	8.90	5.61	9.60	7.38	18.56	6.47	23.20	15.83	34.36	46.12	55.67	55.25	42.27	34.04	
L7	0:04:00	3.28	6.17	9.05	5.68	9.83	7.38	18.60	6.58	23.31	15.94	34.74	46.30	55.96	55.57	42.55	34.57	
L7	0:04:30	3.28	6.21	9.01	5.76	9.75	7.49	18.71	6.84	23.57	16.06	35.20	46.45	56.03	55.61	42.76	34.96	
L7	0:05:00	3.24	6.32	9.12	5.76	9.71	7.67	18.67	6.69	23.53	15.94	35.13	46.27	55.63	55.15	42.30	34.64	
L7	0:05:30	3.24	6.24	9.01	5.68	9.71	7.63	18.60	6.55	23.42	15.76	35.24	46.12	55.60	55.22	42.41	34.64	
L7	0:06:00	3.28	6.28	8.94	5.83	9.68	7.63	18.56	6.58	23.64	15.76	35.17	46.19	55.49	55.08	42.44	34.71	
L7	0:06:30	3.43	6.54	9.52	6.20	10.43	8.40	19.87	8.40	25.61	18.29	39.11	49.33	58.53	58.14	47.70	39.68	
L8	0:00:00	3.76	6.84	10.11	6.90	11.22	9.20	20.81	9.91	26.87	19.40	41.09	49.96	58.42	57.68	49.20	41.75	
L8	0:00:30	3.76	6.92	10.26	6.97	11.29	9.34	20.85	10.39	26.83	19.33	41.62	50.03	57.88	57.09	49.97	42.95	
L8	0:01:00	3.80	6.92	10.19	6.94	11.40	9.52	20.89	10.47	27.05	19.44	42.32	49.92	57.92	56.77	50.53	43.55	
L8	0:01:30	3.80	6.88	10.15	6.94	11.40	9.52	20.81	10.54	27.12	19.29	42.81	49.63	57.34	56.49	50.57	43.80	
L8	0:02:00	3.76	6.84	10.11	6.97	11.33	9.56	20.85	10.65	27.24	19.51	43.24	49.66	57.73	56.45	50.92	44.36	
L8	0:02:30	3.76	6.80	10.11	6.97	11.33	9.60	20.85	10.76	27.68	19.33	43.59	49.52	57.19	56.24	50.81	44.71	
L8	0:03:00	3.76	6.80	10.26	6.97	11.29	9.63	20.81	10.61	27.72	19.21	43.52	49.44	57.37	56.24	50.99	44.85	
L8	0:03:30	3.72	6.73	10.11	6.90	11.25	9.45	20.66	10.58	27.61	18.99	43.62	49.15	57.41	55.99	50.57	44.47	

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L8	0:04:00		3.72	6.84	10.08	6.94	11.22	9.56	20.74	10.65	27.50	19.18	43.87	49.48	58.42	56.56	51.41	45.52
L9	0:00:00		4.02	7.07	10.52	7.49	11.89	10.10	21.64	12.02	28.79	20.81	46.02	50.84	59.29	57.72	53.44	47.67
L9	0:00:30		3.91	7.07	10.52	7.34	12.00	10.36	21.79	12.17	28.87	20.66	46.48	50.84	59.36	57.44	53.54	48.27
L9	0:01:00		3.87	7.03	10.66	7.34	11.97	10.29	21.71	12.09	29.09	20.52	46.41	50.62	58.64	57.33	53.72	48.20
L9	0:01:30		3.91	6.95	10.44	7.34	11.78	10.32	21.60	12.09	29.09	20.55	46.62	50.59	59.18	57.01	53.75	48.41
L9	0:02:00		3.87	6.99	10.37	7.38	11.85	10.14	21.60	12.28	28.90	20.55	46.80	50.55	58.97	56.98	53.93	48.55
L9	0:02:30		3.91	6.95	10.33	7.27	11.89	10.14	21.49	12.24	28.90	20.52	47.08	50.44	59.15	56.98	54.14	48.80
L9	0:03:00		3.83	6.88	10.33	7.27	11.85	10.29	21.53	12.21	28.94	20.59	47.22	50.40	59.04	56.87	54.10	48.94
L9	0:03:30		3.83	6.88	10.30	7.23	11.85	10.18	21.41	12.28	29.20	20.66	47.08	50.22	58.82	56.59	53.89	48.83
L9	0:04:00		3.91	6.80	10.26	7.23	11.82	10.10	21.38	12.21	29.09	20.25	47.04	50.14	58.31	56.59	53.96	48.94
L9	0:04:30		3.76	6.84	10.26	7.23	11.67	10.07	21.34	12.21	28.90	20.33	47.43	50.14	58.79	56.56	54.03	49.08
L9	0:05:00		3.91	7.03	10.55	7.49	12.23	10.69	22.09	13.06	30.13	21.41	48.80	51.44	59.94	57.93	56.38	51.22
L10	0:00:00		3.98	7.07	10.63	7.64	12.45	10.90	22.24	13.65	30.27	22.00	49.62	51.77	59.87	57.72	56.80	52.10
L10	0:00:30		4.06	7.03	10.55	7.49	12.34	10.65	22.05	13.50	30.09	21.82	49.26	51.47	59.80	57.37	56.80	52.25
L10	0:01:00		3.91	6.95	10.55	7.49	12.34	10.69	22.05	13.46	30.27	21.96	49.44	51.47	59.87	57.40	57.01	52.60
L10	0:01:30		3.87	6.99	10.48	7.53	12.34	10.80	22.01	13.50	30.13	22.00	49.58	51.32	59.40	57.01	57.19	52.67
L10	0:02:00		3.91	7.03	10.41	7.53	12.30	10.76	21.94	13.50	30.09	21.70	49.93	51.29	59.69	56.91	57.71	53.23
L10	0:02:30		3.80	6.99	10.44	7.45	12.30	10.69	21.83	13.57	30.09	21.70	49.79	51.14	58.86	56.59	57.29	53.27
L10	0:03:00		3.80	6.95	10.26	7.34	12.19	10.61	21.75	13.54	30.02	21.63	49.83	51.03	59.44	56.66	57.47	53.37
L10	0:03:30		3.80	6.95	10.33	7.34	12.15	10.58	21.75	13.50	30.02	21.74	50.11	51.07	59.55	56.73	57.64	53.58
L10	0:04:00		3.72	6.92	10.19	7.27	12.12	10.50	21.53	13.43	29.87	21.44	49.79	50.81	58.75	56.45	57.19	53.23
L11	0:00:00		3.91	7.03	10.77	7.60	12.60	11.05	22.24	14.57	31.13	22.82	51.48	52.25	60.81	57.75	59.95	55.84
L11	0:00:30		3.95	7.03	10.55	7.60	12.68	11.23	22.24	14.76	31.09	23.34	51.55	52.28	60.16	57.58	60.27	56.44
L11	0:01:00		3.87	6.88	10.59	7.49	12.53	11.09	22.01	14.54	30.79	22.93	51.31	52.03	60.16	57.30	60.37	56.29
L11	0:01:30		3.87	6.84	10.33	7.38	12.42	11.01	21.75	14.35	30.53	22.78	51.20	51.80	59.76	56.94	60.20	56.22
L11	0:02:00		3.83	6.80	10.30	7.38	12.34	10.90	21.60	14.50	30.46	23.01	51.24	51.77	59.76	56.87	60.41	56.47
L11	0:02:30		3.95	6.99	10.22	7.31	12.34	10.80	21.45	14.24	30.13	22.86	51.13	51.58	59.11	56.56	60.13	56.44
L11	0:03:00		3.87	6.80	10.19	7.27	12.19	10.87	21.38	14.24	30.31	22.67	51.24	51.58	59.84	56.56	60.37	56.44
L11	0:03:30		3.83	6.66	10.22	7.23	12.27	10.87	21.38	14.39	30.09	22.67	51.20	51.55	59.62	56.52	60.58	56.75
L11	0:04:00		3.80	6.77	10.26	7.23	12.19	10.69	21.30	14.39	30.27	22.74	51.27	51.47	59.29	56.45	60.55	56.75
L11	0:04:30		3.76	6.73	10.08	7.23	12.08	10.76	21.11	14.28	30.13	22.52	51.17	51.32	60.13	56.49	60.90	56.75
L12	0:00:00		3.87	6.84	10.63	7.53	12.57	11.09	21.71	15.39	30.68	23.82	52.36	52.54	60.70	57.16	62.79	59.04
L12	0:00:30		3.95	6.66	10.37	7.42	12.57	11.05	21.53	15.31	30.83	24.31	52.29	52.47	59.76	57.05	63.21	59.46
L12	0:01:00		3.95	6.58	10.37	7.34	12.45	11.12	21.34	15.42	30.50	24.45	52.22	52.43	59.94	56.59	63.45	59.74
L12	0:01:30		3.83	6.47	10.26	7.23	12.27	10.80	20.96	15.09	30.09	24.01	51.80	52.06	59.00	56.28	63.17	59.57
L12	0:02:00		3.80	6.43	10.11	7.12	12.15	10.72	20.81	14.90	30.05	23.79	51.69	51.88	59.36	55.78	63.03	59.46
L12	0:02:30		3.83	6.47	10.22	7.19	12.19	10.80	20.62	14.90	29.98	23.64	51.73	51.80	58.93	55.82	63.35	59.60
L12	0:03:00		3.76	6.47	10.00	7.12	12.08	10.65	20.62	14.87	29.94	23.93	51.69	51.73	58.71	55.68	63.45	59.78
L12	0:03:30		3.72	6.43	9.96	7.08	12.08	10.54	20.47	14.76	29.79	23.67	51.66	51.62	58.93	55.57	63.35	59.78
L12	0:04:00		3.69	6.39	9.93	7.05	12.00	10.65	20.44	14.57	29.79	23.86	51.66	51.62	58.60	55.57	63.52	60.06
L12	0:04:30		3.80	6.36	10.22	7.23	12.38	10.83	20.92	15.46	30.46	24.90	52.65	52.58	60.05	56.59	65.38	61.86
L13	0:00:00		3.83	6.32	10.33	7.19	12.30	10.90	20.66	15.42	30.02	25.01	52.36	52.54	59.55	55.89	66.19	62.46
L13	0:00:30		3.80	6.21	10.11	7.19	12.30	10.76	20.36	15.35	29.90	24.75	52.19	52.28	58.46	55.43	66.26	62.77

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L13	0:01:00		3.87	6.17	10.04	7.12	12.15	10.87	20.14	15.46	29.46	25.16	52.12	52.21	58.46	55.39	66.64	63.16
L13	0:01:30		3.80	6.17	9.89	7.01	12.04	10.65	19.87	15.20	29.42	24.86	51.87	51.95	57.77	54.62	66.64	63.19
L13	0:02:00		3.72	6.13	9.78	6.97	11.97	10.47	19.76	14.87	29.31	24.79	51.76	51.84	57.66	54.34	66.82	63.19
L13	0:02:30		3.80	6.09	9.89	6.94	11.85	10.36	19.57	15.02	28.94	24.38	51.76	51.73	57.84	54.20	66.89	63.48
L13	0:03:00		3.72	6.06	9.78	6.90	11.89	10.47	19.46	14.90	29.01	24.34	51.69	51.51	57.48	54.13	66.92	63.27
L13	0:03:30		3.65	5.91	9.78	6.83	11.67	10.36	19.23	14.54	28.38	24.34	51.52	51.25	57.34	53.99	66.85	63.19
L13	0:04:00		3.65	5.98	9.60	6.79	11.67	10.25	19.27	14.68	28.57	24.23	51.62	51.32	57.16	53.77	67.06	63.51
L13	0:04:30		3.65	6.09	9.71	6.97	11.85	10.54	19.53	15.02	29.05	25.31	52.36	51.99	58.31	54.69	68.64	65.03
L14	0:00:00		3.83	5.91	9.93	7.05	12.12	10.65	19.57	15.53	29.05	25.46	52.50	52.25	57.84	54.44	69.90	66.19
L14	0:00:30		3.87	5.91	9.89	6.97	12.04	10.61	19.31	15.42	29.13	25.46	52.33	52.10	57.30	53.99	70.46	66.68
L14	0:01:00		3.87	5.80	9.78	6.94	11.89	10.32	19.01	15.39	28.53	25.83	52.15	51.95	57.05	53.35	70.63	66.86
L14	0:01:30		3.83	5.61	9.74	6.83	11.74	10.40	18.82	15.35	28.57	25.83	52.08	51.69	56.79	53.04	70.81	67.07
L14	0:02:00		3.95	5.61	9.60	6.75	11.67	10.29	18.52	15.02	28.01	25.09	51.84	51.36	56.39	52.93	70.46	66.79
L14	0:02:30		3.80	5.53	9.60	6.71	11.55	10.25	18.52	14.90	28.24	25.50	51.76	51.29	56.32	52.86	70.60	66.96
L14	0:03:00		3.80	5.50	9.63	6.68	11.48	10.07	18.33	14.87	27.90	25.31	51.80	51.25	56.10	52.75	70.70	67.28
L14	0:03:30		3.80	5.42	9.49	6.68	11.52	9.96	18.14	14.68	27.75	25.24	51.69	50.99	56.18	52.51	70.63	67.03
L14	0:04:00		3.76	5.46	9.41	6.60	11.40	10.10	18.11	14.65	27.94	25.20	51.62	50.96	55.85	52.33	70.49	67.21
L14	0:04:30		3.72	5.42	9.52	6.57	11.33	9.89	18.03	14.54	27.64	25.12	51.66	50.84	55.96	52.15	70.67	67.31
L14	0:05:00		3.72	5.42	9.41	6.68	11.44	10.10	18.26	14.94	28.01	25.42	52.40	51.58	56.79	53.14	72.45	68.90
L15	0:00:00		3.87	5.42	9.71	6.86	11.74	10.18	18.41	15.35	28.42	25.98	52.47	51.73	57.12	52.86	72.84	69.78
L15	0:00:30		3.95	5.27	9.60	6.75	11.63	10.29	18.18	15.31	28.13	26.57	52.36	51.73	56.90	53.07	73.12	69.85
L15	0:01:00		3.98	5.12	9.63	6.71	11.59	10.14	17.96	15.39	27.61	26.24	52.12	51.69	56.76	52.86	73.50	70.52
L15	0:01:30		4.02	5.05	9.56	6.64	11.48	10.07	17.69	15.39	27.68	26.31	51.98	51.69	56.76	52.79	74.07	70.66
L15	0:02:00		4.02	4.97	9.52	6.57	11.44	10.14	17.51	15.16	27.50	26.76	51.87	51.58	56.72	52.51	74.24	71.19
L15	0:02:30		3.95	4.86	9.34	6.49	11.22	9.85	17.13	14.94	26.72	26.28	51.45	51.14	56.25	52.15	73.89	70.66
L15	0:03:00		3.98	4.79	9.30	6.46	11.18	9.81	17.13	14.94	26.68	26.35	51.62	51.21	56.29	51.91	74.10	70.87
L15	0:03:30		3.98	4.79	9.49	6.49	11.10	9.92	17.09	14.76	27.09	25.94	51.66	51.18	56.43	52.15	74.21	70.94
L15	0:04:00		3.95	4.71	9.27	6.42	10.95	9.85	16.87	14.57	26.50	26.13	51.38	50.88	56.21	51.91	73.82	70.66
L16	0:00:00		4.10	4.75	9.52	6.68	11.40	10.00	17.24	15.57	27.38	26.91	52.26	51.84	56.79	52.58	76.31	73.05
L16	0:00:30		4.17	4.64	9.49	6.64	11.33	10.00	17.02	15.57	27.05	27.46	51.94	51.84	56.43	52.30	77.11	73.65
L16	0:01:00		4.21	4.49	9.41	6.53	11.10	9.89	16.64	15.39	26.24	27.32	51.73	51.80	56.36	52.19	77.57	74.00
L16	0:01:30		4.24	4.37	9.27	6.35	11.03	9.92	16.34	15.35	26.31	27.24	51.38	51.44	55.96	51.63	77.15	73.62
L16	0:02:00		4.10	4.34	9.27	6.38	10.88	9.74	16.23	15.13	25.87	27.02	51.41	51.51	56.32	52.01	77.43	74.04
L16	0:02:30		4.10	4.30	9.08	6.35	10.77	9.74	16.00	15.02	25.53	26.68	51.20	51.21	56.03	51.73	76.94	73.69
L16	0:03:00		4.02	4.26	9.01	6.35	10.69	9.67	15.93	14.90	25.94	26.68	51.20	51.10	56.03	51.56	77.08	73.62
L16	0:03:30		3.98	4.26	9.05	6.16	10.65	9.56	15.82	14.83	25.83	26.87	51.24	51.03	56.14	51.56	76.97	73.40
L16	0:04:00		4.06	4.26	9.01	6.27	10.69	9.56	15.82	14.72	25.35	26.54	51.24	50.99	56.03	51.42	76.97	73.76
L16	0:04:30		4.02	4.22	8.94	6.27	10.62	9.60	15.70	14.54	25.68	26.76	51.24	50.88	56.18	51.66	77.04	73.69
L17	0:00:00		4.13	4.26	9.19	6.38	10.88	9.70	16.04	15.20	25.72	27.46	51.87	51.69	56.76	52.08	79.11	75.55
L17	0:00:30		4.10	4.15	9.19	6.35	10.80	9.81	15.82	15.39	25.83	27.84	51.66	51.66	56.36	51.94	79.67	75.97
L17	0:01:00		4.13	4.04	9.16	6.27	10.77	9.67	15.70	15.39	25.68	27.65	51.66	51.66	56.25	51.77	80.12	76.33
L17	0:01:30		4.17	4.00	9.16	6.24	10.73	9.78	15.55	15.20	24.94	27.73	51.48	51.51	56.00	51.87	80.26	76.43
L17	0:02:00		4.13	3.93	9.08	6.24	10.65	9.70	15.44	15.31	25.20	28.10	51.52	51.55	55.96	51.84	80.65	76.71

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L17	0:02:30		4.10	3.85	9.01	6.16	10.50	9.60	15.18	15.13	24.68	27.54	51.27	51.32	55.85	51.38	80.30	76.64
L17	0:03:00		4.06	3.89	8.94	6.16	10.43	9.52	15.03	14.87	24.49	27.73	51.17	51.14	56.03	51.34	80.23	76.36
L17	0:03:30		4.24	3.81	8.83	6.05	10.35	9.49	14.91	14.83	24.38	27.54	50.99	50.96	55.78	51.31	79.95	76.22
L17	0:04:00		4.06	3.78	8.75	6.16	10.28	9.23	14.76	14.72	24.31	27.39	51.02	50.81	55.60	51.20	79.84	76.12
L17	0:04:30		3.98	3.78	8.75	6.01	10.28	9.23	14.76	14.65	24.49	26.91	50.95	50.66	55.38	50.89	79.98	76.19
L17	0:00:00		3.87	3.78	8.53	5.94	10.01	9.12	14.35	14.17	23.72	26.42	49.97	49.52	52.63	48.70	77.01	73.83
U1	0:00:30		3.69	3.66	8.27	5.68	9.64	8.76	13.82	13.76	22.86	25.61	49.09	48.33	50.27	46.66	74.49	71.71
U1	0:01:00		3.65	3.66	8.20	5.64	9.60	8.80	13.75	13.61	22.75	25.38	48.95	48.15	50.31	46.63	74.10	71.33
U1	0:01:30		3.57	3.74	8.16	5.61	9.53	8.58	13.67	13.50	22.75	24.83	48.63	47.93	50.16	46.38	73.61	71.05
U1	0:02:00		3.54	3.70	8.09	5.68	9.45	8.69	13.64	13.43	22.72	25.01	48.49	47.82	50.13	46.27	73.12	70.80
U1	0:02:30		3.46	3.70	8.05	5.53	9.30	8.51	13.56	13.35	22.49	24.57	48.38	47.71	50.02	46.13	72.80	70.55
U1	0:03:00		3.43	3.70	8.02	5.53	9.34	8.58	13.49	13.24	22.53	24.71	48.45	47.52	49.80	45.99	72.56	70.31
U1	0:03:30		3.39	3.70	7.94	5.50	9.23	8.51	13.41	13.09	22.31	24.71	48.38	47.45	49.59	45.92	72.49	70.10
U1	0:04:00		3.39	3.74	7.91	5.61	9.19	8.47	13.45	13.17	22.31	24.64	48.17	47.34	49.55	45.82	72.10	69.95
U1	0:04:30		3.28	3.74	7.80	5.61	9.19	8.51	13.37	12.98	22.31	24.53	48.10	47.19	49.48	45.71	72.10	69.78
U2	0:00:00		3.13	3.63	7.50	5.35	8.78	8.07	12.77	12.43	21.34	23.08	46.58	45.23	44.80	41.77	67.38	65.84
U2	0:00:30		3.09	3.63	7.46	5.35	8.78	8.07	12.77	12.39	21.38	23.12	46.58	45.27	44.80	41.98	67.41	66.01
U2	0:01:00		3.05	3.59	7.50	5.24	8.74	8.07	12.81	12.39	21.34	23.27	46.58	45.16	44.88	41.80	67.38	65.98
U2	0:01:30		2.98	3.66	7.39	5.35	8.74	8.14	12.77	12.43	21.34	23.04	46.41	45.16	44.88	41.80	67.34	65.84
U2	0:02:00		2.98	3.63	7.43	5.28	8.74	8.07	12.77	12.35	21.34	23.01	46.55	45.08	44.91	41.84	67.31	65.76
U2	0:02:30		2.94	3.66	7.39	5.24	8.66	8.03	12.81	12.35	21.27	23.12	46.34	45.08	44.84	41.80	67.27	65.87
U2	0:03:00		2.72	3.48	6.84	4.80	8.06	7.34	11.80	11.32	19.64	21.15	43.77	41.69	38.14	35.96	58.80	59.32
U3	0:00:00		2.68	3.40	6.80	4.83	8.06	7.52	11.80	11.35	19.71	21.15	43.55	41.69	38.57	36.27	58.97	59.50
U3	0:00:30		2.64	3.48	6.77	4.76	8.03	7.38	11.72	11.28	19.68	21.04	43.70	41.50	38.28	36.24	58.62	59.18
U3	0:01:00		2.61	3.48	6.58	4.80	7.99	7.31	11.76	11.28	19.57	21.04	43.73	41.50	38.39	36.13	58.59	59.18
U3	0:01:30		2.79	3.48	6.77	5.02	8.03	7.52	11.76	11.35	19.71	21.15	43.73	41.50	38.28	36.34	58.66	59.15
U3	0:02:00		2.57	3.48	6.69	4.80	8.03	7.41	11.76	11.28	19.60	21.04	43.55	41.54	38.47	36.17	58.69	59.22
U3	0:02:30		2.64	3.48	6.69	4.94	7.99	7.45	11.83	11.32	19.57	21.07	43.73	41.47	38.47	36.38	58.62	59.18
U3	0:03:00		2.23	3.18	6.03	4.46	7.20	6.80	10.59	10.02	17.42	18.73	39.85	37.03	31.33	29.93	48.75	50.98
U4	0:00:00		2.20	3.25	6.03	4.35	7.16	6.62	10.56	10.02	17.68	18.69	40.14	36.96	31.55	30.11	48.92	51.01
U4	0:00:30		2.27	3.25	5.99	4.50	7.16	6.62	10.71	10.13	17.75	18.69	39.85	36.96	31.80	30.25	48.85	51.12
U4	0:01:00		2.12	3.25	5.96	4.35	7.16	6.65	10.71	10.13	17.75	18.73	40.14	36.96	31.80	30.25	48.92	51.05
U4	0:01:30		2.08	3.25	5.92	4.32	7.13	6.80	10.56	10.06	17.38	18.55	39.92	36.74	31.22	29.86	48.29	50.52
U4	0:02:00		2.08	3.25	5.92	4.50	7.13	6.80	10.56	10.10	17.68	18.58	39.89	36.70	31.29	29.83	48.29	50.59
U4	0:02:30		2.05	3.29	5.92	4.46	7.13	6.58	10.59	9.99	17.53	18.55	39.68	36.70	29.92	29.41	46.93	50.31
U5	0:00:00		1.60	2.80	4.82	3.62	5.89	5.42	8.68	7.99	14.30	14.64	33.41	28.95	23.40	22.12	34.88	37.71
U5	0:00:30		1.53	2.84	4.82	3.47	5.93	5.42	8.75	8.06	14.30	14.68	33.65	29.02	23.33	22.15	34.98	37.88
U5	0:01:00		1.53	2.92	4.89	3.51	5.89	5.67	9.02	8.03	14.71	14.61	33.48	29.06	23.65	22.29	34.91	37.88
U5	0:01:30		1.49	2.88	4.89	3.51	5.93	5.67	8.87	8.06	14.45	14.68	33.65	29.10	23.72	22.61	35.02	37.88
U5	0:02:00		1.53	2.88	4.85	3.80	5.89	5.49	8.90	8.14	14.49	14.68	33.51	29.10	23.69	22.68	35.05	37.95
U5	0:02:30		1.53	2.92	4.89	3.54	5.96	5.71	8.87	8.17	14.82	14.68	33.65	29.13	23.94	22.75	35.09	38.02
U5	0:03:00		1.04	2.39	3.64	2.77	4.43	4.14	6.46	5.29	10.45	9.48	24.10	18.24	13.65	12.89	18.49	21.62
U6	0:00:00		0.60	2.17	2.98	2.29	3.71	3.45	6.05	4.36	9.56	7.69	21.07	16.03	13.29	12.26	16.63	18.31

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
U6	0:00:30	0.56	2.17	2.87	1.99	3.68	3.38	5.97	4.14	9.30	7.25	20.26	15.29	12.79	11.80	15.51	17.04	
U6	0:01:00	0.52	2.13	2.94	2.03	3.64	3.38	6.05	4.18	9.00	7.21	20.19	15.21	12.68	12.18	15.55	17.07	
U6	0:01:30	0.63	2.21	2.79	2.21	3.64	3.38	5.82	4.18	9.04	7.17	20.26	15.29	12.97	12.04	15.41	16.86	
U6	0:02:00	0.48	2.17	2.79	2.21	3.64	3.45	5.82	4.22	9.41	7.14	20.16	15.32	13.00	12.15	15.55	16.86	
U6	0:02:30	-1.23	0.90	-0.66	-0.59	-0.53	-1.05	0.49	-3.85	0.44	-5.57	-1.87	-3.40	3.66	2.96	-5.29	-6.83	
U7	0:00:00	-1.56	0.79	-1.18	-0.92	-0.94	-1.38	0.23	-4.96	-0.15	-6.95	-3.98	-4.76	3.59	3.13	-6.55	-9.19	
U7	0:00:30	-1.49	0.79	-1.29	-1.07	-1.05	-1.45	0.23	-5.21	-0.30	-7.40	-4.37	-5.17	3.44	3.03	-7.04	-10.07	
U7	0:01:00	-1.41	0.71	-1.36	-0.96	-1.09	-1.74	0.26	-5.25	-0.07	-7.54	-4.65	-5.24	3.40	3.31	-7.39	-10.53	
U7	0:01:30	-1.71	0.82	-1.32	-1.03	-1.09	-1.78	0.26	-5.40	-0.30	-7.69	-4.83	-5.32	3.48	3.13	-7.53	-10.88	
U7	0:02:00	-1.75	0.79	-1.29	-1.18	-1.16	-1.78	0.26	-5.44	-0.15	-7.77	-5.07	-5.32	3.44	3.17	-7.77	-11.13	
U7	0:02:30	-1.60	0.75	-1.36	-1.14	-1.13	-1.60	0.30	-5.36	-0.11	-7.77	-5.11	-5.43	3.33	3.20	-7.91	-11.30	
U7	0:03:00	-1.53	0.82	-1.47	-1.00	-1.16	-1.85	0.34	-5.40	-0.07	-7.88	-5.25	-5.39	3.44	3.20	-8.05	-11.44	
U7	0:03:30	-1.64	0.75	-1.40	-1.11	-1.13	-1.60	0.38	-5.51	-0.30	-7.92	-5.14	-5.50	3.40	3.31	-8.09	-11.62	
U7	0:04:00	-1.82	0.82	-1.32	-1.00	-1.13	-1.82	0.38	-5.51	-0.11	-7.92	-5.36	-5.35	3.33	3.20	-8.16	-11.72	
U7	0:04:30	-1.68	0.82	-1.54	-1.11	-1.31	-1.82	0.34	-5.47	-0.07	-7.95	-5.39	-5.50	3.30	3.24	-8.26	-11.83	
U7	0:05:00	-1.82	0.79	-1.51	-1.18	-1.13	-1.85	0.38	-5.47	-0.22	-7.92	-5.29	-5.43	3.33	3.31	-8.33	-11.90	
U7	0:05:30	-1.68	0.75	-1.47	-1.14	-1.20	-1.82	0.38	-5.55	-0.30	-7.99	-5.32	-5.54	3.30	3.24	-8.40	-12.01	
U7	0:06:00	-1.86	0.82	-1.47	-1.03	-1.20	-1.85	0.41	-5.55	-0.30	-7.99	-5.36	-5.58	3.33	3.24	-8.44	-12.04	
U7	0:06:30	-1.68	0.86	-1.54	-1.11	-1.16	-1.60	0.45	-5.55	-0.07	-7.99	-5.39	-5.61	3.22	3.24	-8.47	-12.11	
U7	0:07:00	-1.68	0.79	-1.62	-1.03	-1.20	-1.60	0.41	-5.55	-0.30	-7.99	-5.43	-5.65	3.37	3.28	-8.58	-12.15	
U7	0:07:30	-1.82	0.79	-1.58	-1.00	-1.24	-1.85	0.41	-5.55	-0.11	-8.03	-5.53	-5.50	3.26	3.35	-8.58	-12.25	
U7	0:08:00	-1.68	0.79	-1.51	-1.00	-1.16	-1.85	0.41	-5.55	-0.11	-7.99	-5.43	-5.54	3.37	3.31	-8.61	-12.29	
2L0	0:00:00	-1.79	0.93	-1.88	-0.92	-1.50	-1.60	0.49	-5.51	-0.26	-8.21	-5.92	-5.94	3.11	3.28	-9.35	-13.17	
2L1	0:00:00	-1.86	1.05	-1.65	-1.00	-1.24	-1.45	0.86	-5.25	0.52	-7.62	-5.00	-4.91	5.29	5.14	-5.74	-10.60	
2L1	0:00:00	-1.60	1.23	-1.32	-0.66	-0.75	-1.20	1.58	-4.40	1.82	-6.13	-2.36	-2.22	9.49	8.84	2.59	-4.33	
2L1	0:00:00	-1.15	1.68	-0.29	0.15	0.45	0.04	3.79	-2.59	5.00	-2.86	3.45	4.76	16.19	15.64	13.83	7.22	
2L1	0:00:30	-1.12	1.72	-0.22	0.26	0.53	0.00	3.76	-2.51	5.22	-2.71	3.81	5.17	16.66	16.27	14.08	7.85	
2L1	0:01:00	-1.08	1.72	-0.22	0.18	0.38	0.07	3.76	-2.59	5.19	-2.71	3.84	5.17	16.59	16.16	14.08	7.64	
2L1	0:01:30	-1.15	1.65	-0.22	0.18	0.53	0.07	3.72	-2.66	5.11	-2.75	3.81	5.17	16.34	16.09	13.90	7.57	
2L1	0:02:00	-1.19	1.72	-0.29	0.41	0.45	-0.07	3.72	-2.63	5.08	-2.75	3.77	5.10	16.34	15.71	13.73	7.50	
2L1	0:02:30	-0.97	1.79	-0.04	0.41	0.98	0.44	4.66	-1.66	6.86	-0.74	7.54	10.01	22.53	20.85	21.89	15.00	
2L2	0:00:00	0.74	3.59	3.86	3.47	5.66	4.76	11.50	5.58	16.27	11.63	27.24	31.35	35.97	34.62	43.77	39.01	
2L2	0:00:30	0.74	3.59	3.97	3.73	5.63	4.91	11.23	5.33	15.86	11.41	27.31	30.91	35.82	34.23	43.11	38.62	
2L2	0:01:00	0.78	3.63	3.93	3.54	5.63	4.76	11.31	5.40	16.05	11.37	27.49	31.05	36.15	34.37	43.42	38.97	
2L2	0:01:30	0.82	3.63	3.97	3.65	5.70	4.83	11.34	5.44	16.42	11.60	27.84	31.31	36.47	34.76	43.60	39.33	
2L2	0:02:00	0.82	3.63	4.01	3.51	5.66	4.94	11.31	5.40	16.38	11.48	27.80	31.13	36.04	34.37	43.28	39.01	
2L2	0:02:30	0.78	3.55	3.86	3.69	5.59	4.94	11.23	5.36	16.27	11.37	27.63	30.98	35.82	34.30	43.07	38.83	
2L2	0:03:00	0.89	3.51	4.04	3.65	5.63	4.91	11.19	5.40	16.34	11.78	28.54	32.27	38.94	36.27	46.72	41.40	
2L3	0:00:00	1.71	4.30	6.07	4.98	7.84	6.94	13.94	9.02	20.34	17.58	36.79	40.51	44.73	42.47	56.87	52.63	
2L3	0:00:30	1.71	4.30	5.99	5.09	7.73	6.76	13.79	8.84	20.20	17.28	36.89	40.17	44.37	41.87	56.49	52.39	
2L3	0:01:00	1.86	4.26	6.03	5.13	7.76	6.80	13.71	8.95	20.27	17.47	37.07	40.25	44.48	42.08	56.59	52.53	
2L3	0:01:30	1.71	4.26	5.85	5.13	7.73	6.76	13.67	8.84	20.31	17.24	37.11	40.06	44.59	41.80	56.63	52.49	
2L3	0:02:00	1.71	4.22	5.85	4.98	7.73	6.98	13.67	8.77	20.20	17.24	37.25	40.10	44.37	41.66	56.52	52.49	

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
2L3	0:02:30		1.71	4.22	6.03	5.17	7.69	6.80	13.60	8.80	20.31	17.10	37.14	39.95	44.26	41.87	56.49	52.56
2L4	0:00:00		2.31	4.56	7.43	6.05	9.19	8.29	15.33	11.58	23.09	21.59	43.20	46.12	50.93	47.93	68.74	64.18
2L4	0:00:30		2.42	4.37	7.35	5.87	9.08	8.14	14.95	11.47	22.53	21.44	42.96	45.38	50.13	46.87	68.01	63.83
2L4	0:01:00		2.46	4.34	7.21	5.87	8.89	8.07	14.69	11.21	22.57	21.30	42.99	45.08	49.91	46.59	67.66	63.55
2L4	0:01:30		2.35	4.34	7.13	5.72	8.81	7.89	14.61	11.24	22.46	21.15	43.20	44.97	49.55	46.27	67.41	63.27
2L4	0:02:00		2.38	4.30	7.10	5.68	8.78	7.85	14.58	11.17	22.34	21.07	43.03	44.83	49.69	46.27	67.59	63.37
2L4	0:02:30		2.38	4.22	7.10	5.61	8.70	7.92	14.43	11.06	22.34	21.07	43.10	44.53	49.04	45.82	66.89	62.84
2L4	0:03:00		2.53	4.52	7.46	6.05	9.53	8.47	15.55	12.50	24.12	23.53	46.06	47.82	53.17	49.58	73.43	68.55
2L5	0:00:00		3.28	4.04	8.31	6.27	9.90	9.05	15.21	14.39	23.75	26.61	47.22	49.44	52.16	48.77	80.75	75.38
2L5	0:00:30		3.61	3.63	8.31	6.05	9.71	8.98	14.46	15.02	22.90	26.94	47.01	49.63	50.96	48.00	82.54	77.31
2L5	0:01:00		3.50	3.44	7.94	5.87	9.41	8.91	13.94	14.46	22.46	26.57	46.69	49.37	51.29	47.89	82.01	76.71
2L5	0:01:30		3.46	3.44	7.91	5.87	9.34	8.76	13.79	14.28	22.31	26.80	46.51	49.15	51.32	47.79	81.49	76.26
2L5	0:02:00		3.43	3.37	7.80	5.83	9.26	8.61	13.71	14.09	22.34	26.76	46.62	49.22	51.69	47.86	81.28	76.29
2L5	0:02:30		3.54	3.48	8.09	6.16	9.60	9.01	14.12	14.54	22.94	27.46	47.71	50.29	53.06	49.13	83.49	78.40
2L6	0:00:00		3.65	3.33	8.09	5.98	9.53	9.01	13.86	14.94	22.60	27.69	47.57	50.25	52.12	48.67	84.29	79.00
2L6	0:00:30		3.69	3.18	8.05	5.90	9.49	8.80	13.64	14.79	22.57	27.73	47.50	50.33	52.16	48.46	84.64	79.32
2L6	0:01:00		3.65	3.18	7.94	5.90	9.34	8.87	13.45	14.65	22.05	27.58	47.18	50.03	51.98	48.35	84.40	78.97
2L6	0:01:30		3.65	3.25	7.87	5.94	9.26	8.65	13.34	14.61	22.09	27.46	47.32	50.03	52.27	48.32	84.15	78.93
2L6	0:02:00		3.65	3.10	7.69	5.76	9.26	8.69	13.22	14.50	21.86	27.20	47.11	49.92	52.27	48.28	84.05	78.72
2L6	0:02:30		3.61	3.14	7.80	5.79	9.15	8.65	13.15	14.39	21.83	27.17	47.04	49.81	52.16	48.14	83.84	78.54
2L6	0:03:00		3.61	3.07	7.80	5.79	9.19	8.69	13.07	14.31	21.86	27.50	47.11	49.77	52.05	48.14	83.98	78.65
2L7	0:00:00		3.83	3.03	8.13	5.90	9.56	9.01	13.45	15.13	22.31	28.62	48.24	51.21	52.84	49.13	86.95	81.36
2L7	0:00:30		3.95	2.92	8.13	5.87	9.56	9.12	13.22	15.39	21.90	28.95	47.85	51.29	52.84	49.13	87.65	82.03
2L7	0:01:00		3.95	2.84	8.02	5.79	9.41	8.87	12.96	15.39	21.60	28.80	47.71	51.25	52.41	48.60	87.90	81.89
2L7	0:01:30		4.02	2.80	8.05	5.90	9.38	8.87	12.89	15.50	21.57	29.25	47.75	51.44	51.87	48.63	89.05	82.80
2L7	0:02:00		3.98	2.77	8.05	5.83	9.34	8.91	12.73	15.61	21.31	29.21	47.64	51.44	52.27	48.70	88.77	82.80
2L7	0:02:30		4.06	2.77	8.05	5.94	9.23	8.98	12.66	15.50	21.34	29.47	47.47	51.99	52.59	49.34	89.44	82.95
2L7	0:03:00		4.13	2.69	8.02	5.79	9.34	9.05	12.55	15.68	21.23	29.84	47.71	52.10	52.05	49.30	90.91	83.86
2L7	0:03:30		4.10	2.62	7.80	5.83	9.23	8.91	12.36	15.64	20.97	29.84	47.61	51.99	51.47	48.70	91.68	84.56
2L7	0:04:00		3.83	2.39	7.32	5.28	8.40	8.18	11.12	14.57	18.97	27.91	44.72	48.70	44.08	42.40	82.92	77.73
2U1	0:00:00		3.69	2.43	7.21	5.35	8.33	8.07	11.01	14.46	19.08	27.39	44.75	48.37	43.93	42.22	82.33	77.35
2U1	0:00:30		3.65	2.47	6.99	5.39	8.21	8.11	10.89	14.20	18.79	27.06	44.61	48.11	43.86	41.84	82.05	77.03
2U1	0:01:00		3.57	2.47	6.91	5.35	8.21	8.18	10.82	14.20	18.68	27.32	44.47	47.96	43.86	41.66	81.73	76.75
2U1	0:01:30		3.16	2.06	5.96	4.39	6.98	6.83	9.13	12.46	15.60	23.38	39.36	41.61	32.05	31.62	66.47	65.24
2U2	0:00:00		3.13	2.09	6.07	4.65	7.01	7.05	9.02	12.35	15.90	23.67	39.47	41.54	32.27	31.80	66.57	65.48
2U2	0:00:30		3.13	2.17	6.07	4.69	7.01	7.09	9.24	12.46	15.97	23.34	39.50	41.54	32.49	31.98	66.61	65.41
2U2	0:01:00		3.09	2.17	6.07	4.46	6.98	7.12	9.24	12.50	15.71	23.56	39.50	41.65	32.56	32.01	66.64	65.41
2U2	0:01:30		3.05	2.17	6.07	4.46	7.05	6.94	9.28	12.43	15.82	23.34	39.54	41.50	32.60	32.01	66.64	65.52
2U2	0:02:00		3.02	2.17	6.07	4.69	7.05	6.91	9.24	12.46	15.75	23.30	39.40	41.43	32.67	32.01	66.64	65.41
2U2	0:02:30		2.98	2.21	6.03	4.46	7.01	6.91	9.09	12.39	15.97	23.45	39.43	41.43	32.60	32.01	66.64	65.34
2U2	0:03:00		3.02	2.32	6.03	4.46	7.01	6.91	9.09	12.39	16.01	23.27	39.40	41.39	32.63	32.05	66.61	65.34
2U2	0:03:30		2.98	2.21	6.03	4.69	6.98	6.94	9.09	12.46	15.75	23.53	39.40	41.39	32.74	32.05	66.57	65.31
2U2	0:04:00		2.94	2.24	6.03	4.54	7.01	6.98	9.09	12.46	15.75	23.23	39.40	41.35	32.71	32.15	66.57	65.34

Table I.2 Calculated Strain, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	30.10	30.10	17.10	17.10	5.10	5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
2U2	0:04:30		2.46	1.65	4.71	3.36	5.29	5.45	6.27	9.39	11.19	17.62	29.46	29.10	17.02	17.01	41.22	45.06
2U3	0:00:00		2.20	1.46	4.30	3.43	5.03	5.20	6.12	9.14	10.75	17.32	29.04	28.69	17.78	17.64	41.50	44.64
2U3	0:00:30		2.27	1.57	4.49	3.36	5.03	5.27	6.20	9.25	11.08	17.24	29.14	28.73	18.04	18.03	41.36	44.71
2U3	0:01:00		2.16	1.57	4.30	3.32	4.99	5.16	6.39	9.14	10.67	17.21	28.86	28.43	17.35	17.22	40.10	43.83
2U3	0:01:30		2.12	1.50	4.27	3.10	4.99	5.20	6.09	9.17	10.93	17.02	28.86	28.17	17.46	17.33	40.31	43.73
2U3	0:02:00		2.16	1.61	4.30	3.39	4.91	4.98	6.42	9.06	10.67	16.91	28.79	28.10	17.64	17.43	40.13	43.69
2U3	0:02:30		0.74	0.19	0.92	0.70	0.86	1.05	0.45	1.85	1.26	3.27	4.65	3.21	0.58	0.14	5.04	7.36
2U4	0:00:00		0.22	-0.07	0.07	-0.15	0.08	0.15	-0.23	0.30	0.37	0.82	1.27	0.70	0.36	-0.67	1.93	2.68
2U4	0:00:30		0.15	-0.04	0.15	-0.04	0.00	0.00	-0.19	0.18	0.26	0.45	0.70	0.41	0.33	-0.11	1.02	1.62
2U4	0:01:00		0.15	-0.07	-0.07	0.04	0.00	0.11	-0.15	0.07	-0.04	0.30	0.46	0.26	0.33	-0.53	0.84	1.16
2U4	0:01:30		0.07	-0.04	0.07	-0.04	-0.04	-0.07	-0.08	0.04	0.22	0.22	0.18	0.18	0.04	-0.46	0.18	0.84
2U4	0:02:00		0.04	0.00	-0.11	-0.18	0.00	-0.07	-0.11	0.04	0.19	0.15	0.07	0.15	0.29	-0.42	0.42	0.56
2U4	0:02:30		0.04	0.00	0.00	-0.11	0.00	0.07	-0.04	0.00	-0.04	0.11	0.00	0.11	0.29	-0.04	-0.07	0.35
2U4	0:03:00		0.00	-0.04	-0.07	-0.07	0.00	-0.07	-0.04	-0.04	0.19	0.11	-0.07	0.04	0.00	0.00	0.11	0.18
2U4	0:03:30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table I.3 Calculated Strain, 4 Minute Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L0	0:00:00		-2.68	-1.35	-4.30	-6.35	-5.81	-9.70	-4.77	-26.93	-13.75	-27.46	-43.80	-19.27	-0.58	4.61	-28.26	-48.20
L1	0:04:00		-2.23	-1.05	-3.68	-5.76	-5.14	-8.94	-3.57	-25.56	-11.78	-24.94	-40.35	-15.03	8.15	12.26	-19.89	-40.35
L2	0:04:00		-1.94	-0.49	-2.65	-5.09	-3.90	-7.60	-1.20	-22.97	-7.82	-20.29	-32.07	-6.90	18.76	22.22	-9.10	-28.45
L3	0:04:00		-1.45	-0.07	-1.95	-4.43	-2.81	-6.58	0.53	-20.97	-4.82	-16.91	-26.32	-1.07	23.91	26.83	-2.77	-21.33
L4	0:04:00		-1.01	0.49	-0.88	-3.28	-1.61	-5.38	2.59	-18.46	-1.33	-12.71	-19.13	5.94	28.69	31.48	2.98	-14.15
L5	0:04:00		0.15	1.94	1.58	-1.40	1.46	-1.96	7.59	-11.84	6.04	-3.16	-3.14	20.79	38.76	40.53	15.23	0.81
L6	0:04:00		1.64	3.85	5.00	1.77	5.36	2.44	12.96	-3.18	14.97	6.88	15.79	34.82	48.10	49.16	27.84	16.72
L7	0:04:00		3.28	6.17	9.05	5.68	9.83	7.38	18.60	6.58	23.31	15.94	34.74	46.30	55.96	55.57	42.55	34.57
L8	0:04:00		3.72	6.84	10.08	6.94	11.22	9.56	20.74	10.65	27.50	19.18	43.87	49.48	58.42	56.56	51.41	45.52
L9	0:04:00		3.91	6.80	10.26	7.23	11.82	10.10	21.38	12.21	29.09	20.25	47.04	50.14	58.31	56.59	53.96	48.94
L10	0:04:00		3.72	6.92	10.19	7.27	12.12	10.50	21.53	13.43	29.87	21.44	49.79	50.81	58.75	56.45	57.19	53.23
L11	0:04:00		3.80	6.77	10.26	7.23	12.19	10.69	21.30	14.39	30.27	22.74	51.27	51.47	59.29	56.45	60.55	56.75
L12	0:04:00		3.69	6.39	9.93	7.05	12.00	10.65	20.44	14.57	29.79	23.86	51.66	51.62	58.60	55.57	63.52	60.06
L13	0:04:00		3.65	5.98	9.60	6.79	11.67	10.25	19.27	14.68	28.57	24.23	51.62	51.32	57.16	53.77	67.06	63.51
L14	0:04:00		3.76	5.46	9.41	6.60	11.40	10.10	18.11	14.65	27.94	25.20	51.62	50.96	55.85	52.33	70.49	67.21
L15	0:04:00		3.95	4.71	9.27	6.42	10.95	9.85	16.87	14.57	26.50	26.13	51.38	50.88	56.21	51.91	73.82	70.66
L16	0:04:00		4.06	4.26	9.01	6.27	10.69	9.56	15.82	14.72	25.35	26.54	51.24	50.99	56.03	51.42	76.97	73.76
L17	0:04:00		4.06	3.78	8.75	6.16	10.28	9.23	14.76	14.72	24.31	27.39	51.02	50.81	55.60	51.20	79.84	76.12
U1	0:03:00		3.43	3.70	8.02	5.53	9.34	8.58	13.49	13.24	22.53	24.71	48.45	47.52	49.80	45.99	72.56	70.31
U2	0:03:00		2.72	3.48	6.84	4.80	8.06	7.34	11.80	11.32	19.64	21.15	43.77	41.69	38.14	35.96	58.80	59.32
U3	0:03:00		2.23	3.18	6.03	4.46	7.20	6.80	10.59	10.02	17.42	18.73	39.85	37.03	31.33	29.93	48.75	50.98
U4	0:02:30		2.05	3.29	5.92	4.46	7.13	6.58	10.59	9.99	17.53	18.55	39.68	36.70	29.92	29.41	46.93	50.31
U5	0:03:00		1.04	2.39	3.64	2.77	4.43	4.14	6.46	5.29	10.45	9.48	24.10	18.24	13.65	12.89	18.49	21.62
U6	0:02:30		-1.23	0.90	-0.66	-0.59	-0.53	-1.05	0.49	-3.85	0.44	-5.57	-1.87	-3.40	3.66	2.96	-5.29	-6.83
U7	0:03:00		-1.53	0.82	-1.47	-1.00	-1.16	-1.85	0.34	-5.40	-0.07	-7.88	-5.25	-5.39	3.44	3.20	-8.05	-11.44
U7	0:06:00		-1.86	0.82	-1.47	-1.03	-1.20	-1.85	0.41	-5.55	-0.30	-7.99	-5.36	-5.58	3.33	3.24	-8.44	-12.04
2L0	0:00:00		-1.79	0.93	-1.88	-0.92	-1.50	-1.60	0.49	-5.51	-0.26	-8.21	-5.92	-5.94	3.11	3.28	-9.35	-13.17
2L1	0:02:30		-0.97	1.79	-0.04	0.41	0.98	0.44	4.66	-1.66	6.86	-0.74	7.54	10.01	22.53	20.85	21.89	15.00
2L2	0:03:00		0.89	3.51	4.04	3.65	5.63	4.91	11.19	5.40	16.34	11.78	28.54	32.27	38.94	36.27	46.72	41.40
2L3	0:02:30		1.71	4.22	6.03	5.17	7.69	6.80	13.60	8.80	20.31	17.10	37.14	39.95	44.26	41.87	56.49	52.56
2L4	0:03:00		2.53	4.52	7.46	6.05	9.53	8.47	15.55	12.50	24.12	23.53	46.06	47.82	53.17	49.58	73.43	68.55
2L5	0:02:30		3.54	3.48	8.09	6.16	9.60	9.01	14.12	14.54	22.94	27.46	47.71	50.29	53.06	49.13	83.49	78.40
2L6	0:03:00		3.61	3.07	7.80	5.79	9.19	8.69	13.07	14.31	21.86	27.50	47.11	49.77	52.05	48.14	83.98	78.65
2L7	0:03:00		4.13	2.69	8.02	5.79	9.34	9.05	12.55	15.68	21.23	29.84	47.71	52.10	52.05	49.30	90.91	83.86
2L7	0:04:00		3.83	2.39	7.32	5.28	8.40	8.18	11.12	14.57	18.97	27.91	44.72	48.70	44.08	42.40	82.92	77.73
2U1	0:01:30		3.16	2.06	5.96	4.39	6.98	6.83	9.13	12.46	15.60	23.38	39.36	41.61	32.05	31.62	66.47	65.24
2U2	0:03:00		3.02	2.32	6.03	4.46	7.01	6.91	9.09	12.39	16.01	23.27	39.40	41.39	32.63	32.05	66.61	65.34
2U3	0:02:30		0.74	0.19	0.92	0.70	0.86	1.05	0.45	1.85	1.26	3.27	4.65	3.21	0.58	0.14	5.04	7.36
2U4	0:03:00		0.00	-0.04	-0.07	-0.07	0.00	-0.07	-0.04	-0.04	0.19	0.11	-0.07	0.04	0.00	0.00	0.11	0.18

Table I.4 Average Calculated Strain, 4 Minute Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain											
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+30.10	+17.10	+5.10	-4.90	-13.90	-18.90	-24.90	-26.40	-28.90	-32.90	-38.6
L0	0:00:00	0.00	-2.01	-5.32	-7.76	-15.85	-20.61	-31.54	-10.73	-5.95	2.02	-38.23	0.00
L1	0:04:00	0.00	-1.64	-4.72	-7.04	-14.56	-18.36	-27.69	-4.36	1.10	10.20	-30.12	14.33
L2	0:04:00	0.00	-1.21	-3.87	-5.75	-12.08	-14.06	-19.49	4.92	10.76	20.49	-18.78	27.84
L3	0:04:00	0.00	-0.76	-3.19	-4.70	-10.22	-10.86	-13.70	10.04	15.79	25.37	-12.05	34.81
L4	0:04:00	0.00	-0.26	-2.08	-3.50	-7.93	-7.02	-6.59	15.55	21.00	30.08	-5.59	41.95
L5	0:04:00	0.00	1.05	0.09	-0.25	-2.12	1.44	8.83	27.13	31.82	39.64	8.02	56.64
L6	0:04:00	0.00	2.74	3.39	3.90	4.89	10.92	25.30	38.76	42.46	48.63	22.28	70.91
L7	0:04:00	0.00	4.72	7.36	8.60	12.59	19.63	40.52	48.80	51.41	55.77	38.56	85.59
L8	0:04:00	0.00	5.28	8.51	10.39	15.69	23.34	46.67	52.17	54.16	57.49	48.46	93.10
L9	0:04:00	0.00	5.36	8.75	10.96	16.79	24.67	48.59	52.87	54.59	57.45	51.45	96.87
L10	0:04:00	0.00	5.32	8.73	11.31	17.48	25.66	50.30	53.61	55.10	57.60	55.21	100.63
L11	0:04:00	0.00	5.28	8.75	11.44	17.84	26.51	51.37	54.18	55.56	57.87	58.65	104.75
L12	0:04:00	0.00	5.04	8.49	11.33	17.50	26.83	51.64	53.81	55.04	57.09	61.79	107.60
L13	0:04:00	0.00	4.82	8.19	10.96	16.98	26.40	51.47	52.77	53.78	55.46	65.29	111.32
L14	0:04:00	0.00	4.61	8.01	10.75	16.38	26.57	51.29	51.88	52.71	54.09	68.85	114.26
L15	0:04:00	0.00	4.33	7.84	10.40	15.72	26.31	51.13	51.80	52.65	54.06	72.24	118.32
L16	0:04:00	0.00	4.16	7.64	10.12	15.27	25.94	51.11	51.59	52.39	53.72	75.36	122.38
L17	0:04:00	0.00	3.92	7.46	9.75	14.74	25.85	50.92	51.32	52.10	53.40	77.98	125.46
U1	0:03:00	0.00	3.56	6.78	8.96	13.36	23.62	47.99	46.91	47.28	47.90	71.43	107.18
U2	0:03:00	0.00	3.10	5.82	7.70	11.56	20.39	42.73	38.41	37.90	37.05	59.06	90.06
U3	0:03:00	0.00	2.71	5.25	7.00	10.31	18.07	38.44	32.94	32.07	30.63	49.86	71.18
U4	0:02:30	0.00	2.67	5.19	6.85	10.29	18.04	38.19	32.26	31.28	29.66	48.62	52.78
U5	0:03:00	0.00	1.72	3.20	4.28	5.88	9.96	21.17	15.98	14.96	13.27	20.05	37.03
U6	0:02:30	0.00	-0.17	-0.63	-0.79	-1.68	-2.57	-2.63	0.99	1.86	3.31	-6.06	3.18
U7	0:03:00	0.00	-0.35	-1.23	-1.51	-2.53	-3.98	-5.32	-0.02	1.23	3.32	-9.75	0.00
U7	0:06:00	0.00	-0.52	-1.25	-1.53	-2.57	-4.14	-5.47	-0.10	1.17	3.29	-10.24	0.00
2L0	0:00:00	0.00	-0.43	-1.40	-1.55	-2.51	-4.24	-5.93	-0.33	0.99	3.20	-11.26	0.00
2L1	0:02:30	0.00	0.41	0.18	0.71	1.50	3.06	8.77	16.34	18.34	21.69	18.44	34.02
2L2	0:03:00	0.00	2.20	3.85	5.27	8.30	14.06	30.41	34.08	35.40	37.60	44.06	69.99
2L3	0:02:30	0.00	2.97	5.60	7.24	11.20	18.70	38.55	40.44	41.42	43.07	54.52	88.81
2L4	0:03:00	0.00	3.53	6.76	9.00	14.03	23.82	46.94	48.60	49.64	51.38	70.99	105.81
2L5	0:02:30	0.00	3.51	7.13	9.31	14.33	25.20	49.00	49.21	49.92	51.09	80.94	124.99
2L6	0:03:00	0.00	3.34	6.79	8.94	13.69	24.68	48.44	48.40	49.04	50.09	81.31	129.30
2L7	0:03:00	0.00	3.41	6.90	9.20	14.11	25.54	49.91	49.30	49.82	50.68	87.39	132.30
2L7	0:04:00	0.00	3.11	6.30	8.29	12.85	23.44	46.71	43.63	43.48	43.24	80.33	130.12
2U1	0:01:30	0.00	2.61	5.17	6.90	10.80	19.49	40.49	34.43	33.46	31.84	65.85	97.61
2U2	0:03:00	0.00	2.67	5.25	6.96	10.74	19.64	40.39	34.70	33.82	32.34	65.97	72.48
2U3	0:02:30	0.00	0.47	0.81	0.96	1.15	2.27	3.93	1.71	1.20	0.36	6.20	31.83
2U4	0:03:00	0.00	-0.02	-0.07	-0.04	-0.04	0.15	-0.02	-0.01	0.00	0.00	0.14	0.00

337

Ground Surface

Top of Mid Cell

Bottom of Mid Cell

Top of Bottom Cell

Table I.5 Shaft Load, 4 Minute Readings, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Shaft Load, tons											
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+30.10	+17.10	+5.10	-4.90	-13.90	-18.90	-24.90	-26.4	-28.9	-32.9	-38.6
L0	0:00:00	0.00	-16.36	-43.26	-63.05	-128.77	-167.26	-254.89	-91.63	-50.81	17.22	-326.37	0.0
L1	0:04:00	0.00	-13.33	-38.32	-57.20	-118.32	-149.03	-223.78	-37.25	9.38	87.10	-257.13	122.4
L2	0:04:00	0.00	-9.84	-31.44	-46.71	-98.19	-114.08	-157.49	41.97	91.84	174.95	-160.30	237.7
L3	0:04:00	0.00	-6.20	-25.90	-38.16	-83.06	-88.18	-110.70	85.68	134.77	216.59	-102.88	297.2
L4	0:04:00	0.00	-2.11	-16.93	-28.41	-64.45	-57.00	-53.30	132.79	179.31	256.85	-47.71	358.2
L5	0:04:00	0.00	8.50	0.73	-2.03	-17.25	11.69	71.33	231.61	271.68	338.46	68.48	483.6
L6	0:04:00	0.00	22.30	27.51	31.68	39.73	88.66	204.50	330.91	362.51	415.18	190.23	605.4
L7	0:04:00	0.00	38.37	59.83	69.90	102.29	159.30	327.52	416.66	438.95	476.09	329.20	730.7
L8	0:04:00	0.00	42.92	69.11	84.40	127.52	189.42	377.23	445.38	462.42	490.81	413.76	794.8
L9	0:04:00	0.00	43.53	71.06	89.05	136.42	200.26	392.73	451.39	466.06	490.50	439.25	827.0
L10	0:04:00	0.00	43.23	70.91	91.89	141.99	208.24	406.53	457.66	470.45	491.76	471.34	859.1
L11	0:04:00	0.00	42.92	71.06	92.94	144.98	215.17	415.19	462.52	474.35	494.07	500.72	894.3
L12	0:04:00	0.00	40.95	68.96	92.03	142.22	217.74	417.36	459.37	469.87	487.38	527.55	918.7
L13	0:04:00	0.00	39.13	66.57	89.03	137.94	214.29	416.02	450.52	459.15	473.53	557.38	950.4
L14	0:04:00	0.00	37.45	65.07	87.37	133.06	215.65	414.53	442.89	449.98	461.80	587.81	975.5
L15	0:04:00	0.00	35.17	63.73	84.51	127.72	213.56	413.23	442.22	449.46	461.54	616.74	1010.1
L16	0:04:00	0.00	33.80	62.08	82.26	124.05	210.56	413.11	440.44	447.27	458.66	643.41	1044.8
L17	0:04:00	0.00	31.83	60.59	79.26	119.78	209.82	411.51	438.15	444.81	455.91	665.74	1071.1
U1	0:03:00	0.00	28.95	55.05	72.79	108.58	191.74	387.84	400.49	403.65	408.92	609.85	915.0
U2	0:03:00	0.00	25.17	47.27	62.59	93.90	165.53	345.32	327.90	323.55	316.29	504.22	768.9
U3	0:03:00	0.00	21.99	42.64	56.87	83.76	146.70	310.71	281.20	273.82	261.52	425.70	607.7
U4	0:02:30	0.00	21.69	42.19	55.68	83.61	146.40	308.66	275.40	267.09	253.23	415.07	450.6
U5	0:03:00	0.00	13.96	26.03	34.81	47.74	80.87	171.11	136.43	127.76	113.31	171.20	316.1
U6	0:02:30	0.00	-1.35	-5.09	-6.42	-13.64	-20.82	-21.27	8.44	15.86	28.24	-51.73	27.1
U7	0:03:00	0.00	-2.86	-10.02	-12.25	-20.56	-32.28	-43.00	-0.18	10.53	28.37	-83.22	0.0
U7	0:06:00	0.00	-4.22	-10.17	-12.41	-20.86	-33.63	-44.18	-0.84	10.00	28.05	-87.42	0.0
2L0	0:00:00	0.00	-3.46	-11.37	-12.59	-20.40	-34.39	-47.95	-2.81	8.47	27.28	-96.12	0.0
2L1	0:02:30	0.00	3.36	1.50	5.73	12.16	24.81	70.91	139.46	156.60	185.16	157.45	290.4
2L2	0:03:00	0.00	17.91	31.27	42.79	67.42	114.13	245.76	290.93	302.22	321.04	376.15	597.6
2L3	0:02:30	0.00	24.12	45.48	58.85	91.01	151.79	311.54	345.22	353.64	367.67	465.49	758.2
2L4	0:03:00	0.00	28.66	54.91	73.11	113.97	193.38	379.35	414.92	423.81	438.63	606.07	903.4
2L5	0:02:30	0.00	28.49	57.90	75.63	116.43	204.55	396.04	420.14	426.17	436.21	691.06	1067.0
2L6	0:03:00	0.00	27.13	55.20	72.63	111.26	200.34	391.53	413.22	418.64	427.67	694.20	1103.8
2L7	0:03:00	0.00	27.72	56.10	74.71	114.68	207.29	403.35	420.92	425.31	432.64	746.04	1129.5
2L7	0:04:00	0.00	25.30	51.16	67.36	104.37	190.27	377.52	372.50	371.25	369.16	685.81	1110.9
2U1	0:01:30	0.00	21.21	42.04	56.10	87.72	158.19	327.22	293.98	285.67	271.83	562.20	833.4
2U2	0:03:00	0.00	21.67	42.64	56.55	87.27	159.39	326.47	296.25	288.69	276.10	563.25	618.8
2U3	0:02:30	0.00	3.78	6.58	7.79	9.34	18.39	31.78	14.56	10.25	3.08	52.94	271.8
2U4	0:03:00	0.00	-0.15	-0.60	-0.30	-0.30	1.20	-0.14	-0.05	-0.03	0.00	1.20	0.0
Modulus, ksi		3991.2	3991.2	3991.2	3991.2	3991.2	3987.1	3970.1	3970.1	3970.1	3970.1	3970.1	3970.1
Diameter, in		72.00	72.00	72.00	72.00	72.00	72.00	72.00	74.00	74.00	74.00	74.00	74.00
		Top of Shaft							Top of Mid Cell	Bottom of Mid Cell		Top of Bottom Cell	

Table I.6 Average Segment Side Shear, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf											
		CL Elev., ft	+38.55	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	-25.65	-27.65	-30.90	-35.75
		Length, ft	16.90	13.00	12.00	10.00	9.00	5.00	6.00	1.50	2.50	4.00	5.70
L0	0:00:00		-0.12	-0.18	-0.15	-0.41	-0.29	-1.00	1.36	1.34	1.34	-4.50	2.89
L1	0:04:00		-0.11	-0.17	-0.15	-0.39	-0.25	-0.86	1.56	1.54	1.54	-4.51	3.37
L2	0:04:00		-0.10	-0.15	-0.13	-0.34	-0.16	-0.53	1.67	1.65	1.65	-4.39	3.54
L3	0:04:00		-0.09	-0.15	-0.12	-0.30	-0.10	-0.30	1.65	1.62	1.62	-4.19	3.56
L4	0:04:00		-0.07	-0.13	-0.12	-0.26	-0.02	-0.03	1.56	1.53	1.53	-4.00	3.61
L5	0:04:00		-0.04	-0.10	-0.08	-0.15	0.10	0.57	1.33	1.31	1.31	-3.55	3.69
L6	0:04:00		0.00	-0.04	-0.05	-0.02	0.22	1.16	1.04	1.02	1.02	-2.97	3.69
L7	0:04:00		0.05	0.02	-0.02	0.11	0.27	1.72	0.71	0.70	0.70	-1.96	3.57
L8	0:04:00		0.07	0.04	0.00	0.16	0.30	1.93	0.53	0.52	0.52	-1.06	3.38
L9	0:04:00		0.07	0.05	0.01	0.19	0.31	1.98	0.44	0.44	0.44	-0.73	3.44
L10	0:04:00		0.07	0.05	0.03	0.20	0.32	2.04	0.38	0.37	0.37	-0.33	3.44
L11	0:04:00		0.07	0.05	0.03	0.21	0.35	2.06	0.35	0.34	0.34	0.02	3.50
L12	0:04:00		0.06	0.05	0.04	0.20	0.38	2.05	0.30	0.29	0.29	0.45	3.47
L13	0:04:00		0.06	0.05	0.03	0.19	0.38	2.07	0.23	0.23	0.23	1.01	3.49
L14	0:04:00		0.05	0.05	0.03	0.18	0.42	2.04	0.18	0.18	0.18	1.56	3.44
L15	0:04:00		0.04	0.05	0.03	0.16	0.44	2.05	0.19	0.18	0.18	1.94	3.50
L16	0:04:00		0.04	0.05	0.02	0.16	0.44	2.08	0.17	0.17	0.17	2.32	3.57
L17	0:04:00		0.03	0.05	0.02	0.15	0.47	2.07	0.17	0.16	0.16	2.64	3.60
U1	0:03:00		0.03	0.04	0.01	0.12	0.42	2.01	0.04	0.04	0.04	2.53	2.70
U2	0:03:00		0.01	0.02	0.00	0.10	0.36	1.84	-0.22	-0.22	-0.22	2.36	2.33
U3	0:03:00		0.00	0.02	0.00	0.08	0.31	1.67	-0.32	-0.32	-0.32	2.05	1.58
U4	0:02:30		0.00	0.02	-0.01	0.08	0.30	1.66	-0.36	-0.35	-0.35	2.02	0.25
U5	0:03:00		-0.02	-0.02	-0.03	0.00	0.13	0.89	-0.37	-0.37	-0.37	0.68	1.25
U6	0:02:30		-0.07	-0.08	-0.07	-0.10	-0.11	-0.07	0.19	0.19	0.19	-1.10	0.65
U7	0:03:00		-0.07	-0.09	-0.08	-0.11	-0.13	-0.18	0.31	0.30	0.30	-1.51	0.69
U7	0:06:00		-0.08	-0.09	-0.08	-0.11	-0.14	-0.18	0.31	0.31	0.31	-1.56	0.72
2L0	0:00:00		-0.08	-0.10	-0.07	-0.11	-0.15	-0.21	0.33	0.32	0.32	-1.66	0.80
2L1	0:02:30		-0.06	-0.07	-0.05	-0.03	0.01	0.42	0.53	0.52	0.52	-0.43	1.14
2L2	0:03:00		-0.01	-0.01	-0.01	0.06	0.21	1.33	0.33	0.32	0.32	0.64	1.94
2L3	0:02:30		0.01	0.02	-0.01	0.10	0.29	1.63	0.23	0.22	0.22	1.19	2.58
2L4	0:03:00		0.02	0.04	0.01	0.15	0.40	1.91	0.24	0.24	0.24	2.09	2.62
2L5	0:02:30		0.02	0.05	0.01	0.15	0.45	1.97	0.14	0.14	0.14	3.22	3.34
2L6	0:03:00		0.02	0.05	0.01	0.14	0.46	1.96	0.12	0.12	0.12	3.37	3.64
2L7	0:03:00		0.02	0.05	0.02	0.15	0.48	2.01	0.09	0.08	0.08	3.98	3.41
2L7	0:04:00		0.01	0.04	0.01	0.13	0.44	1.92	-0.11	-0.11	-0.11	4.02	3.78
2U1	0:01:30		0.00	0.02	0.00	0.10	0.35	1.73	-0.36	-0.35	-0.35	3.68	2.39
2U2	0:03:00		0.00	0.02	0.00	0.10	0.36	1.71	-0.33	-0.33	-0.33	3.64	0.44
2U3	0:02:30		-0.05	-0.05	-0.06	-0.06	-0.01	0.08	-0.22	-0.22	-0.22	0.58	1.91
2U4	0:03:00		-0.07	-0.07	-0.06	-0.07	-0.06	-0.08	-0.07	-0.07	-0.07	-0.05	-0.08
Segment Wt., tons			20.93	16.10	14.86	12.38	11.15	6.19	7.64	1.96	3.27	5.23	7.46
Maximum Shear, tsf			0.07	0.05	0.04	0.21	0.48	2.08	1.67	1.65	1.65	4.02	3.78

Table I.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 5 -1996

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain								Shaft Compression			Error	
		CL Elev., ft	+38.55	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	Strain Gage		TT in	in	%
		Length, ft	16.90	13.00	12.00	10.00	9.00	5.00	6.00	Net, in	Change, in			
L0	0:00:00		-1.01	-3.67	-6.54	-11.80	-18.23	-26.07	-21.13	-0.0082	0.0000	0.0000	0.0000	
L1	0:04:00		-0.82	-3.18	-5.88	-10.80	-16.46	-23.02	-16.03	-0.0071	0.0011	0.0000	0.0011	
L2	0:04:00		-0.61	-2.54	-4.81	-8.92	-13.07	-16.77	-7.28	-0.0052	0.0030	0.0010	0.0020	196.6%
L3	0:04:00		-0.38	-1.98	-3.94	-7.46	-10.54	-12.28	-1.83	-0.0039	0.0043	0.0021	0.0022	106.4%
L4	0:04:00		-0.13	-1.17	-2.79	-5.71	-7.48	-6.81	4.48	-0.0022	0.0060	0.0036	0.0024	66.7%
L5	0:04:00		0.52	0.57	-0.08	-1.19	-0.34	5.13	17.98	0.0016	0.0098	0.0069	0.0029	42.0%
L6	0:04:00		1.37	3.07	3.64	4.39	7.91	18.11	32.03	0.0061	0.0142	0.0109	0.0033	30.7%
L7	0:04:00		2.36	6.04	7.98	10.60	16.11	30.07	44.66	0.0106	0.0188	0.0137	0.0051	37.2%
L8	0:04:00		2.64	6.89	9.45	13.04	19.52	35.01	49.42	0.0123	0.0205	0.0151	0.0054	36.2%
L9	0:04:00		2.68	7.05	9.85	13.87	20.73	36.63	50.73	0.0128	0.0210	0.0157	0.0053	33.8%
L10	0:04:00		2.66	7.02	10.02	14.39	21.57	37.98	51.95	0.0132	0.0213	0.0161	0.0052	32.6%
L11	0:04:00		2.64	7.01	10.09	14.64	22.18	38.94	52.77	0.0134	0.0216	0.0163	0.0053	32.7%
L12	0:04:00		2.52	6.76	9.91	14.42	22.17	39.23	52.72	0.0133	0.0215	0.0164	0.0051	30.8%
L13	0:04:00		2.41	6.50	9.58	13.97	21.69	38.94	52.12	0.0130	0.0212	0.0165	0.0047	28.7%
L14	0:04:00		2.30	6.31	9.38	13.57	21.47	38.93	51.58	0.0128	0.0210	0.0166	0.0044	26.4%
L15	0:04:00		2.16	6.09	9.12	13.06	21.02	38.72	51.46	0.0126	0.0208	0.0166	0.0042	25.0%
L16	0:04:00		2.08	5.90	8.88	12.70	20.60	38.53	51.35	0.0124	0.0206	0.0166	0.0040	23.9%
L17	0:04:00		1.96	5.69	8.61	12.25	20.30	38.38	51.12	0.0122	0.0204	0.0166	0.0038	22.6%
U1	0:03:00		1.78	5.17	7.87	11.16	18.49	35.80	47.45	0.0112	0.0194	0.0163	0.0031	19.0%
U2	0:03:00		1.55	4.46	6.76	9.63	15.97	31.56	40.57	0.0097	0.0179	0.0160	0.0019	12.0%
U3	0:03:00		1.35	3.98	6.12	8.65	14.19	28.26	35.69	0.0086	0.0168	0.0149	0.0019	12.8%
U4	0:02:30		1.33	3.93	6.02	8.57	14.16	28.11	35.22	0.0085	0.0167	0.0148	0.0020	13.4%
U5	0:03:00		0.86	2.46	3.74	5.08	7.92	15.57	18.58	0.0048	0.0130	0.0137	-0.0006	-4.6%
U6	0:02:30		-0.08	-0.40	-0.71	-1.23	-2.12	-2.60	-0.82	-0.0008	0.0074	0.0092	-0.0018	-19.4%
U7	0:03:00		-0.18	-0.79	-1.37	-2.02	-3.25	-4.65	-2.67	-0.0014	0.0068	0.0080	-0.0012	-14.9%
U7	0:06:00		-0.26	-0.89	-1.39	-2.05	-3.36	-4.80	-2.78	-0.0015	0.0067	0.0080	-0.0012	-15.7%
2L0	0:00:00		-0.21	-0.91	-1.47	-2.03	-3.37	-5.08	-3.13	-0.0015	0.0067	0.0075	-0.0008	-10.7%
2L1	0:02:30		0.21	0.30	0.45	1.10	2.28	5.91	12.55	0.0018	0.0100	0.0078	0.0022	27.9%
2L2	0:03:00		1.10	3.03	4.56	6.78	11.18	22.23	32.24	0.0070	0.0152	0.0115	0.0038	32.9%
2L3	0:02:30		1.48	4.28	6.42	9.22	14.95	28.62	39.49	0.0092	0.0174	0.0132	0.0042	31.6%
2L4	0:03:00		1.76	5.14	7.88	11.51	18.93	35.38	47.77	0.0113	0.0195	0.0144	0.0051	35.7%
2L5	0:02:30		1.75	5.32	8.22	11.82	19.77	37.10	49.11	0.0117	0.0199	0.0153	0.0046	30.3%
2L6	0:03:00		1.67	5.07	7.87	11.32	19.19	36.56	48.42	0.0114	0.0196	0.0153	0.0043	28.3%
2L7	0:03:00		1.71	5.16	8.05	11.65	19.83	37.72	49.60	0.0117	0.0199	0.0155	0.0044	28.6%
2L7	0:04:00		1.56	4.71	7.29	10.57	18.14	35.08	45.17	0.0107	0.0189	0.0155	0.0034	22.2%
2U1	0:01:30		1.31	3.89	6.04	8.85	15.14	29.99	37.46	0.0089	0.0171	0.0152	0.0020	13.0%
2U2	0:03:00		1.33	3.96	6.10	8.85	15.19	30.02	37.55	0.0090	0.0172	0.0151	0.0021	13.7%
2U3	0:02:30		0.23	0.64	0.88	1.05	1.71	3.10	2.82	0.0010	0.0092	0.0126	-0.0034	-27.0%
2U4	0:03:00		-0.01	-0.05	-0.06	-0.04	0.06	0.07	-0.01	0.0000	0.0082	0.0098	-0.0016	-16.1%

Table I.8 Movement at Segment Centerline, Shaft 5 - 1996

Load Interval	Elapsed Time hhmmss	Segment Movement, in								Mid Cell
		CL Elev., ft	+38.55	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	-24.90
		Length, ft	16.90	13.00	12.00	10.00	9.00	5.00	6.00	-
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:04:00	0.0039	0.0040	0.0041	0.0042	0.0044	0.0045	0.0048	0.0050	0.0050
L2	0:04:00	0.0099	0.0100	0.0102	0.0105	0.0110	0.0115	0.0123	0.0128	0.0128
L3	0:04:00	0.0161	0.0163	0.0166	0.0171	0.0178	0.0186	0.0197	0.0204	0.0204
L4	0:04:00	0.0238	0.0241	0.0245	0.0252	0.0261	0.0273	0.0288	0.0297	0.0297
L5	0:04:00	0.0418	0.0423	0.0431	0.0442	0.0458	0.0477	0.0500	0.0515	0.0515
L6	0:04:00	0.0734	0.0742	0.0755	0.0772	0.0796	0.0823	0.0855	0.0875	0.0875
L7	0:04:00	0.1327	0.1338	0.1357	0.1380	0.1412	0.1448	0.1488	0.1512	0.1512
L8	0:04:00	0.1936	0.1948	0.1968	0.1994	0.2030	0.2068	0.2112	0.2138	0.2138
L9	0:04:00	0.2379	0.2391	0.2411	0.2439	0.2475	0.2515	0.2560	0.2586	0.2586
L10	0:04:00	0.3007	0.3019	0.3039	0.3067	0.3104	0.3145	0.3190	0.3217	0.3217
L11	0:04:00	0.3695	0.3707	0.3727	0.3755	0.3792	0.3834	0.3880	0.3907	0.3907
L12	0:04:00	0.4602	0.4613	0.4633	0.4661	0.4698	0.4740	0.4786	0.4813	0.4813
L13	0:04:00	0.5731	0.5743	0.5762	0.5789	0.5826	0.5867	0.5913	0.5940	0.5940
L14	0:04:00	0.7038	0.7050	0.7069	0.7096	0.7132	0.7173	0.7219	0.7245	0.7245
L15	0:04:00	0.8838	0.8848	0.8867	0.8894	0.8930	0.8970	0.9016	0.9042	0.9042
L16	0:04:00	1.0572	1.0583	1.0601	1.0627	1.0663	1.0703	1.0748	1.0775	1.0775
L17	0:04:00	1.2168	1.2178	1.2196	1.2222	1.2257	1.2297	1.2342	1.2369	1.2369
U1	0:03:00	1.2300	1.2310	1.2327	1.2352	1.2385	1.2424	1.2467	1.2492	1.2492
U2	0:03:00	1.2308	1.2317	1.2333	1.2356	1.2387	1.2423	1.2462	1.2485	1.2485
U3	0:03:00	1.2279	1.2288	1.2303	1.2324	1.2354	1.2388	1.2425	1.2445	1.2445
U4	0:02:30	1.2237	1.2245	1.2260	1.2282	1.2311	1.2345	1.2382	1.2402	1.2402
U5	0:03:00	1.2175	1.2182	1.2194	1.2212	1.2236	1.2262	1.2289	1.2304	1.2304
U6	0:02:30	1.1802	1.1806	1.1813	1.1823	1.1838	1.1854	1.1868	1.1876	1.1876
U7	0:03:00	1.1418	1.1421	1.1427	1.1436	1.1450	1.1465	1.1478	1.1485	1.1485
U7	0:06:00	1.1407	1.1410	1.1416	1.1426	1.1439	1.1454	1.1467	1.1474	1.1474
2L0	0:00:00	1.1444	1.1447	1.1453	1.1463	1.1476	1.1491	1.1504	1.1510	1.1510
2L1	0:02:30	1.1520	1.1524	1.1532	1.1545	1.1564	1.1585	1.1606	1.1619	1.1619
2L2	0:03:00	1.1903	1.1911	1.1924	1.1943	1.1970	1.2001	1.2034	1.2054	1.2054
2L3	0:02:30	1.2192	1.2201	1.2217	1.2239	1.2269	1.2303	1.2342	1.2364	1.2364
2L4	0:03:00	1.2788	1.2798	1.2815	1.2839	1.2873	1.2912	1.2955	1.2980	1.2980
2L5	0:02:30	1.5323	1.5332	1.5350	1.5375	1.5410	1.5449	1.5493	1.5519	1.5519
2L6	0:03:00	1.6591	1.6600	1.6617	1.6642	1.6676	1.6715	1.6758	1.6784	1.6784
2L7	0:03:00	1.8352	1.8362	1.8379	1.8404	1.8438	1.8478	1.8523	1.8548	1.8548
2L7	0:04:00	1.8793	1.8802	1.8819	1.8842	1.8875	1.8913	1.8956	1.8980	1.8980
2U1	0:01:30	1.8788	1.8796	1.8811	1.8832	1.8863	1.8897	1.8935	1.8957	1.8957
2U2	0:03:00	1.8754	1.8763	1.8778	1.8799	1.8830	1.8864	1.8902	1.8924	1.8924
2U3	0:02:30	1.8667	1.8672	1.8680	1.8694	1.8712	1.8732	1.8749	1.8758	1.8758
2U4	0:03:00	1.8176	1.8180	1.8187	1.8199	1.8216	1.8233	1.8249	1.8257	1.8257

Table I.9 Section Properties, Shaft 5 - 1996

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	20	1.561	31.229
3/4" Galvanized Steel Telltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			35.173

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.586
Area of Pipe =			28.354

342

Concrete Modulus 3800 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
47.0	72	4071.50	35.17	28.35	4007.98	3991.24	4PVC pipe, 4hose
-8.9	72	4071.50	34.51	28.35	4008.64	3987.11	4PVC pipe, 4hose
-24.0	74	4300.84	33.18	27.47	4240.20	3970.11	4PVC pipe, 2hose

Figure I.1 Shaft Top VW Strain, Shaft 5 - 1996

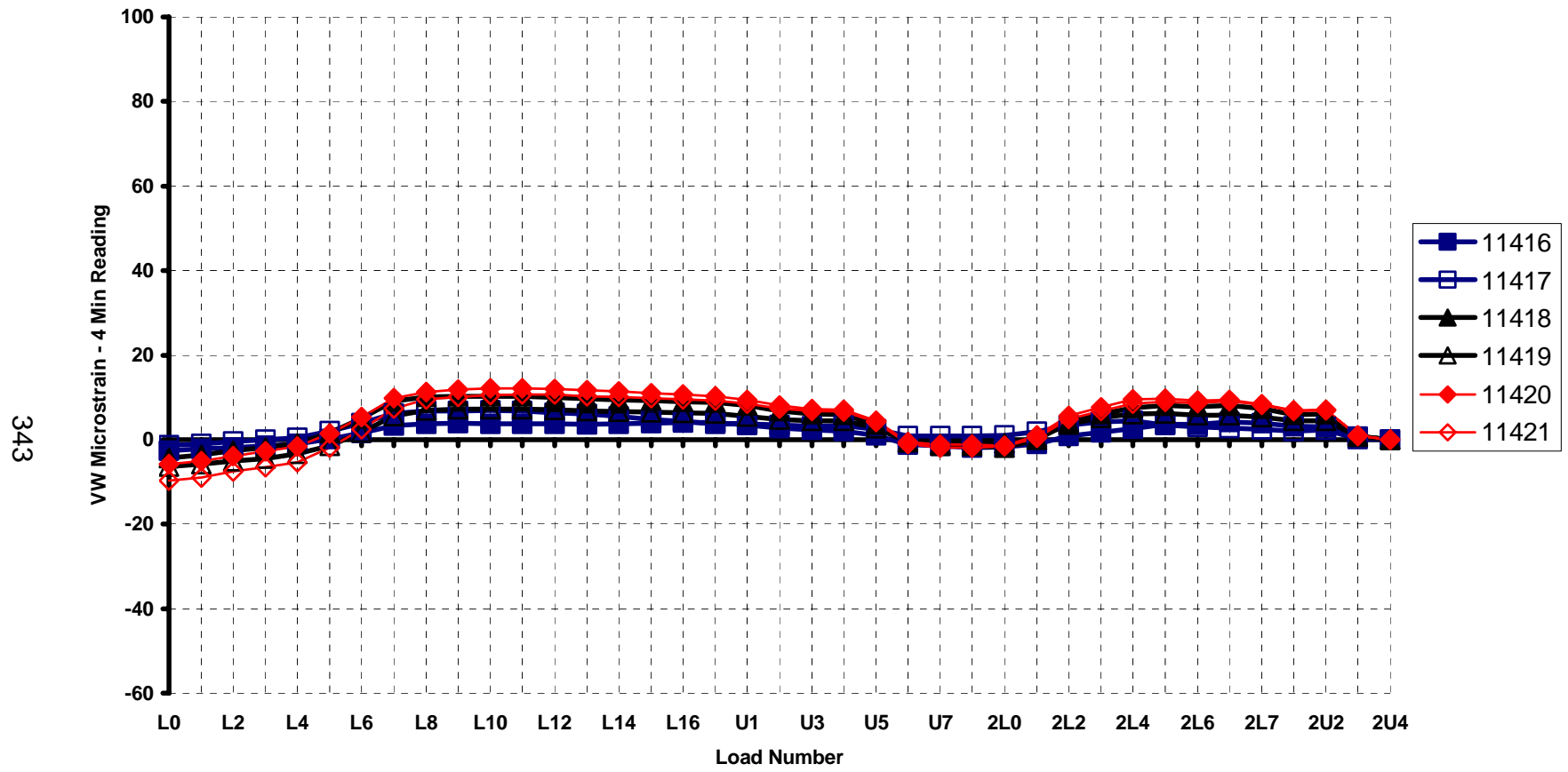


Figure I.2 Shaft Middle VW Strain, Shaft 5 - 1996

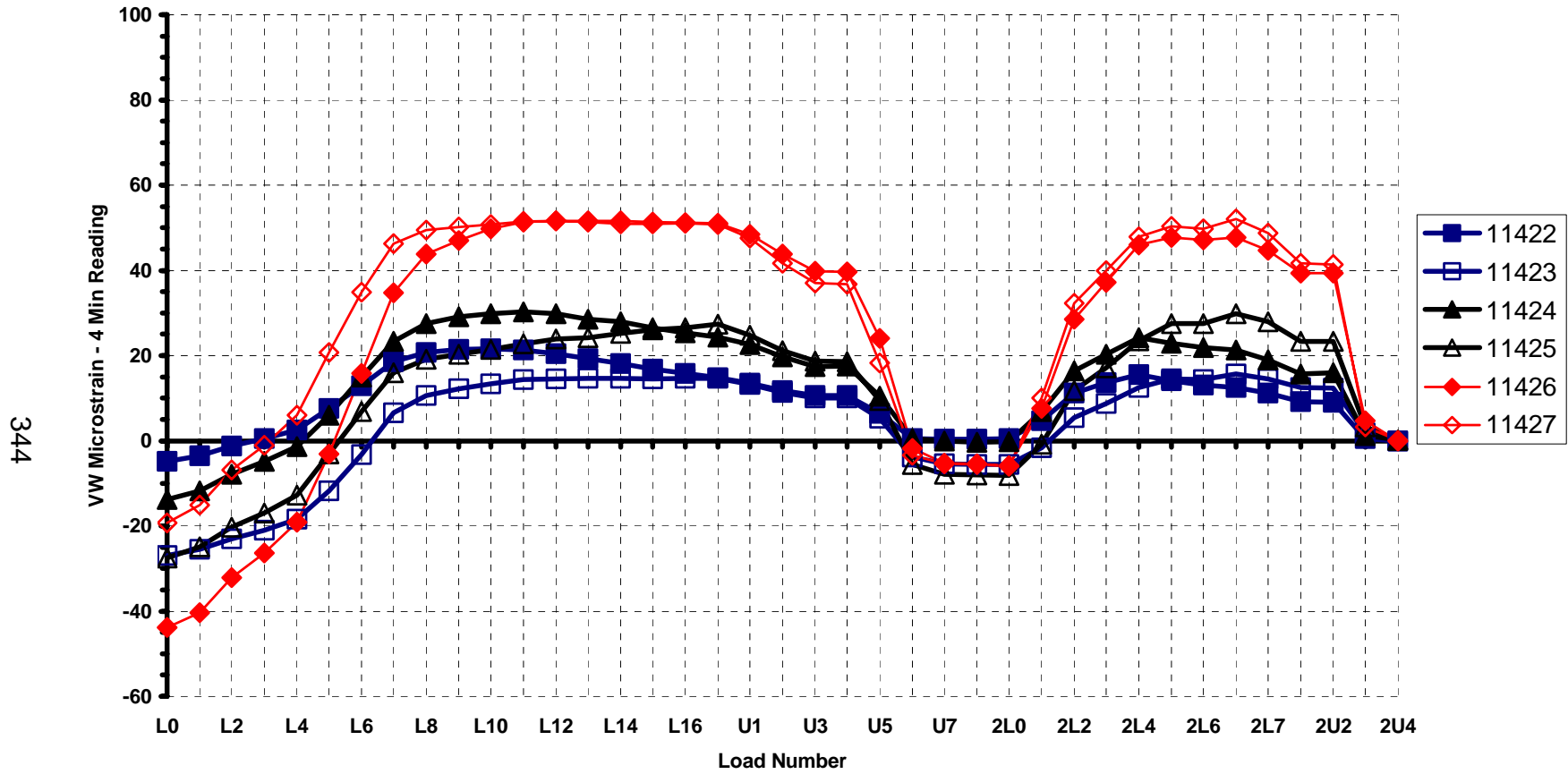


Figure I.3 Shaft Bottom VW Strain, Shaft 5 - 1996

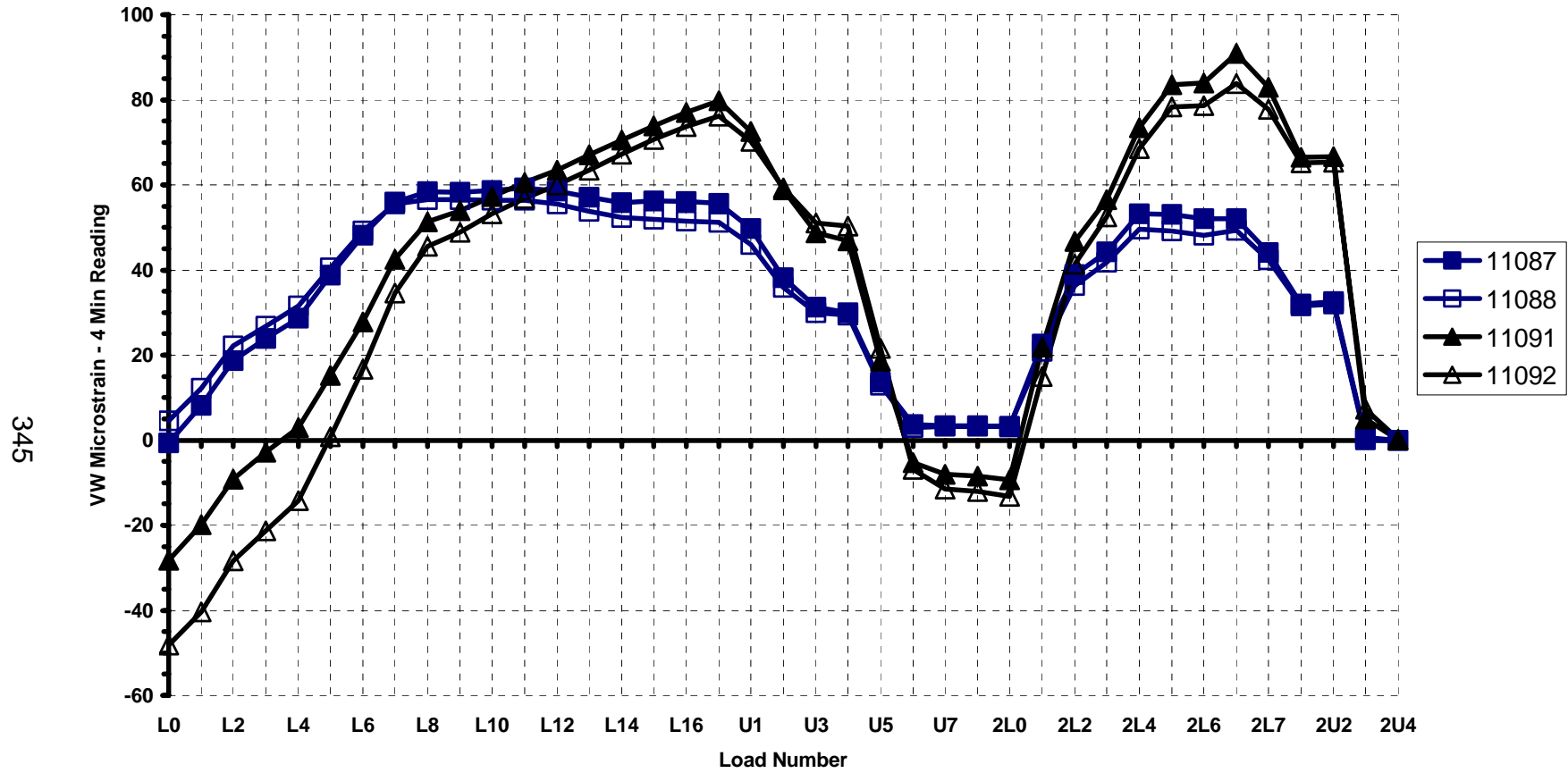


Figure I.4 Shaft Top Shear Stress vs. Movement, Shaft 5 - 1996

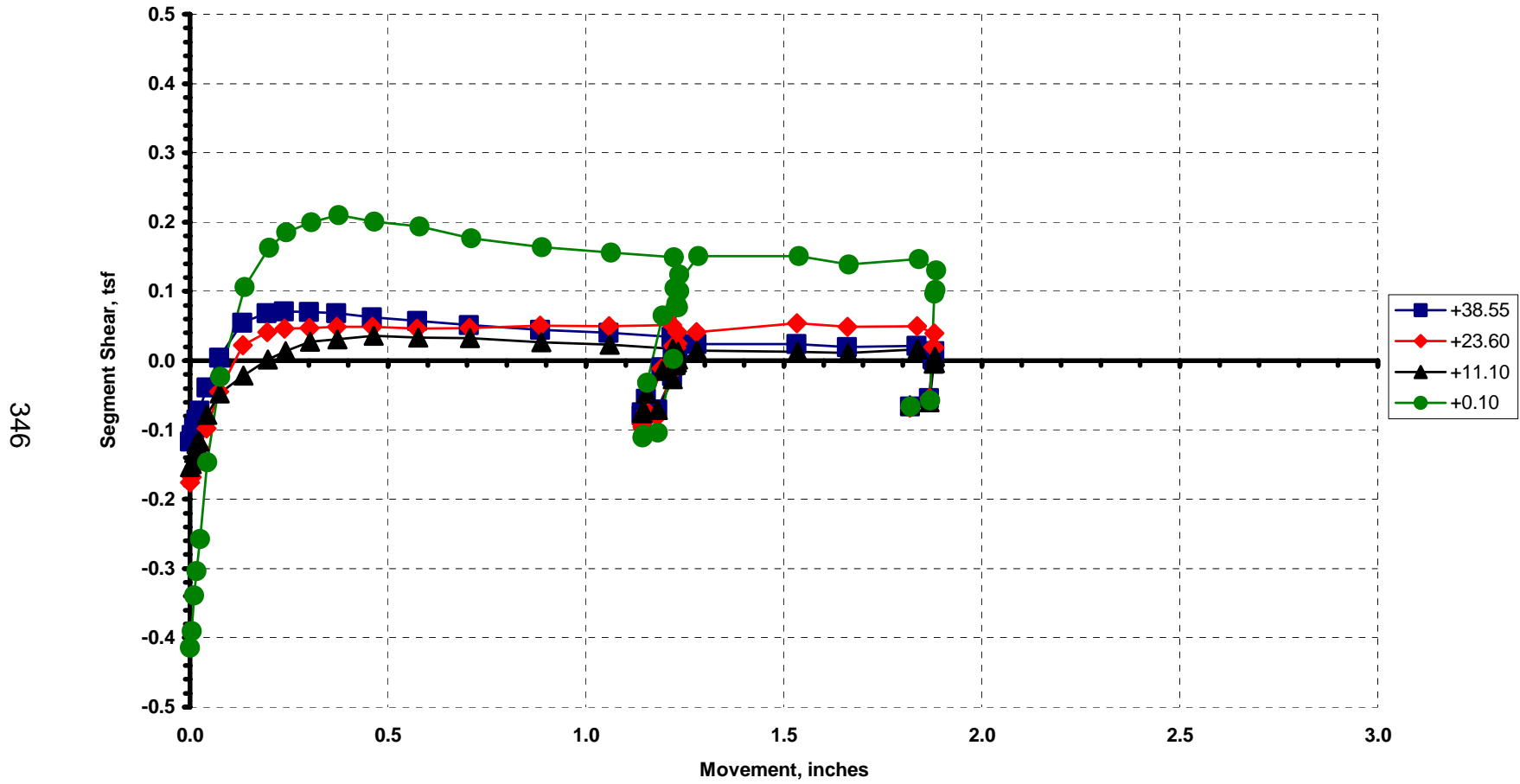


Figure I.5 Shaft Middle Shear Stress vs. Movement, Shaft 5 - 1996

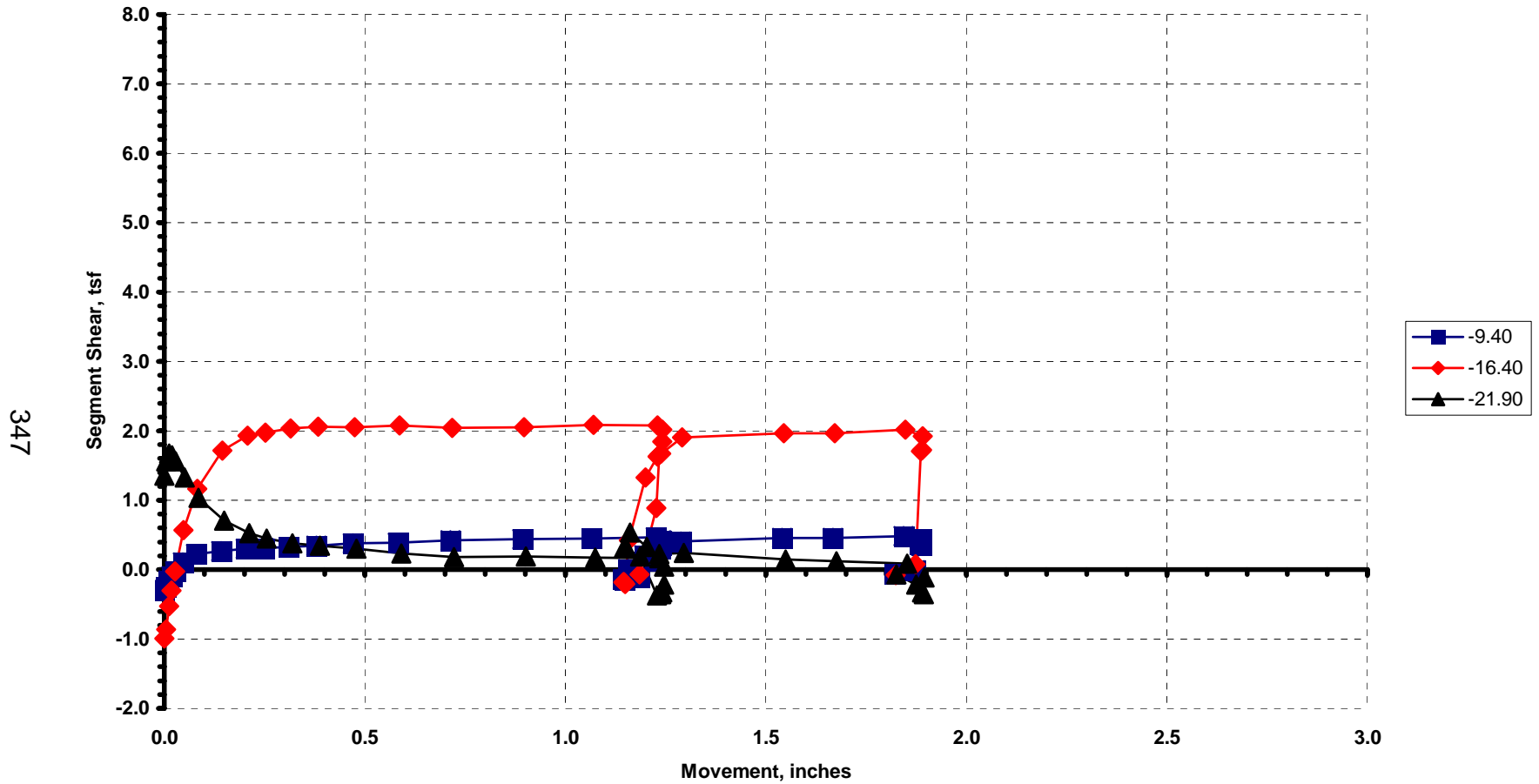
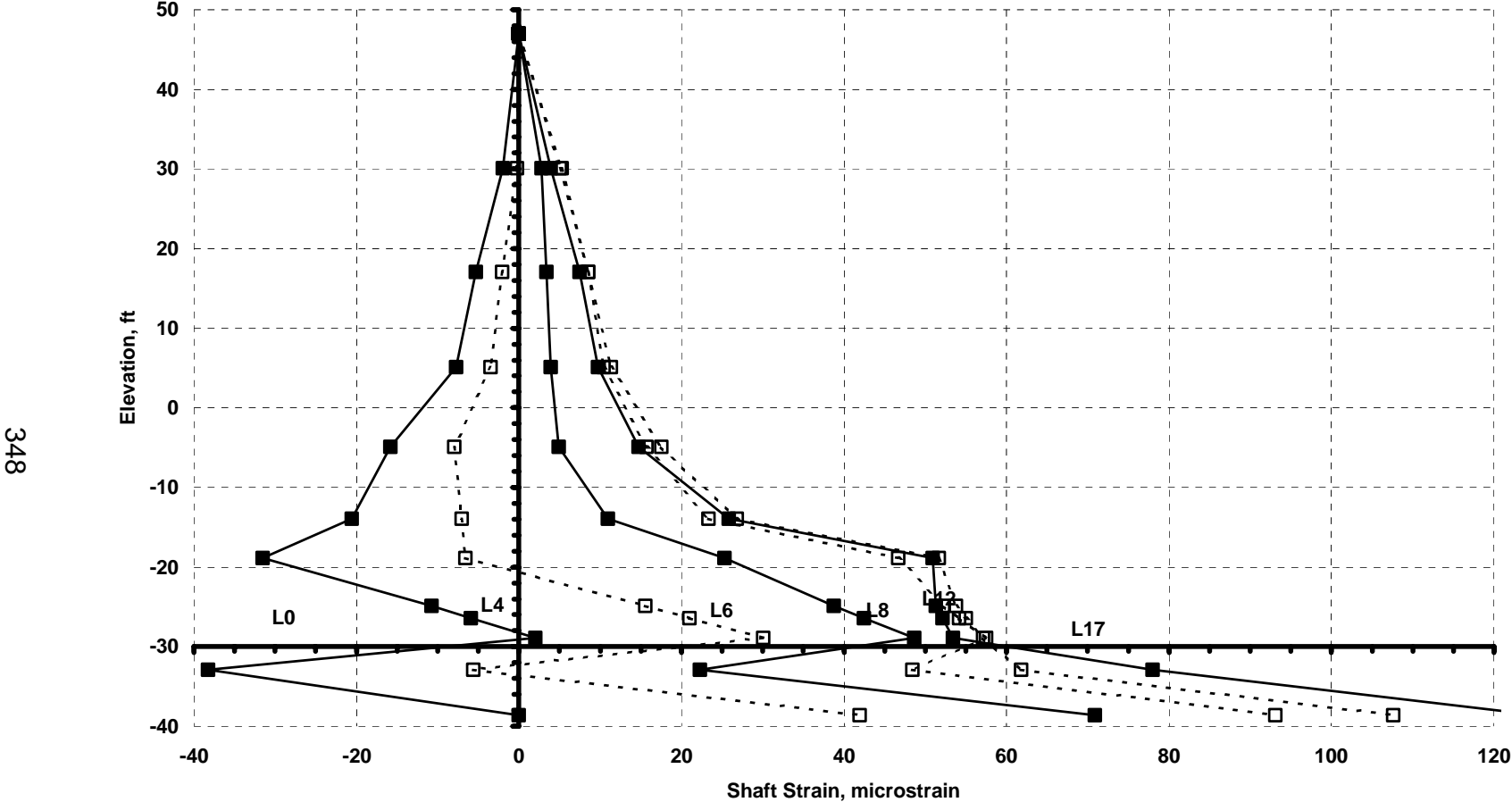
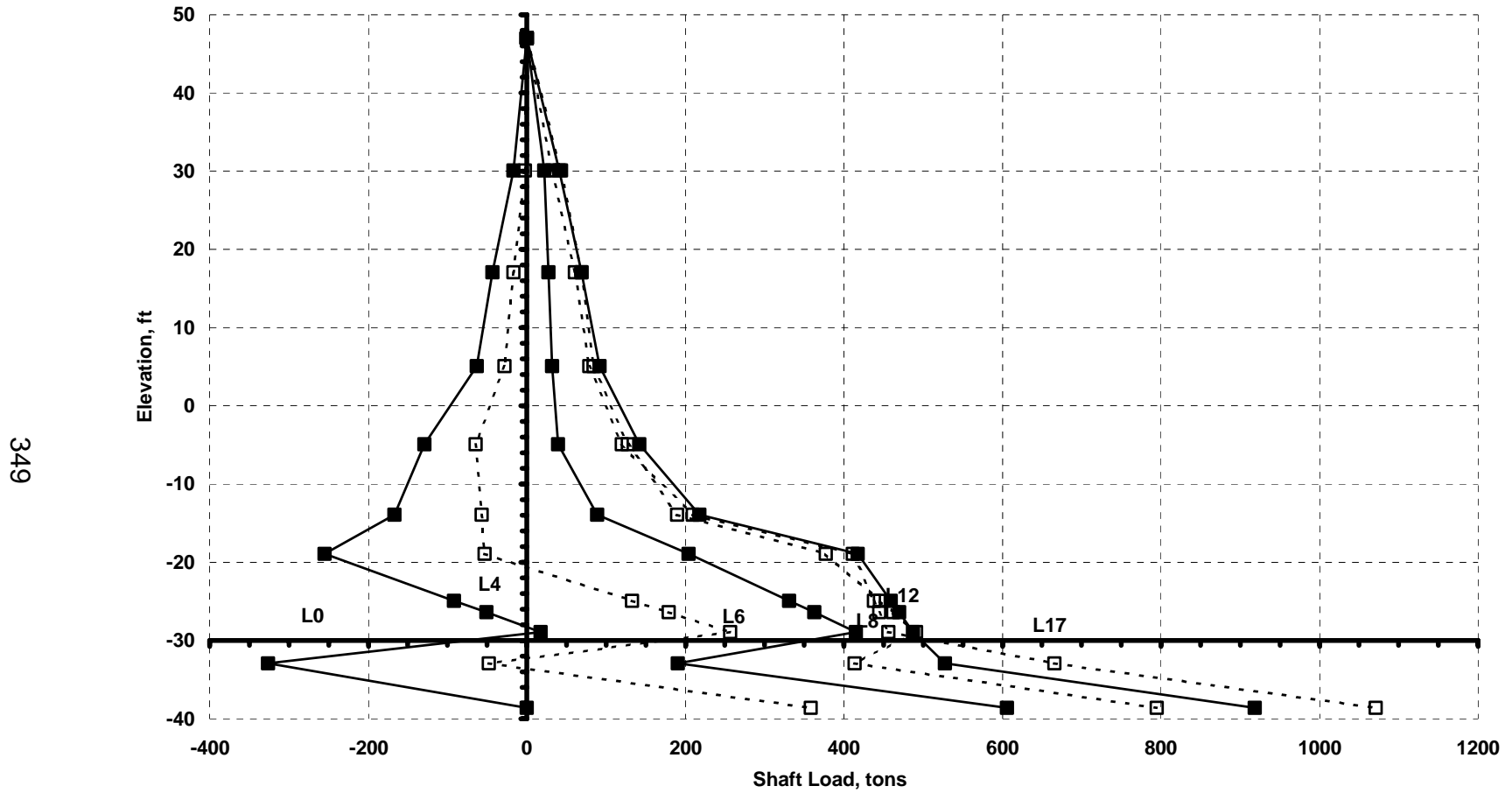


Figure I.6 Strain Distribution, Shaft 5 - 1996



348

Figure I.7 Load Distribution, Shaft 5 - 1996



349

Figure I.8 Shear Stress Distribution, Shaft 5 - 1996

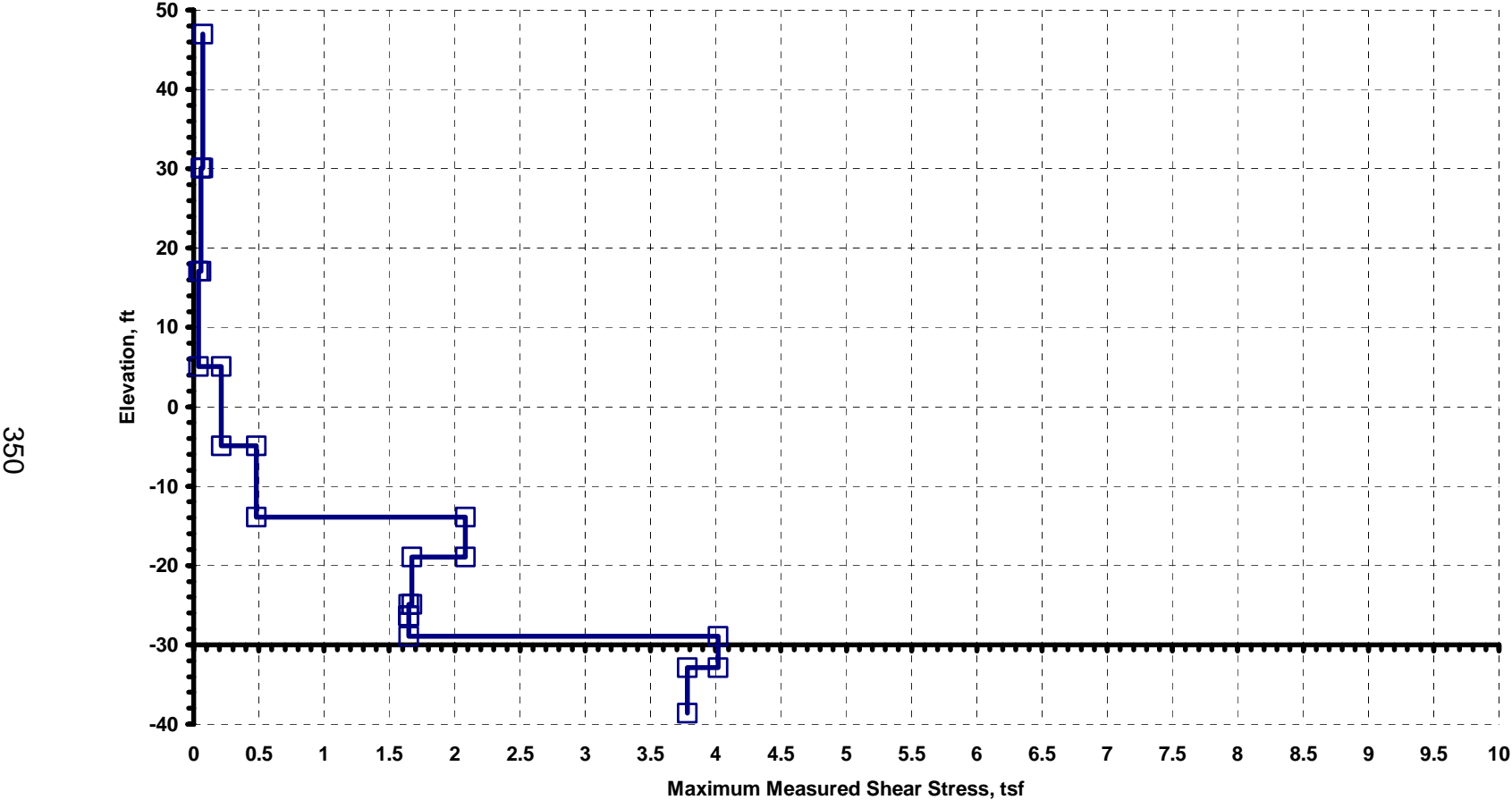


Figure I.9 Average Compression vs Load, Stage 1 - Shaft 5 - 1996

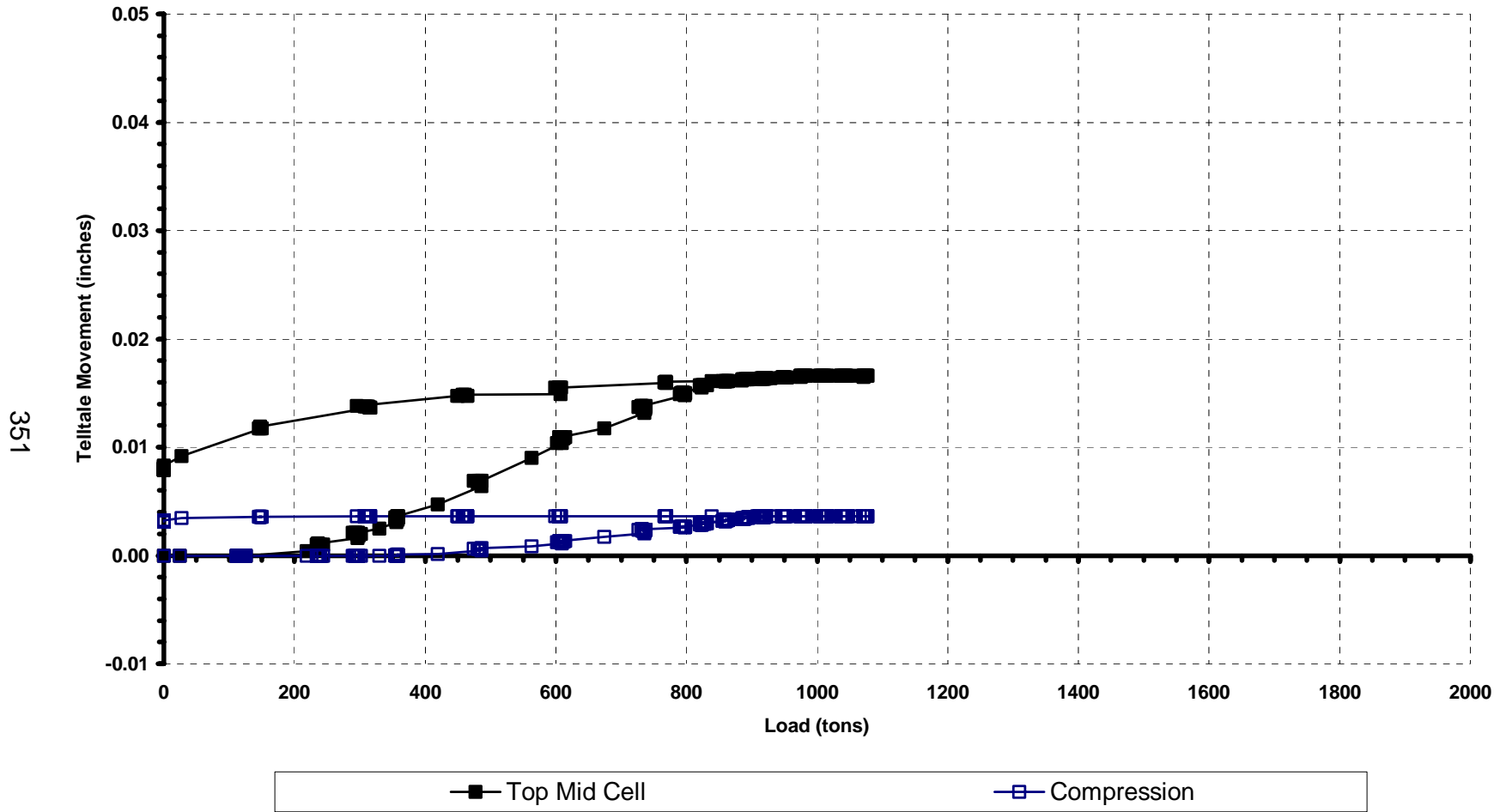


Figure I.10 Mid Cell Movement, Stage 1 - Shaft 5 - 1996

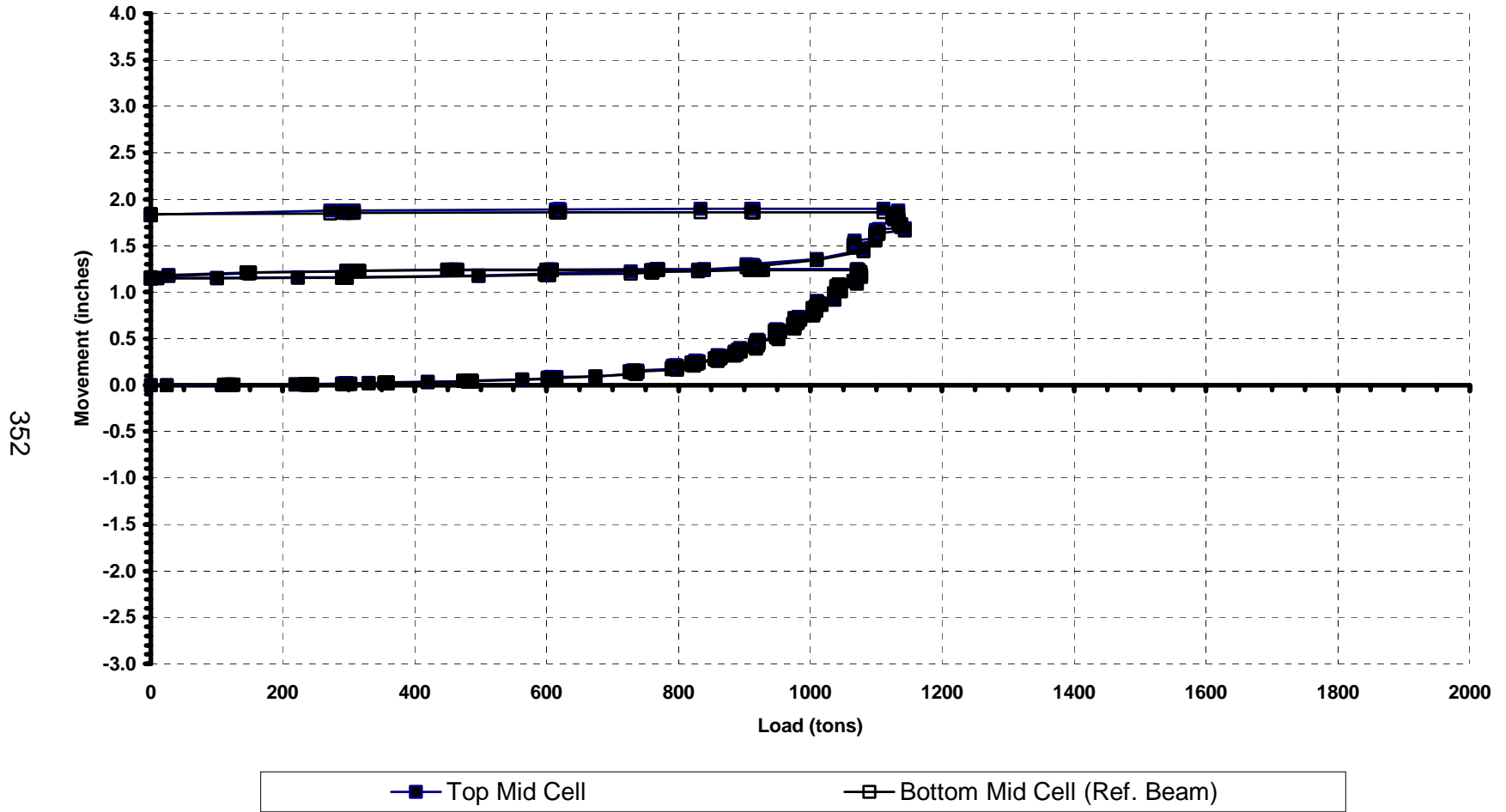
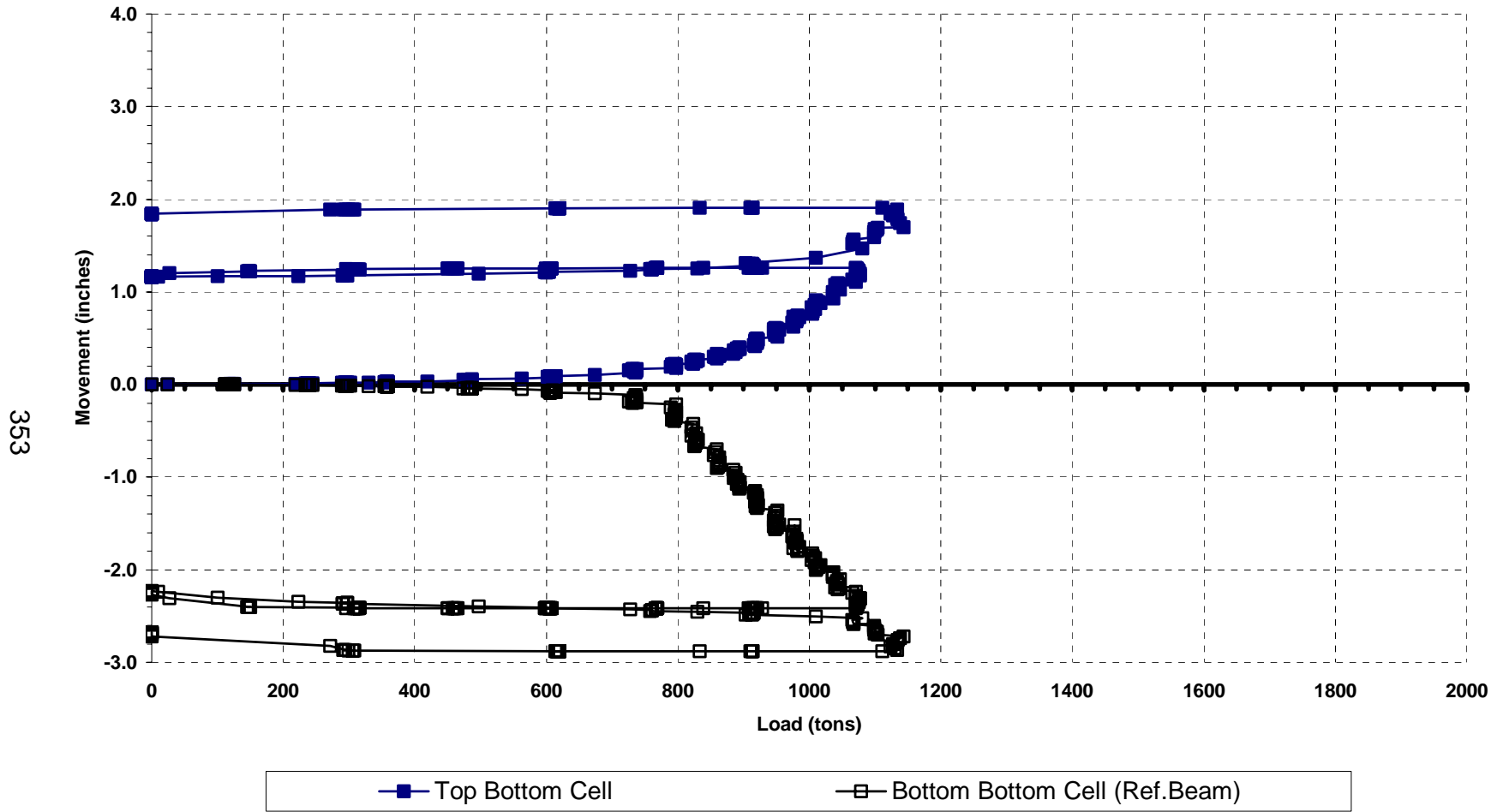


Figure I.11 Bottom Cell Movement, Stage 1 - Shaft 5 - 1996



**APPENDIX J
TEST SHAFT 5 – ANALYSIS OF 2002 TEST**

Table J.1 Adjusted Indicator Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft				Survey Level Readings				Compression		
				DG #11	DG #12	DG #13	Average	Ruler 1	Ruler 2	Ruler 3	Average	TT #1	TT #6	Avg Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:00:30	4.3	12.1	-0.1203	-0.0003	-0.0008	-0.0405					0.0000	0.0000	0.0000
L1	0:01:00	4.5	16.4	-0.0049	-0.0005	-0.0020	-0.0025					0.0000	0.0000	0.0000
L1	0:02:00	4.5	15.8	-0.0037	0.0003	-0.0015	-0.0016	0.01	0.01	0.01	0.01	0.0000	0.0000	0.0000
L1	0:04:00	4.1	14.1	0.0013	-0.0004	0.0033	0.0014	0.01	0.02	0.01	0.01	0.0000	0.0000	0.0000
L2	0:00:30	91.2	48.9	-0.0004	0.0031	0.0048	0.0025					0.0002	0.0002	0.0002
L2	0:01:00	89.9	49.2	0.0025	0.0032	0.0059	0.0039					0.0002	0.0002	0.0002
L2	0:02:00	88.3	48.3	0.0026	0.0020	0.0056	0.0034	0.01	0.02	0.02	0.02	0.0002	0.0002	0.0002
L2	0:04:00	86.6	50.5	-0.0002	0.0007	0.0023	0.0009	0.01	0.02	0.02	0.02	0.0002	0.0003	0.0003
L3	0:00:30	209.1	108.2	0.0144	0.0107	0.0160	0.0137					0.0006	0.0010	0.0008
L3	0:01:00	213.7	108.6	0.0140	0.0107	0.0155	0.0134					0.0006	0.0010	0.0008
L3	0:02:00	211.0	110.3	0.0138	0.0112	0.0159	0.0136	0.03	0.02	0.02	0.03	0.0006	0.0010	0.0008
L3	0:04:00	206.5	109.8	0.0145	0.0114	0.0162	0.0140	0.03	0.02	0.02	0.03	0.0007	0.0011	0.0009
L4	0:00:30	329.2	193.3	0.0309	0.0284	0.0333	0.0309					0.0019	0.0025	0.0022
L4	0:01:00	338.0	198.8	0.0314	0.0294	0.0340	0.0316					0.0019	0.0025	0.0022
L4	0:02:00	337.2	199.2	0.0332	0.0293	0.0345	0.0323	0.05	0.04	0.03	0.04	0.0019	0.0025	0.0022
L4	0:04:00	336.7	202.9	0.0331	0.0312	0.0354	0.0332	0.06	0.04	0.03	0.05	0.0020	0.0026	0.0023
L5	0:00:30	454.9	300.7	0.0727	0.0608	0.0665	0.0667					0.0035	0.0040	0.0038
L5	0:01:00	461.0	301.6	0.0730	0.0610	0.0667	0.0669					0.0035	0.0040	0.0038
L5	0:02:00	456.2	303.2	0.0741	0.0629	0.0684	0.0685	0.08	0.08	0.07	0.08	0.0035	0.0040	0.0038
L5	0:04:00	453.8	306.9	0.0719	0.0651	0.0696	0.0689	0.10	0.10	0.08	0.09	0.0037	0.0041	0.0039
L6	0:00:30	564.9	399.8	0.1200	0.1117	0.1146	0.1154					0.0048	0.0052	0.0050
L6	0:01:00	578.8	406.8	0.1258	0.1162	0.1197	0.1206					0.0048	0.0052	0.0050
L6	0:02:00	570.1	408.5	0.1291	0.1222	0.1246	0.1253	0.15	0.14	0.17	0.15	0.0048	0.0052	0.0050
L6	0:04:00	576.9	413.5	0.1368	0.1275	0.1310	0.1318	0.16	0.15	0.17	0.16	0.0048	0.0052	0.0050
L7	0:00:30	706.2	520.9	0.2116	0.2040	0.2071	0.2076					0.0055	0.0059	0.0057
L7	0:01:00	704.0	521.0	0.2164	0.2096	0.2127	0.2129					0.0055	0.0059	0.0057
L7	0:02:00	707.7	525.9	0.2251	0.2208	0.2228	0.2229	0.25	0.25	0.27	0.26	0.0055	0.0059	0.0057
L7	0:04:00	700.7	529.9	0.2454	0.2365	0.2405	0.2408	0.29	0.26	0.28	0.28	0.0055	0.0059	0.0057
L8	0:00:30	767.2	579.1	0.3419	0.3289	0.3320	0.3343					0.0058	0.0062	0.0060
L8	0:01:00	770.1	578.7	0.3511	0.3414	0.3433	0.3453					0.0058	0.0062	0.0060
L8	0:02:00	752.7	579.3	0.3685	0.3613	0.3638	0.3645	0.42	0.40	0.40	0.41	0.0058	0.0062	0.0060
L8	0:04:00	751.0	580.3	0.4112	0.3989	0.4042	0.4048	0.44	0.45	0.43	0.44	0.0058	0.0062	0.0060
L9	0:00:30	794.8	606.1	0.5148	0.5033	0.5106	0.5096					0.0061	0.0063	0.0062
L9	0:01:00	795.3	606.1	0.5325	0.5212	0.5283	0.5273					0.0061	0.0063	0.0062
L9	0:02:00	796.9	606.5	0.5581	0.5480	0.5531	0.5531	0.58	0.58	0.59	0.58	0.0061	0.0063	0.0062
L9	0:04:00	793.6	609.2	0.6137	0.6022	0.6083	0.6081	0.64	0.64	0.66	0.64	0.0066	0.0063	0.0065
L9	0:14:57	799.7	620.7	0.8156	0.8009	0.8047	0.8071	0.85	0.85	0.87	0.86	0.0107	0.0064	0.0086
L10	0:00:30	803.7	632.7	0.9761	0.9611	0.9658	0.9677					0.0134	0.0065	0.0100
L10	0:01:00	787.5	629.2	0.9796	0.9656	0.9707	0.9720					0.0134	0.0065	0.0100
L10	0:02:00	776.0	626.0	0.9820	0.9693	0.9743	0.9752	1.00	0.99	1.00	1.00	0.0134	0.0065	0.0100
L10	0:04:00	762.7	621.4	0.9836	0.9714	0.9779	0.9776	1.01	1.01	1.01	1.01	0.0134	0.0065	0.0100
U1	0:00:30	576.8	575.6	0.9771	0.9657	0.9697	0.9708					0.0134	0.0063	0.0099

Table J.1 Adjusted Indicator Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft				Survey Level Readings				Compression		
				DG #11	DG #12	DG #13	Average	Ruler 1	Ruler 2	Ruler 3	Average	TT #1	TT #6	Avg Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
U1	0:03:00	582.4	575.4	0.9768	0.9648	0.9713	0.9710	1.02	1.02	1.01	1.01	0.0134	0.0063	0.0099
U2	0:00:30	440.2	500.2	0.9653	0.9527	0.9583	0.9588					0.0123	0.0057	0.0090
U2	0:03:00	445.6	500.7	0.9663	0.9526	0.9581	0.9590	1.01	1.02	1.01	1.01	0.0123	0.0057	0.0090
U3	0:00:30	293.4	288.3	0.9588	0.9459	0.9510	0.9519					0.0119	0.0052	0.0086
U3	0:03:12	291.3	297.0	0.9486	0.9344	0.9398	0.9409	1.01	1.01	1.00	1.01	0.0112	0.0047	0.0080
U4	0:00:30	129.0	136.4	0.9340	0.9191	0.9252	0.9261					0.0098	0.0037	0.0068
U4	0:03:14	140.6	137.0	0.9239	0.9096	0.9150	0.9162	0.98	0.94	0.95	0.96	0.0094	0.0034	0.0064
U5	0:00:30	0.0	0.0	0.8691	0.8549	0.8607	0.8616					0.0065	0.0019	0.0042
U5	0:03:00	0.0	0.0	0.8661	0.8519	0.8567	0.8582	0.95	0.94	0.95	0.95	0.0062	0.0018	0.0040
U5	0:06:00	0.0	0.0	0.8638	0.8510	0.8551	0.8566	0.89	0.87	0.89	0.88	0.0062	0.0018	0.0040

Table J.1 Adjusted Indicator Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Mvmt.	TT #3	TT #8	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0000	0.0003	0.0002	-0.0403	0.0000	-0.0002	-0.0001	-0.0406	0.0000	0.0001	0.0000	-0.0404	-0.0347	-0.0278	-0.0313	-0.0717
L1	0:01:00	0.0000	0.0003	0.0002	-0.0023	0.0000	-0.0002	-0.0001	-0.0026	0.0000	0.0001	0.0000	-0.0024	-0.0350	-0.0280	-0.0315	-0.0340
L1	0:02:00	0.0000	0.0003	0.0002	-0.0015	0.0000	-0.0002	-0.0001	-0.0017	0.0000	0.0001	0.0000	-0.0016	-0.0352	-0.0282	-0.0317	-0.0333
L1	0:04:00	0.0000	0.0003	0.0002	0.0016	0.0000	-0.0009	-0.0005	0.0010	0.0000	0.0001	0.0000	0.0015	-0.0354	-0.0287	-0.0321	-0.0307
L2	0:00:30	0.0005	0.0006	0.0006	0.0031	-0.0813	-0.0907	-0.0860	-0.0835	-0.0864	-0.0615	-0.0740	-0.0715	-0.0860	-0.0718	-0.0789	-0.0764
L2	0:01:00	0.0005	0.0006	0.0006	0.0044	-0.0819	-0.0912	-0.0866	-0.0827	-0.0870	-0.0618	-0.0744	-0.0705	-0.0867	-0.0722	-0.0795	-0.0756
L2	0:02:00	0.0005	0.0006	0.0006	0.0040	-0.0829	-0.0920	-0.0875	-0.0841	-0.0876	-0.0619	-0.0748	-0.0714	-0.0874	-0.0728	-0.0801	-0.0767
L2	0:04:00	0.0005	0.0006	0.0006	0.0015	-0.0846	-0.0936	-0.0891	-0.0882	-0.0885	-0.0623	-0.0754	-0.0745	-0.0883	-0.0739	-0.0811	-0.0802
L3	0:00:30	0.0025	0.0023	0.0024	0.0161	-0.1829	-0.1924	-0.1877	-0.1740	-0.1873	-0.1613	-0.1743	-0.1606	-0.1399	-0.1226	-0.1313	-0.1176
L3	0:01:00	0.0025	0.0023	0.0024	0.0158	-0.1834	-0.1930	-0.1882	-0.1748	-0.1879	-0.1625	-0.1752	-0.1618	-0.1405	-0.1231	-0.1318	-0.1184
L3	0:02:00	0.0025	0.0023	0.0024	0.0160	-0.1886	-0.1978	-0.1932	-0.1796	-0.1926	-0.1676	-0.1801	-0.1665	-0.1433	-0.1256	-0.1345	-0.1208
L3	0:04:00	0.0027	0.0027	0.0027	0.0167	-0.1898	-0.1991	-0.1945	-0.1804	-0.1936	-0.1687	-0.1812	-0.1671	-0.1440	-0.1265	-0.1353	-0.1212
L4	0:00:30	0.0053	0.0055	0.0054	0.0363	-0.2858	-0.2962	-0.2910	-0.2601	-0.2910	-0.2650	-0.2780	-0.2471	-0.1941	-0.1769	-0.1855	-0.1546
L4	0:01:00	0.0053	0.0055	0.0054	0.0370	-0.2904	-0.3010	-0.2957	-0.2641	-0.2954	-0.2709	-0.2832	-0.2516	-0.1970	-0.1794	-0.1882	-0.1566
L4	0:02:00	0.0053	0.0056	0.0055	0.0378	-0.2930	-0.3039	-0.2985	-0.2661	-0.2980	-0.2736	-0.2858	-0.2535	-0.1990	-0.1813	-0.1902	-0.1578
L4	0:04:00	0.0056	0.0058	0.0057	0.0389	-0.2973	-0.3083	-0.3028	-0.2696	-0.3024	-0.2777	-0.2901	-0.2568	-0.2019	-0.1837	-0.1928	-0.1596
L5	0:00:30	0.0081	0.0086	0.0084	0.0750	-0.3770	-0.3883	-0.3827	-0.3160	-0.3819	-0.3600	-0.3710	-0.3043	-0.2538	-0.2326	-0.2432	-0.1765
L5	0:01:00	0.0081	0.0086	0.0084	0.0753	-0.3781	-0.3894	-0.3838	-0.3169	-0.3829	-0.3607	-0.3718	-0.3049	-0.2548	-0.2334	-0.2441	-0.1772
L5	0:02:00	0.0081	0.0086	0.0084	0.0768	-0.3823	-0.3939	-0.3881	-0.3196	-0.3871	-0.3653	-0.3762	-0.3077	-0.2582	-0.2366	-0.2474	-0.1789
L5	0:04:00	0.0081	0.0088	0.0085	0.0773	-0.3877	-0.3992	-0.3935	-0.3246	-0.3923	-0.3690	-0.3807	-0.3118	-0.2625	-0.2404	-0.2515	-0.1826
L6	0:00:30	0.0101	0.0113	0.0107	0.1261	-0.4761	-0.4876	-0.4819	-0.3664	-0.4807	-0.4577	-0.4692	-0.3538	-0.3298	-0.3060	-0.3179	-0.2025
L6	0:01:00	0.0101	0.0113	0.0107	0.1313	-0.4833	-0.4947	-0.4890	-0.3684	-0.4877	-0.4641	-0.4759	-0.3553	-0.3360	-0.3118	-0.3239	-0.2033
L6	0:02:00	0.0101	0.0114	0.0108	0.1361	-0.4905	-0.5020	-0.4963	-0.3710	-0.4950	-0.4701	-0.4826	-0.3573	-0.3425	-0.3180	-0.3303	-0.2050
L6	0:04:00	0.0101	0.0114	0.0108	0.1425	-0.5006	-0.5121	-0.5064	-0.3746	-0.5050	-0.4812	-0.4931	-0.3613	-0.3515	-0.3267	-0.3391	-0.2073
L7	0:00:30	0.0113	0.0133	0.0123	0.2199	-0.6153	-0.6271	-0.6212	-0.4136	-0.6205	-0.5966	-0.6086	-0.4010	-0.4472	-0.4205	-0.4339	-0.2263
L7	0:01:00	0.0113	0.0133	0.0123	0.2252	-0.6222	-0.6338	-0.6280	-0.4151	-0.6270	-0.6039	-0.6155	-0.4026	-0.4538	-0.4268	-0.4403	-0.2274
L7	0:02:00	0.0113	0.0134	0.0124	0.2353	-0.6346	-0.6468	-0.6407	-0.4178	-0.6397	-0.6175	-0.6286	-0.4057	-0.4658	-0.4386	-0.4522	-0.2293
L7	0:04:00	0.0114	0.0134	0.0124	0.2532	-0.6551	-0.6675	-0.6613	-0.4205	-0.6603	-0.6353	-0.6478	-0.4070	-0.4847	-0.4574	-0.4711	-0.2303
L8	0:00:30	0.0118	0.0146	0.0132	0.3475	-0.7655	-0.7780	-0.7718	-0.4375	-0.7713	-0.7494	-0.7604	-0.4261	-0.5871	-0.5587	-0.5729	-0.2386
L8	0:01:00	0.0118	0.0146	0.0132	0.3585	-0.7782	-0.7909	-0.7846	-0.4393	-0.7842	-0.7602	-0.7722	-0.4269	-0.5998	-0.5713	-0.5856	-0.2403
L8	0:02:00	0.0118	0.0146	0.0132	0.3777	-0.7999	-0.8129	-0.8064	-0.4419	-0.8061	-0.7847	-0.7954	-0.4309	-0.6214	-0.5925	-0.6070	-0.2424
L8	0:04:00	0.0121	0.0148	0.0135	0.4182	-0.8397	-0.8529	-0.8463	-0.4415	-0.8461	-0.8236	-0.8349	-0.4301	-0.6606	-0.6313	-0.6460	-0.2412
L9	0:00:30	0.0125	0.0157	0.0141	0.5237	-0.9508	-0.9636	-0.9572	-0.4476	-0.9588	-0.9249	-0.9419	-0.4323	-0.7689	-0.7387	-0.7538	-0.2442
L9	0:01:00	0.0125	0.0157	0.0141	0.5414	-0.9689	-0.9822	-0.9756	-0.4482	-0.9769	-0.9430	-0.9600	-0.4326	-0.7872	-0.7569	-0.7721	-0.2447
L9	0:02:00	0.0127	0.0157	0.0142	0.5673	-0.9950	-1.0100	-1.0025	-0.4494	-1.0046	-0.9707	-0.9877	-0.4346	-0.8144	-0.7840	-0.7992	-0.2461
L9	0:04:00	0.0158	0.0157	0.0158	0.6238	-1.0242	-1.0670	-1.0456	-0.4375	-1.0613	-1.0274	-1.0444	-0.4363	-0.8679	-0.8404	-0.8542	-0.2461
L9	0:14:57	0.0437	0.0180	0.0309	0.8379	-1.0248	-1.1485	-1.0867	-0.2796	-1.1241	-1.0944	-1.1093	-0.3022	-1.0462	-1.0446	-1.0454	-0.2383
L10	0:00:30	0.0602	0.0181	0.0392	1.0068	-1.0250	-1.1485	-1.0868	-0.1191	-1.2901	-1.2581	-1.2741	-0.3064	-1.1942	-1.2078	-1.2010	-0.2333
L10	0:01:00	0.0603	0.0181	0.0392	1.0112	-1.0250	-1.1485	-1.0868	-0.1148	-1.2925	-1.2607	-1.2766	-0.3046	-1.1968	-1.2108	-1.2038	-0.2318
L10	0:02:00	0.0603	0.0181	0.0392	1.0144	-1.0250	-1.1485	-1.0868	-0.1116	-1.2940	-1.2625	-1.2783	-0.3031	-1.1988	-1.2126	-1.2057	-0.2305
L10	0:04:00	0.0603	0.0181	0.0392	1.0168	-1.0250	-1.1485	-1.0868	-0.1091	-1.2959	-1.2642	-1.2801	-0.3024	-1.2011	-1.2146	-1.2079	-0.2302
U1	0:00:30	0.0603	0.0179	0.0391	1.0099	-1.0250	-1.1485	-1.0868	-0.1159	-1.2844	-1.2645	-1.2745	-0.3036	-1.1950	-1.2074	-1.2012	-0.2304

Table J.1 Adjusted Indicator Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Mvmt.	TT #3	TT #8	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
U1	0:03:00	0.0582	0.0179	0.0381	1.0090	-1.0250	-1.1485	-1.0868	-0.1158	-1.2841	-1.2645	-1.2743	-0.3033	-1.1947	-1.2072	-1.2010	-0.2300
U2	0:00:30	0.0519	0.0162	0.0341	0.9928	-1.0250	-1.1485	-1.0868	-0.1280	-1.2606	-1.2645	-1.2626	-0.3038	-1.1826	-1.1919	-1.1873	-0.2285
U2	0:03:00	0.0517	0.0162	0.0340	0.9930	-1.0250	-1.1485	-1.0868	-0.1278	-1.2600	-1.2645	-1.2623	-0.3033	-1.1819	-1.1909	-1.1864	-0.2274
U3	0:00:30	0.0499	0.0150	0.0325	0.9844	-1.0250	-1.1485	-1.0868	-0.1349	-1.2570	-1.2645	-1.2608	-0.3089	-1.1643	-1.1713	-1.1678	-0.2159
U3	0:03:12	0.0469	0.0138	0.0304	0.9713	-1.0250	-1.1485	-1.0868	-0.1458	-1.2464	-1.2593	-1.2529	-0.3119	-1.1510	-1.1566	-1.1538	-0.2129
U4	0:00:30	0.0416	0.0111	0.0264	0.9525	-1.0250	-1.1485	-1.0868	-0.1607	-1.2268	-1.2390	-1.2329	-0.3068	-1.1194	-1.1216	-1.1205	-0.1944
U4	0:03:14	0.0397	0.0107	0.0252	0.9414	-1.0249	-1.1485	-1.0867	-0.1705	-1.2180	-1.2325	-1.2253	-0.3091	-1.0996	-1.1003	-1.1000	-0.1838
U5	0:00:30	0.0288	0.0070	0.0179	0.8795	-1.0249	-1.1485	-1.0867	-0.2251	-1.1654	-1.1753	-1.1704	-0.3088	-0.9038	-0.9105	-0.9072	-0.0456
U5	0:03:00	0.0281	0.0067	0.0174	0.8756	-1.0249	-1.1485	-1.0867	-0.2285	-1.1606	-1.1708	-1.1657	-0.3075	-0.8892	-0.8968	-0.8930	-0.0348
U5	0:06:00	0.0278	0.0067	0.0173	0.8739	-1.0249	-1.1485	-1.0867	-0.2301	-1.1584	-1.1684	-1.1634	-0.3068	-0.8846	-0.8924	-0.8885	-0.0319

Table J.2 Calculated Strain, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L0	0:00:00		-0.30	1.35	-0.59	-0.41	-0.38	-1.38	4.55	-9.54	7.34	-15.53	6.10	-13.62	-4.82	0.42	0.56	-3.13
L1	0:00:30		-0.78	1.42	-0.44	-0.18	-0.15	-1.16	5.03	-9.39	7.97	-14.64	7.33	-12.33	-2.06	2.50	1.61	-0.74
L1	0:01:00		-0.60	1.42	-0.99	-0.07	-0.15	-1.13	4.96	-9.17	7.89	-14.90	7.36	-12.37	-2.06	2.50	1.72	-0.67
L1	0:01:30		-0.60	1.46	-0.99	-0.07	-0.04	-1.13	5.03	-9.17	7.97	-14.98	7.36	-12.37	-2.28	2.54	1.75	-0.74
L1	0:02:00		-0.56	1.38	-0.99	0.00	-0.15	-1.13	5.00	-9.17	7.97	-14.87	7.36	-12.33	-2.28	2.50	1.65	-0.74
L1	0:02:30		-0.60	1.83	-0.99	0.00	-0.15	-1.13	4.85	-9.28	7.89	-14.64	7.36	-12.37	-2.06	2.25	1.61	-0.70
L1	0:03:00		-0.78	1.42	-0.99	-0.11	-0.04	-0.80	5.11	-9.28	7.97	-14.64	7.36	-12.37	-2.28	2.50	1.58	-0.70
L1	0:03:30		-0.78	1.38	-0.44	-0.30	-0.15	-1.09	5.03	-9.28	7.97	-14.64	7.36	-12.33	-2.32	2.50	1.61	-0.70
L1	0:04:00		-0.60	1.42	-0.99	-0.07	-0.15	-1.13	5.00	-9.39	7.97	-14.64	7.36	-12.33	-2.10	2.50	1.61	-0.70
L1	0:04:30		-0.60	1.38	-0.99	-0.15	-0.15	-1.13	5.00	-9.28	7.89	-14.68	7.36	-12.30	-2.10	2.47	1.79	-0.70
L1	0:05:00		-0.37	1.42	-0.99	-0.07	-0.15	-1.13	5.03	-9.28	7.97	-14.64	7.33	-12.30	-2.10	2.50	1.79	-0.70
L1	0:05:30		-0.78	1.83	-0.44	-0.22	-0.15	-1.09	4.88	-9.17	7.97	-14.87	7.33	-12.33	-2.10	2.50	1.61	-0.74
L1	0:06:00		-0.56	1.83	-0.40	-0.07	-0.11	-1.09	5.11	-9.10	8.08	-14.46	7.61	-12.04	-1.74	3.10	2.10	-0.39
L2	0:00:30		-0.34	1.72	0.11	0.37	0.71	-0.36	6.42	-7.73	9.97	-12.08	11.49	-6.98	4.85	6.76	4.55	3.52
L2	0:01:00		-0.60	1.79	0.11	0.55	0.71	-0.33	6.31	-7.77	9.97	-12.04	11.52	-6.98	4.85	6.76	4.80	4.33
L2	0:01:30		-0.34	1.72	-0.29	0.48	0.71	-0.36	6.31	-7.69	10.01	-12.00	11.59	-6.94	5.03	6.80	4.80	3.52
L2	0:02:00		-0.34	1.72	0.48	0.48	0.71	-0.36	6.31	-7.77	9.89	-12.04	11.56	-6.90	5.03	7.08	4.59	3.52
L2	0:02:30		-0.34	1.72	-0.29	0.44	0.71	-0.33	6.31	-7.77	9.89	-12.19	11.59	-6.90	4.85	6.83	4.83	3.52
L2	0:03:00		-0.56	1.72	0.11	0.37	0.86	-0.33	6.35	-7.66	10.01	-12.04	11.59	-6.76	5.03	6.83	4.62	3.56
L2	0:03:30		-0.34	1.72	-0.29	0.44	0.71	-0.33	6.31	-7.66	10.04	-12.00	11.63	-6.87	5.03	7.01	4.62	3.56
L2	0:04:00		-0.78	1.72	-0.26	0.48	0.75	-0.33	6.35	-7.73	9.93	-11.97	11.63	-6.68	4.85	6.87	4.62	3.56
L2	0:04:30		-0.34	2.13	-0.29	0.44	0.86	-0.33	6.31	-7.73	9.93	-11.97	11.66	-6.87	4.85	6.87	4.90	3.56
L2	0:05:00		-0.30	2.13	-0.26	0.52	0.75	-0.33	6.31	-7.84	10.08	-12.15	11.73	-6.83	5.07	6.94	4.94	3.63
L2	0:05:30		-0.30	1.76	-0.22	0.52	0.79	-0.07	6.39	-7.58	10.04	-12.00	11.98	-6.24	5.47	7.22	5.15	3.87
L3	0:00:30		0.15	2.69	1.32	1.77	2.59	1.53	9.54	-3.74	14.45	-6.58	20.30	4.17	13.04	11.37	8.96	9.82
L3	0:01:00		0.15	2.69	1.36	1.59	2.63	1.56	9.39	-3.81	14.30	-6.47	20.47	4.43	13.26	11.55	9.07	10.10
L3	0:01:30		0.19	2.73	1.43	1.66	2.74	1.67	9.50	-3.62	14.41	-6.47	20.76	4.50	13.44	11.73	9.53	10.21
L3	0:02:00		0.19	2.62	1.40	1.59	2.70	1.67	9.65	-3.51	14.49	-6.28	20.72	4.47	13.40	11.73	9.25	10.14
L3	0:02:30		0.15	2.39	1.07	1.66	2.70	1.64	9.43	-3.66	14.41	-6.32	20.72	4.80	13.37	11.76	9.28	10.14
L3	0:03:00		0.45	2.54	1.40	1.62	2.66	1.64	9.88	-3.70	14.41	-6.32	20.72	4.58	13.44	11.76	9.28	10.10
L3	0:03:30		0.15	2.73	1.40	1.51	2.70	1.67	9.43	-3.70	14.41	-6.50	20.72	4.39	13.40	11.76	9.28	10.07
L3	0:04:00		0.15	2.39	1.40	1.48	2.70	1.64	9.50	-3.59	14.41	-6.50	20.76	4.62	13.29	11.69	9.28	10.07
L3	0:04:30		-0.11	2.39	1.40	1.70	2.66	1.67	9.43	-3.70	14.41	-6.32	20.76	4.62	13.29	11.80	9.53	10.32
L4	0:00:30		0.89	3.55	3.97	3.43	5.48	5.02	13.15	1.33	19.31	2.42	31.50	18.09	21.33	16.16	14.95	18.80
L4	0:01:00		0.93	3.63	4.01	3.73	5.78	5.20	13.45	2.37	19.60	2.68	32.31	19.31	21.99	16.52	15.79	19.33
L4	0:01:30		1.08	3.37	3.97	3.58	5.74	5.16	13.37	2.26	19.42	2.90	32.17	18.94	21.80	16.48	15.37	19.19
L4	0:02:00		0.93	3.55	4.01	4.02	5.81	5.23	13.49	2.44	19.64	2.79	32.45	19.79	22.02	16.66	15.58	19.40
L4	0:02:30		0.93	3.66	4.01	3.69	5.74	5.12	13.41	2.37	19.60	2.68	32.38	19.13	21.95	16.66	15.58	19.33
L4	0:03:00		1.34	3.37	3.97	3.62	5.78	5.23	13.37	2.33	19.71	2.94	32.35	18.94	21.80	16.66	15.58	19.26
L4	0:03:30		1.71	3.40	4.12	3.69	5.93	5.38	13.64	2.66	19.86	3.27	32.91	19.79	22.35	16.90	15.86	19.64
L4	0:04:00		0.93	3.40	4.12	3.76	5.89	5.34	13.60	2.11	19.82	3.23	32.84	19.64	22.28	16.87	15.86	19.57
L4	0:04:30		1.97	3.40	4.08	3.69	5.89	5.34	14.16	2.55	19.79	2.90	32.74	19.53	22.20	16.87	15.83	19.54
L4	0:05:00		0.97	3.59	4.08	3.76	5.85	5.27	14.09	2.03	19.75	2.86	32.77	19.42	22.09	16.87	16.11	19.50
L5	0:00:30		2.05	4.08	6.91	5.53	8.96	8.47	17.43	8.28	25.12	10.63	43.55	32.35	29.85	22.33	22.48	27.95

359

Table J.2 Calculated Strain, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L5	0:01:00		1.64	4.04	6.29	5.28	8.85	8.36	17.84	8.77	24.42	10.48	43.38	32.31	29.99	22.64	22.66	28.16
L5	0:01:30		2.01	4.08	6.91	5.50	8.93	8.47	17.36	8.25	24.57	10.59	43.66	32.35	29.85	22.61	22.59	27.95
L5	0:02:00		2.98	4.08	6.43	5.50	9.04	8.54	18.03	8.40	24.75	10.85	43.98	32.79	30.28	22.89	22.83	28.24
L5	0:02:30		3.20	4.52	6.43	5.68	9.04	8.58	17.54	9.10	24.79	10.93	44.54	32.83	30.28	23.03	22.94	28.45
L5	0:03:00		2.05	4.08	6.43	5.64	9.00	8.58	17.99	9.02	24.98	10.85	44.08	32.35	30.14	22.93	22.87	28.24
L5	0:03:30		2.08	4.08	6.51	5.72	9.11	8.61	18.11	9.21	24.83	11.15	44.36	33.12	30.46	23.17	23.88	28.55
L5	0:04:00		1.64	4.08	6.47	5.42	9.08	8.58	18.03	8.51	24.75	11.00	44.26	32.57	30.32	23.07	23.08	28.41
L5	0:04:30		2.01	4.49	6.40	5.64	9.00	8.58	17.81	9.10	24.72	10.93	44.19	32.79	30.21	23.00	23.01	28.34
L6	0:00:30		2.94	4.15	8.46	6.64	11.07	10.90	19.57	14.20	27.46	19.07	53.28	43.57	37.31	28.38	30.57	36.26
L6	0:01:00		2.31	4.64	8.71	6.94	11.29	11.09	19.80	14.72	27.83	20.25	54.13	44.94	38.36	29.12	30.75	37.74
L6	0:01:30		2.61	4.19	8.16	7.08	11.40	11.30	19.76	14.50	28.13	20.92	54.62	45.31	38.72	29.33	31.06	38.06
L6	0:02:00		2.53	4.56	7.98	6.64	11.18	11.05	19.42	14.57	27.68	20.33	54.13	44.68	38.14	28.98	30.71	37.42
L6	0:02:30		2.57	4.15	8.64	7.05	11.33	11.16	19.76	14.90	28.42	21.00	54.65	45.34	38.83	29.58	31.20	38.16
L6	0:03:00		2.31	4.56	7.98	6.57	11.14	11.01	19.50	14.61	27.79	18.88	54.27	44.90	38.50	29.16	30.92	37.88
L6	0:03:30		3.50	4.04	7.91	6.60	11.07	10.94	19.87	13.98	27.50	18.66	54.02	44.90	38.47	29.16	30.75	37.67
L6	0:04:00		2.57	4.56	8.09	6.68	11.25	11.12	19.65	14.83	27.87	21.11	54.72	45.75	38.97	29.55	31.38	38.34
L6	0:04:30		2.57	4.56	8.09	6.83	11.25	11.12	19.57	14.83	27.83	21.18	54.80	45.60	39.05	29.76	31.48	38.23
L6	0:05:00		3.54	4.08	8.09	6.64	11.25	11.23	19.42	14.90	28.24	21.30	54.94	45.42	39.23	29.79	32.36	38.62
L7	0:00:30		4.10	4.45	9.71	7.71	12.34	12.61	19.65	16.79	29.72	26.35	62.20	56.83	47.77	36.66	39.78	47.88
L7	0:01:00		3.80	4.37	9.49	7.31	12.19	12.54	19.53	17.79	29.39	27.87	62.09	56.86	47.81	36.20	39.54	47.70
L7	0:01:30		4.02	4.37	9.23	7.23	12.19	12.47	19.31	17.83	28.87	28.02	62.12	57.16	48.03	36.38	39.64	47.81
L7	0:02:00		3.16	3.93	9.41	7.53	12.12	12.54	19.35	16.72	29.24	28.10	62.12	57.01	48.28	37.05	39.82	48.02
L7	0:02:30		3.02	3.89	9.30	7.45	11.93	12.32	18.90	16.46	28.50	27.73	61.56	56.27	47.41	35.74	38.17	47.63
L7	0:03:00		3.05	4.34	9.41	7.27	12.04	12.50	19.05	17.83	29.01	28.25	62.09	56.94	48.21	36.70	38.91	47.95
L7	0:03:30		3.05	3.89	9.38	7.31	12.00	12.47	18.90	17.83	28.27	28.32	62.09	57.12	48.50	36.77	39.29	48.23
L7	0:04:00		4.06	3.89	9.56	7.42	12.04	12.50	19.08	16.79	28.42	28.39	61.98	57.31	48.39	36.62	39.08	48.13
L7	0:04:30		4.02	4.22	9.19	7.42	11.55	12.25	18.44	16.46	27.72	28.02	61.49	56.60	47.81	36.70	38.63	47.88
L7	0:05:00		3.98	4.22	9.01	7.12	11.82	12.29	18.56	17.64	27.72	28.17	61.60	56.64	47.99	36.27	38.66	47.88
L7	0:05:30		3.05	3.85	9.34	7.12	11.97	12.47	18.71	17.90	28.09	28.65	62.05	57.34	48.72	36.94	39.54	48.37
L8	0:00:30		4.65	3.93	10.26	7.53	12.34	13.19	18.14	19.64	28.76	31.78	64.56	62.48	52.95	40.29	43.53	53.16
L8	0:01:00		3.69	3.93	10.37	7.38	12.38	13.23	17.96	20.42	27.64	31.81	64.63	62.77	53.24	40.43	43.70	53.30
L8	0:01:30		4.32	3.89	10.30	7.27	12.27	13.16	17.99	19.79	27.35	31.81	64.17	62.55	52.88	40.04	43.28	52.99
L8	0:02:00		4.50	3.81	10.26	7.38	12.19	13.05	17.47	20.38	27.16	32.04	63.99	62.55	52.88	39.93	43.42	52.63
L8	0:02:30		3.69	3.70	10.15	7.42	12.12	13.12	17.36	20.53	27.09	31.92	64.24	63.25	53.64	40.67	43.77	53.44
L8	0:03:00		3.80	3.44	10.26	7.45	12.19	13.19	17.24	20.19	26.94	31.96	63.96	63.32	53.32	40.22	43.53	53.41
L8	0:03:30		3.72	3.70	10.11	7.31	11.97	13.01	17.32	20.49	26.38	31.85	63.39	62.62	52.95	39.90	43.18	53.09
L8	0:04:00		3.72	3.37	10.15	7.31	12.00	13.01	17.36	20.64	26.35	31.96	63.46	62.96	53.13	40.08	43.49	53.30
L8	0:04:30		4.47	3.70	10.00	6.97	11.89	12.94	17.21	20.56	26.38	32.00	64.45	63.40	53.68	40.53	43.74	53.76
L8	0:05:00		3.91	3.40	10.22	7.05	12.08	13.16	16.87	20.45	26.42	32.18	63.99	63.88	54.04	40.78	43.91	54.15
L9	0:00:30		4.10	3.18	10.66	7.12	12.30	13.56	16.83	22.34	26.24	-379.38	63.99	67.31	56.03	41.94	44.75	55.84
L9	0:01:00		4.91	3.40	10.33	7.01	12.15	13.41	16.53	22.67	25.31	-230.35	63.82	67.64	56.29	42.01	44.79	56.01
L9	0:01:30		4.02	3.37	10.55	6.94	12.04	13.34	16.00	22.67	25.20	-146.88	63.68	67.87	56.32	41.98	44.72	56.12
L9	0:02:00		4.06	3.10	10.48	7.27	12.00	13.34	16.08	22.38	24.94	-71.39	63.46	67.94	56.43	42.29	44.82	56.40

Table J.2 Calculated Strain, Shaft 5 - 2002

361

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L9	0:02:30	4.10	3.33	10.52	7.23	12.04	13.52	16.04	22.67	24.79	38.69	63.43	68.38	56.68	42.36	44.93	56.40	
L9	0:03:00	4.91	3.29	10.19	7.16	11.89	13.41	15.70	22.86	24.83	38.69	63.29	68.38	56.68	42.33	44.89	56.44	
L9	0:03:30	4.10	3.29	10.52	6.90	11.93	13.45	15.63	23.04	24.38	38.69	63.29	68.68	56.90	42.36	45.00	56.75	
L9	0:04:00	4.88	3.25	10.37	6.86	11.85	13.30	15.44	22.71	24.35	38.65	62.97	68.75	56.97	42.47	45.00	56.75	
L9	0:04:30	4.06	3.25	10.41	6.83	11.82	13.23	15.29	22.60	23.86	38.69	62.58	68.42	56.43	41.87	44.65	56.40	
L9	0:05:00	4.02	3.18	10.22	6.71	11.67	13.19	14.99	22.82	23.90	38.73	62.58	68.75	56.87	42.44	44.96	56.82	
L9	0:05:30	5.03	3.25	10.22	6.90	11.89	13.30	15.21	23.23	23.86	38.39	62.79	69.16	57.05	42.47	46.26	56.82	
L9	0:06:00	5.06	3.25	10.41	6.79	11.78	13.19	14.80	23.04	23.68	38.47	62.30	68.83	56.65	42.01	44.75	56.47	
L9	0:06:30	3.98	3.18	10.15	6.94	11.59	13.19	14.95	22.56	23.68	38.54	62.34	68.97	56.94	42.26	44.89	56.51	
L9	0:07:00	5.06	3.22	9.93	6.79	11.82	13.34	14.76	23.23	24.01	37.87	62.48	69.49	57.23	42.58	45.63	57.10	
L9	0:07:30	4.10	3.18	10.41	6.83	11.55	13.19	14.65	23.34	23.46	38.24	62.20	69.86	57.44	42.72	45.14	57.03	
L9	0:08:00	4.10	2.92	10.22	6.75	11.78	13.30	14.88	23.34	23.31	37.91	62.30	69.97	57.55	42.61	45.17	57.21	
L9	0:08:30	4.88	3.10	10.19	6.86	11.52	12.94	13.97	22.67	22.42	38.09	61.38	69.01	56.58	41.84	44.58	56.51	
L9	0:09:00	3.91	2.84	10.08	6.83	11.25	12.76	13.60	22.60	22.31	38.69	60.82	68.35	55.96	41.31	44.33	56.05	
L9	0:09:30	4.84	3.07	9.74	6.68	11.14	12.61	13.41	22.38	22.05	38.61	60.22	67.94	55.63	41.06	44.16	55.87	
L9	0:10:00	4.80	3.07	9.52	6.64	11.03	12.54	13.26	21.86	21.94	-89.90	60.22	67.64	55.42	40.78	44.02	55.66	
L9	0:10:30	3.80	3.10	9.56	6.27	10.95	12.54	13.75	22.08	21.83	-146.88	60.01	67.46	55.24	40.64	44.09	55.48	
L9	0:11:00	3.76	3.07	9.49	6.53	10.69	12.47	13.07	21.97	21.64	-206.15	59.38	67.24	55.05	40.50	43.88	55.10	
L9	0:11:30	3.69	3.10	9.56	6.57	10.84	12.43	13.00	21.86	21.64	-230.50	59.48	67.09	54.95	40.46	43.84	55.03	
L9	0:12:00	3.98	3.25	10.26	6.94	11.59	13.16	14.09	23.04	23.01	37.83	61.95	69.60	57.23	42.40	45.10	57.14	
L9	0:12:30	4.06	2.92	10.00	7.01	11.67	13.23	14.58	23.15	22.94	39.06	62.09	70.45	57.81	42.75	45.38	57.60	
L9	0:13:00	4.95	3.14	10.08	6.75	11.67	13.23	14.01	23.34	22.49	38.24	62.12	70.75	58.06	43.03	45.49	57.63	
L9	0:13:30	4.17	3.07	10.04	6.90	11.63	13.12	14.28	23.67	22.05	38.24	61.38	70.75	57.73	42.51	45.21	57.28	
L9	0:14:00	4.17	2.80	10.33	6.97	11.67	13.23	13.79	23.45	22.27	38.47	61.60	71.15	58.13	42.93	45.42	57.95	
L9	0:14:57	4.17	2.99	10.11	6.60	11.63	13.08	14.12	23.63	21.79	37.98	61.28	71.56	58.42	43.00	45.49	58.05	
L9	0:15:27	4.17	2.99	10.00	6.64	11.63	13.12	14.01	24.11	21.86	38.06	61.24	71.78	58.53	42.89	45.52	58.23	
L10	0:00:30	5.25	2.80	10.11	6.57	11.40	13.16	12.73	25.33	19.68	41.96	58.11	73.92	59.11	42.75	45.42	58.69	
L10	0:01:00	5.06	2.73	9.45	6.64	11.07	12.72	12.25	24.63	19.08	41.36	57.76	73.04	58.39	42.15	45.00	58.13	
L10	0:01:30	4.02	2.73	9.30	6.35	10.92	12.65	11.76	24.34	18.94	41.22	57.44	72.59	57.92	41.84	44.79	57.98	
L10	0:02:00	4.80	2.77	9.52	6.64	10.84	12.43	11.65	24.11	18.94	41.22	56.80	72.30	57.66	41.59	45.10	57.77	
L10	0:02:30	4.88	2.77	9.12	6.53	10.80	12.47	11.53	23.86	18.71	40.99	56.59	72.08	57.26	41.45	44.58	57.63	
L10	0:03:00	4.84	2.80	9.08	6.53	10.77	12.25	11.50	23.78	18.64	40.92	56.94	71.85	57.26	41.38	44.47	57.42	
L10	0:03:30	3.98	2.80	9.52	6.49	10.73	12.21	11.46	23.30	18.64	40.92	56.84	71.63	57.12	41.31	44.40	57.39	
L10	0:04:00	4.77	2.80	9.01	6.16	10.69	12.25	11.38	23.26	18.49	40.77	56.28	71.52	56.97	41.10	44.37	57.28	
L10	0:04:30	3.76	2.62	9.38	6.49	10.69	12.07	11.50	23.08	18.45	40.73	56.13	71.37	56.87	40.99	44.61	57.17	
L10	0:05:00	4.73	2.84	9.16	6.09	10.43	12.10	11.27	22.97	18.42	38.50	55.64	71.12	56.32	40.82	44.12	56.44	
U1	0:00:30	4.17	2.39	7.94	5.24	9.30	10.61	9.50	20.79	15.04	35.12	46.87	61.77	48.10	34.02	37.93	49.39	
U1	0:01:00	4.17	2.39	7.91	5.24	9.34	10.58	9.58	20.34	14.75	34.82	46.41	61.88	48.14	34.02	38.91	49.96	
U1	0:01:30	3.20	2.43	7.94	5.20	9.38	10.69	9.65	20.67	15.19	35.27	46.30	62.11	48.17	34.19	37.93	49.39	
U1	0:02:00	3.20	2.43	8.57	5.57	9.19	10.65	9.69	20.45	15.19	35.27	47.04	61.92	48.17	34.19	37.89	49.39	
U1	0:02:30	3.20	2.47	8.31	5.57	9.41	10.61	9.69	20.79	14.93	35.01	46.55	61.92	47.99	34.27	37.86	49.96	
U1	0:03:00	4.13	2.47	8.02	5.61	9.41	10.72	9.69	20.90	15.27	35.34	47.08	61.92	48.21	34.27	37.86	49.46	
U1	0:03:30	3.16	2.47	8.57	5.61	9.41	10.65	9.73	20.45	15.27	35.34	46.51	61.92	48.17	34.09	37.86	49.39	

Table J.2 Calculated Strain, Shaft 5 - 2002

362

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta \epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
U1	0:04:00		3.98	2.47	8.31	5.31	9.41	10.72	9.73	20.42	14.90	34.97	46.44	61.96	48.17	34.30	38.98	49.96
U1	0:04:30		3.16	2.21	8.53	5.57	9.45	10.58	9.77	20.49	14.97	35.05	46.97	61.96	48.17	34.09	37.86	49.64
U2	0:00:30		2.64	2.06	7.02	4.32	7.99	9.12	8.04	17.42	12.04	31.22	37.42	51.25	41.00	27.61	31.31	42.46
U2	0:01:00		2.64	2.06	6.95	4.54	8.03	9.09	8.00	18.27	12.08	31.26	37.46	51.32	40.89	27.68	32.08	42.46
U2	0:01:30		3.50	2.09	7.61	4.61	8.06	9.20	8.00	17.46	11.71	31.22	37.11	51.21	40.93	27.40	32.11	42.49
U2	0:02:00		2.64	2.09	6.95	4.39	8.06	9.16	8.04	18.23	12.12	30.55	37.11	51.36	40.93	27.68	32.15	42.32
U2	0:02:30		3.57	2.09	6.95	4.65	7.91	9.16	8.04	17.49	12.15	31.26	37.14	51.36	40.96	27.71	32.15	42.53
U2	0:03:00		3.50	2.09	7.54	4.65	8.06	9.23	8.08	18.27	12.15	31.29	37.56	51.40	40.96	27.50	32.15	42.39
U2	0:03:30		2.64	2.09	6.95	4.61	7.91	9.09	8.08	18.34	12.15	31.29	37.60	51.40	41.00	27.71	31.45	42.21
U2	0:04:00		3.50	1.79	6.95	4.43	7.95	9.20	8.19	17.42	11.78	31.29	37.60	51.44	41.18	27.75	32.18	42.56
U2	0:04:30		2.64	1.79	6.95	4.69	7.91	9.12	8.19	17.53	12.19	31.26	37.21	51.44	41.04	27.82	32.18	42.56
U3	0:00:30		2.83	1.65	5.81	3.51	6.38	7.31	5.90	15.57	8.26	26.54	27.34	39.77	30.14	19.33	20.28	28.24
U3	0:01:12		2.31	1.16	5.48	3.10	6.08	6.94	5.60	14.72	7.86	23.71	25.48	37.26	28.83	18.59	19.89	27.78
U3	0:01:42		2.61	1.57	5.81	3.28	6.11	7.05	5.82	13.68	7.97	23.79	25.30	36.92	28.98	19.44	19.44	27.85
U3	0:02:12		2.61	1.57	5.85	3.32	6.00	6.98	5.86	15.27	8.00	23.86	25.58	37.44	29.23	18.70	20.07	27.95
U3	0:02:42		2.01	1.61	5.85	3.21	6.15	7.09	5.75	13.91	7.97	23.90	25.62	37.48	29.08	19.47	20.10	27.99
U3	0:03:12		2.75	1.61	5.55	3.28	6.19	6.98	5.90	13.83	8.08	23.97	25.65	37.51	29.16	19.47	20.14	28.06
U3	0:03:42		2.01	1.61	5.85	3.36	6.19	7.01	5.90	15.02	8.00	24.01	25.69	37.55	29.23	19.51	20.14	28.27
U3	0:04:12		2.01	1.65	5.85	3.39	6.19	7.01	5.94	14.98	8.08	24.05	25.72	37.59	29.16	18.77	20.17	28.09
U3	0:04:42		2.05	1.20	5.99	3.21	6.19	7.09	5.86	15.05	8.04	24.08	25.48	37.59	29.27	18.77	20.17	28.13
U3	0:05:12		2.01	1.65	5.55	3.21	6.19	7.09	5.86	14.83	8.08	24.08	25.51	37.63	29.23	19.51	20.17	28.16
U3	0:05:42		2.75	1.61	5.88	3.32	6.23	7.01	5.97	15.42	8.04	24.08	25.76	37.63	29.41	19.54	20.14	28.16
U4	0:00:30		1.64	1.01	3.82	1.84	3.90	4.54	3.42	9.17	4.52	13.68	14.73	18.72	14.81	11.69	11.42	13.55
U4	0:01:14		1.30	0.49	3.46	1.66	3.86	4.29	3.68	8.54	5.08	12.97	15.29	18.43	14.92	11.66	10.68	13.41
U4	0:01:44		1.49	1.01	3.49	1.77	3.86	4.33	3.91	8.17	5.22	12.90	15.40	18.39	15.03	11.80	11.31	13.24
U4	0:02:14		2.16	1.01	3.31	1.70	3.86	4.03	3.98	8.91	5.41	12.86	15.58	18.39	15.07	11.76	11.31	13.27
U4	0:02:44		1.30	1.01	3.49	1.66	3.94	4.07	4.02	8.17	5.37	12.86	15.54	18.39	15.36	11.76	11.31	13.48
U4	0:03:14		1.30	1.05	3.49	1.73	3.94	4.07	4.06	8.95	5.41	12.82	15.47	18.39	15.14	11.73	11.35	13.34
U4	0:03:44		1.49	1.05	3.64	1.70	3.94	4.36	4.09	8.17	5.45	12.82	15.50	17.98	15.32	11.80	11.31	13.34
U4	0:04:14		1.49	1.05	3.35	1.81	3.94	4.07	4.09	8.40	5.56	12.82	15.54	18.43	15.39	11.80	11.35	13.38
U4	0:04:44		1.49	0.56	3.53	1.77	3.98	4.11	3.94	8.21	5.48	12.82	15.58	18.43	15.28	11.76	11.28	13.24
U5	0:00:30		0.37	0.41	-0.11	-0.15	0.11	0.15	0.04	0.67	-0.59	1.75	-0.56	1.51	0.40	0.21	0.21	0.42
U5	0:01:00		0.07	-0.07	-0.18	-0.22	0.11	0.15	-0.30	1.07	-0.48	1.45	-0.39	1.33	0.36	0.49	0.21	0.39
U5	0:01:30		0.34	0.45	0.26	-0.07	0.08	0.11	-0.26	1.11	-0.44	1.00	-0.32	1.18	0.36	0.46	0.21	0.21
U5	0:02:00		0.30	0.49	0.22	-0.04	0.08	0.11	0.11	1.07	-0.41	1.11	-0.32	1.07	0.47	0.21	-0.07	0.42
U5	0:02:30		0.34	0.45	0.15	-0.11	0.04	0.11	0.23	0.41	-0.15	1.00	-0.28	0.96	0.29	0.18	0.18	0.28
U5	0:03:00		0.04	0.49	-0.11	-0.22	0.08	0.07	-0.19	0.37	-0.33	0.89	-0.21	0.89	0.40	0.42	0.18	0.28
U5	0:03:30		0.04	0.49	0.18	-0.22	0.04	0.07	-0.19	0.92	-0.07	0.74	-0.21	0.81	0.25	0.14	0.14	0.35
U5	0:04:00		0.30	0.49	0.18	0.00	0.04	0.07	0.15	0.92	-0.26	0.74	-0.18	0.74	0.58	0.14	0.14	0.25
U5	0:04:30		0.30	0.00	0.11	-0.22	0.04	0.04	0.15	0.30	0.00	0.71	-0.18	0.70	0.22	0.11	0.14	0.25
U5	0:05:00		0.04	0.49	0.11	-0.22	0.04	0.11	-0.15	0.96	-0.22	0.63	-0.11	0.63	0.14	0.11	0.11	0.25
U5	0:05:30		-0.11	0.00	0.15	-0.18	0.04	0.04	0.19	0.26	-0.22	0.41	-0.11	0.59	0.18	0.11	0.11	0.21
U5	0:06:00		0.30	0.00	-0.33	-0.11	-0.08	0.04	0.19	0.26	0.04	0.52	-0.14	0.55	0.18	0.11	0.11	0.04

Table J.2 Calculated Strain, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
U5	0:06:30		0.30	0.49	-0.48	-0.04	0.04	0.04	0.19	0.22	-0.19	0.52	-0.14	0.52	0.22	0.35	0.11	0.21
U5	0:07:00		-0.11	0.00	-0.48	-0.26	0.00	0.07	-0.11	0.22	0.04	0.52	-0.11	0.48	0.14	0.11	0.11	0.28
U5	0:07:30		0.26	0.00	-0.33	0.04	-0.26	0.04	0.19	0.18	-0.19	0.37	-0.07	0.44	0.11	0.07	0.07	0.07
U5	0:08:00		0.26	0.49	0.07	-0.07	-0.11	0.04	0.19	0.18	0.07	0.41	-0.04	0.44	0.14	0.07	0.11	0.07
U5	0:23:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table J.3 Calculated Strain, 4 Minute Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11416	11417	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427	11087	11088	11091	11092
		Elev. ft	+30.10	+30.10	+17.10	+17.10	+5.10	+5.10	-4.90	-4.90	-13.90	-13.90	-18.90	-18.90	-28.90	-28.90	-32.90	-32.90
L0	0:00:00		-0.30	1.35	-0.59	-0.41	-0.38	-1.38	4.55	-9.54	7.34	-15.53	6.10	-13.62	-4.82	0.42	0.56	-3.13
L1	0:04:00		-0.60	1.42	-0.99	-0.07	-0.15	-1.13	5.00	-9.39	7.97	-14.64	7.36	-12.33	-2.10	2.50	1.61	-0.70
L2	0:04:00		-0.78	1.72	-0.26	0.48	0.75	-0.33	6.35	-7.73	9.93	-11.97	11.63	-6.68	4.85	6.87	4.62	3.56
L3	0:04:00		0.15	2.39	1.40	1.48	2.70	1.64	9.50	-3.59	14.41	-6.50	20.76	4.62	13.29	11.69	9.28	10.07
L4	0:04:00		0.93	3.40	4.12	3.76	5.89	5.34	13.60	2.11	19.82	3.23	32.84	19.64	22.28	16.87	15.86	19.57
L5	0:04:00		1.64	4.08	6.47	5.42	9.08	8.58	18.03	8.51	24.75	11.00	44.26	32.57	30.32	23.07	23.08	28.41
L6	0:04:00		2.57	4.56	8.09	6.68	11.25	11.12	19.65	14.83	27.87	21.11	54.72	45.75	38.97	29.55	31.38	38.34
L7	0:04:00		4.06	3.89	9.56	7.42	12.04	12.50	19.08	16.79	28.42	28.39	61.98	57.31	48.39	36.62	39.08	48.13
L8	0:04:00		3.72	3.37	10.15	7.31	12.00	13.01	17.36	20.64	26.35	31.96	63.46	62.96	53.13	40.08	43.49	53.30
L9	0:04:00		4.88	3.25	10.37	6.86	11.85	13.30	15.44	22.71	24.35	38.65	62.97	68.75	56.97	42.47	45.00	56.75
L9	0:14:57		4.17	2.99	10.11	6.60	11.63	13.08	14.12	23.63	21.79	37.98	61.28	71.56	58.42	43.00	45.49	58.05
L10	0:04:00		4.77	2.80	9.01	6.16	10.69	12.25	11.38	23.26	18.49	40.77	56.28	71.52	56.97	41.10	44.37	57.28
U1	0:03:00		4.13	2.47	8.02	5.61	9.41	10.72	9.69	20.90	15.27	35.34	47.08	61.92	48.21	34.27	37.86	49.46
U2	0:03:00		3.50	2.09	7.54	4.65	8.06	9.23	8.08	18.27	12.15	31.29	37.56	51.40	40.96	27.50	32.15	42.39
U3	0:03:12		2.75	1.61	5.55	3.28	6.19	6.98	5.90	13.83	8.08	23.97	25.65	37.51	29.16	19.47	20.14	28.06
U4	0:03:14		1.30	1.05	3.49	1.73	3.94	4.07	4.06	8.95	5.41	12.82	15.47	18.39	15.14	11.73	11.35	13.34
U5	0:03:00		0.04	0.49	-0.11	-0.22	0.08	0.07	-0.19	0.37	-0.33	0.89	-0.21	0.89	0.40	0.42	0.18	0.28
U5	0:06:00		0.30	0.00	-0.33	-0.11	-0.08	0.04	0.19	0.26	0.04	0.52	-0.14	0.55	0.18	0.11	0.11	0.04

Table J.4 Average Calculated Strain, 4 Minute Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+43.80	+30.10	+17.10	+5.10	-4.90	-13.90	-18.90	-24.90
L0	0:00:00	0.00	0.00	0.52	-0.50	-0.88	-2.50	-4.10	-3.76	0.00
L1	0:04:00	0.00	0.00	0.41	-0.53	-0.64	-2.20	-3.34	-2.48	0.48
L2	0:04:00	0.00	0.00	0.47	0.11	0.21	-0.69	-1.02	2.47	10.15
L3	0:04:00	0.00	0.00	1.27	1.44	2.17	2.96	3.96	12.69	24.18
L4	0:04:00	0.00	0.00	2.17	3.94	5.62	7.85	11.53	26.24	39.43
L5	0:04:00	0.00	0.00	2.86	5.95	8.83	13.27	17.88	38.41	53.16
L6	0:04:00	0.00	0.00	3.57	7.38	11.19	17.24	24.49	50.24	67.57
L7	0:04:00	0.00	0.00	3.97	8.49	12.27	17.94	28.41	59.64	82.08
L8	0:04:00	0.00	0.00	3.54	8.73	12.51	19.00	29.15	63.21	87.96
L9	0:04:00	0.00	0.00	4.06	8.62	12.58	19.07	31.50	65.86	92.96
L9	0:14:57	0.00	0.00	3.58	8.36	12.36	18.88	29.89	66.42	93.67
L10	0:04:00	0.00	0.00	3.78	7.59	11.47	17.32	29.63	63.90	89.33
U1	0:03:00	0.00	0.00	3.30	6.81	10.07	15.29	25.31	54.50	68.22
U2	0:03:00	0.00	0.00	2.80	6.09	8.65	13.17	21.72	44.48	52.19
U3	0:03:12	0.00	0.00	2.18	4.42	6.58	9.87	16.02	31.58	34.12
U4	0:03:14	0.00	0.00	1.17	2.61	4.00	6.50	9.12	16.93	16.46
U5	0:03:00	0.00	0.00	0.26	-0.17	0.07	0.09	0.28	0.34	0.00
U5	0:06:00	0.00	0.00	0.15	-0.22	-0.02	0.22	0.28	0.21	0.00

Top of Shaft Ground Surface

Top of Mid Cell

Table J.5 Shaft Load, 4 Minute Readings, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Shaft Load, tons								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+43.80	+30.10	+17.10	+5.10	-4.90	-13.90	-18.90	-24.90
L0	0:00:00	0.0	0.0	4.3	-4.0	-7.1	-20.3	-33.3	-30.6	0.0
L1	0:04:00	0.0	0.0	3.4	-4.3	-5.2	-17.9	-27.1	-20.2	4.1
L2	0:04:00	0.0	0.0	3.8	0.9	1.7	-5.6	-8.3	20.1	86.6
L3	0:04:00	0.0	0.0	10.3	11.7	17.6	24.0	32.1	103.0	206.5
L4	0:04:00	0.0	0.0	17.6	32.0	45.6	63.8	93.6	213.0	336.7
L5	0:04:00	0.0	0.0	23.2	48.3	71.7	107.8	145.1	311.8	453.8
L6	0:04:00	0.0	0.0	29.0	60.0	90.9	140.1	198.8	407.8	576.9
L7	0:04:00	0.0	0.0	32.3	69.0	99.7	145.7	230.6	484.1	700.7
L8	0:04:00	0.0	0.0	28.8	70.9	101.6	154.4	236.6	513.1	751.0
L9	0:04:00	0.0	0.0	33.0	70.0	102.2	155.0	255.7	534.6	793.6
L9	0:14:57	0.0	0.0	29.1	67.9	100.4	153.4	242.6	539.1	799.7
L10	0:04:00	0.0	0.0	30.8	61.6	93.2	140.8	240.5	518.6	762.7
U1	0:03:00	0.0	0.0	26.8	55.3	81.8	124.3	205.4	442.4	582.4
U2	0:03:00	0.0	0.0	22.7	49.5	70.3	107.0	176.3	361.0	445.6
U3	0:03:12	0.0	0.0	17.7	35.9	53.5	80.2	130.1	256.4	291.3
U4	0:03:14	0.0	0.0	9.5	21.2	32.5	52.8	74.0	137.4	140.6
U5	0:03:00	0.0	0.0	2.1	-1.3	0.6	0.7	2.3	2.7	0.0
U5	0:06:00	0.0	0.0	1.2	-1.8	-0.2	1.8	2.3	1.7	0.0
Modulus, ksi		3991.2	3991.2	3991.2	3991.2	3991.2	3991.2	3987.1	3987.1	3970.1
Diameter, in		72.00	72.00	72.00	72.00	72.00	72.00	72.00	72.00	74.00
		Top of Shaft	Ground Surface							Top of Mid Cell

Table J.6 Average Segment Side Shear, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf									
		CL Elev., ft	+45.40	+36.95	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	
		Length, ft	3.20	13.70	13.00	12.00	10.00	9.00	5.00	6.00	
L0	0:00:00		0.000	-0.049	-0.100	-0.079	-0.136	-0.142	-0.037	0.200	
L1	0:04:00		0.000	-0.053	-0.097	-0.069	-0.133	-0.120	0.008	0.145	
L2	0:04:00		0.000	-0.051	-0.078	-0.062	-0.105	-0.081	0.235	0.514	
L3	0:04:00		0.000	-0.026	-0.060	-0.039	-0.032	-0.018	0.686	0.836	
L4	0:04:00		0.000	0.002	-0.007	-0.006	0.031	0.110	1.201	1.012	
L5	0:04:00		0.000	0.024	0.037	0.038	0.126	0.154	1.703	1.172	
L6	0:04:00		0.000	0.046	0.061	0.071	0.195	0.280	2.152	1.408	
L7	0:04:00		0.000	0.059	0.084	0.070	0.179	0.434	2.624	1.822	
L8	0:04:00		0.000	0.046	0.106	0.070	0.214	0.419	2.867	2.008	
L9	0:04:00		0.000	0.062	0.085	0.077	0.214	0.528	2.894	2.193	
L9	0:14:57		0.000	0.047	0.093	0.078	0.215	0.460	3.081	2.206	
L10	0:04:00		0.000	0.053	0.060	0.074	0.187	0.522	2.886	2.062	
U1	0:03:00		0.000	0.038	0.051	0.051	0.160	0.413	2.449	1.155	
U2	0:03:00		0.000	0.022	0.044	0.026	0.129	0.343	1.894	0.671	
U3	0:03:12		0.000	0.003	0.008	0.012	0.076	0.229	1.274	0.238	
U4	0:03:14		0.000	-0.029	-0.018	-0.016	0.042	0.059	0.607	-0.039	
U5	0:03:00		0.000	-0.057	-0.080	-0.057	-0.065	-0.057	-0.061	-0.091	
U5	0:06:00		0.000	-0.061	-0.078	-0.058	-0.055	-0.063	-0.072	-0.081	
Segment Wt., tons				6.79	16.97	16.10	14.86	12.38	11.15	6.19	7.64
Maximum Shear, tsf				0.000	0.062	0.106	0.078	0.215	0.528	3.081	2.206

Table J.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 5 -2002

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain									Shaft Compression			Error	
		CL Elev., ft	+45.40	+38.55	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	Strain Gage		TT in	in	%
		Length, ft	3.20	16.90	13.00	12.00	10.00	9.00	5.00	6.00	Net, in	Change, in			
L0	0:00:00		0.00	0.26	0.01	-0.69	-1.69	-3.30	-3.93	-1.88	-0.0010	0.0000	0.0000	0.0000	
L1	0:04:00		0.00	0.21	-0.06	-0.59	-1.42	-2.77	-2.91	-1.00	-0.0008	0.0002	0.0002	0.0001	37.3%
L2	0:04:00		0.00	0.23	0.29	0.16	-0.24	-0.85	0.73	6.31	0.0005	0.0015	0.0006	0.0009	166.7%
L3	0:04:00		0.00	0.64	1.35	1.80	2.56	3.46	8.32	18.43	0.0031	0.0041	0.0027	0.0014	51.2%
L4	0:04:00		0.00	1.08	3.05	4.78	6.73	9.69	18.89	32.84	0.0067	0.0077	0.0057	0.0020	35.3%
L5	0:04:00		0.00	1.43	4.40	7.39	11.05	15.57	28.15	45.78	0.0100	0.0110	0.0085	0.0026	30.3%
L6	0:04:00		0.00	1.78	5.47	9.29	14.21	20.86	37.36	58.90	0.0130	0.0140	0.0108	0.0032	29.9%
L7	0:04:00		0.00	1.99	6.23	10.38	15.10	23.17	44.03	70.86	0.0149	0.0159	0.0124	0.0035	28.2%
L8	0:04:00		0.00	1.77	6.14	10.62	15.75	24.08	46.18	75.59	0.0155	0.0165	0.0135	0.0031	22.8%
L9	0:04:00		0.00	2.03	6.34	10.60	15.83	25.29	48.68	79.41	0.0162	0.0172	0.0158	0.0014	9.0%
L9	0:14:57		0.00	1.79	5.97	10.36	15.62	24.38	48.15	80.04	0.0159	0.0169	0.0309	-0.0139	-45.2%
L10	0:04:00		0.00	1.89	5.68	9.53	14.40	23.48	46.76	76.62	0.0152	0.0162	0.0392	-0.0230	-58.7%
U1	0:03:00		0.00	1.65	5.06	8.44	12.68	20.30	39.90	61.36	0.0129	0.0138	0.0381	-0.0242	-63.6%
U2	0:03:00		0.00	1.40	4.45	7.37	10.91	17.45	33.10	48.34	0.0107	0.0117	0.0340	-0.0223	-65.6%
U3	0:03:12		0.00	1.09	3.30	5.50	8.22	12.94	23.80	32.85	0.0077	0.0087	0.0304	-0.0217	-71.4%
U4	0:03:14		0.00	0.59	1.89	3.31	5.25	7.81	13.02	16.70	0.0043	0.0053	0.0252	-0.0199	-78.9%
U5	0:03:00		0.00	0.13	0.05	-0.05	0.08	0.19	0.31	0.17	0.0001	0.0011	0.0174	-0.0163	-93.9%
U5	0:06:00		0.00	0.07	-0.04	-0.12	0.10	0.25	0.24	0.10	0.0001	0.0010	0.0173	-0.0162	-94.0%

Table J.8 Movement at Segment Centerline, Shaft 5 - 2002

Load Interval	Elapsed Time hhmmss	Segment Movement, in									Mid Cell
		CL Elev., ft	+45.40	+38.55	+23.60	+11.10	+0.10	-9.40	-16.40	-21.90	-24.90
		Length, ft	3.20	16.90	13.00	12.00	10.00	9.00	5.00	6.00	-
L0	0:00:00		0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000
L1	0:04:00		0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
L2	0:04:00		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
L3	0:04:00		0.014	0.014	0.014	0.014	0.014	0.015	0.015	0.016	0.017
L4	0:04:00		0.032	0.032	0.033	0.033	0.034	0.035	0.036	0.038	0.039
L5	0:04:00		0.067	0.067	0.068	0.069	0.070	0.071	0.073	0.076	0.077
L6	0:04:00		0.130	0.130	0.130	0.131	0.133	0.135	0.137	0.140	0.143
L7	0:04:00		0.238	0.238	0.239	0.240	0.242	0.244	0.247	0.251	0.253
L8	0:04:00		0.403	0.403	0.404	0.405	0.406	0.409	0.411	0.415	0.418
L9	0:04:00		0.608	0.608	0.609	0.610	0.611	0.614	0.617	0.621	0.624
L9	0:14:57		0.822	0.822	0.823	0.824	0.826	0.828	0.831	0.835	0.838
L10	0:04:00		1.002	1.002	1.002	1.004	1.005	1.007	1.010	1.014	1.017
U1	0:03:00		0.996	0.996	0.997	0.998	0.999	1.001	1.003	1.007	1.009
U2	0:03:00		0.982	0.982	0.983	0.984	0.985	0.987	0.988	0.991	0.993
U3	0:03:12		0.964	0.964	0.964	0.965	0.966	0.967	0.968	0.970	0.971
U4	0:03:14		0.937	0.937	0.937	0.938	0.938	0.939	0.940	0.941	0.941
U5	0:03:00		0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876
U5	0:06:00		0.874	0.874	0.874	0.874	0.874	0.874	0.874	0.874	0.874

Table J.9 Section Properties, Shaft 5 - 2002

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	20	1.561	31.229
3/4" Galvanized Steel Teltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			35.173

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	6	4.431	26.586
Area of Pipe =			28.354

370

Concrete Modulus 3800 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
47.0	72	4071.50	35.17	28.35	4007.98	3991.24	4PVC pipe, 4hose
-8.9	72	4071.50	34.51	28.35	4008.64	3987.11	4PVC pipe, 4hose
-24.0	74	4300.84	33.18	27.47	4240.20	3970.11	4PVC pipe, 2hose

Figure J.1 Shaft Top VW Strain, Shaft 5 - 2002

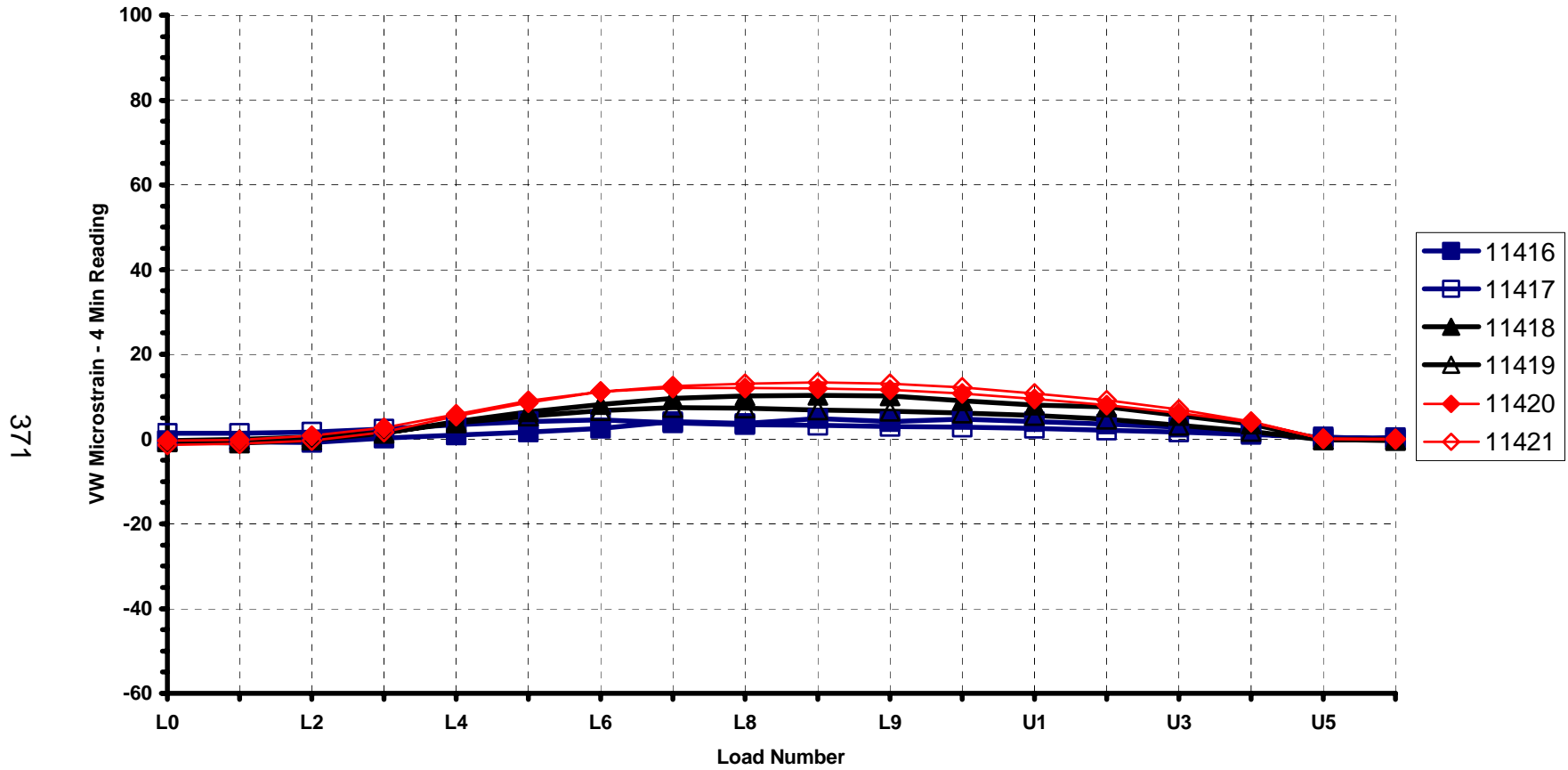


Figure J.2 Shaft Middle VW Strain, Shaft 5 - 2002

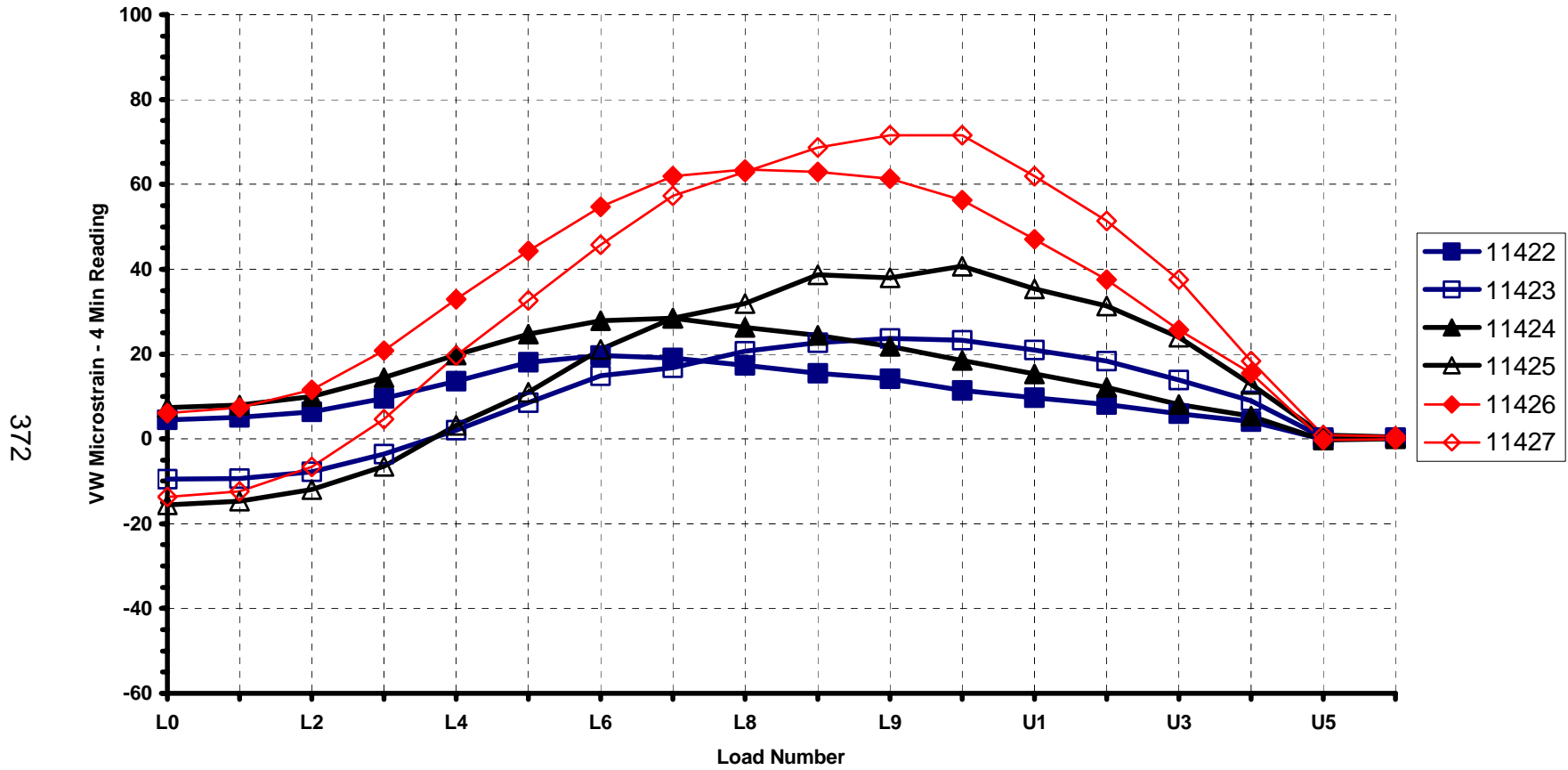
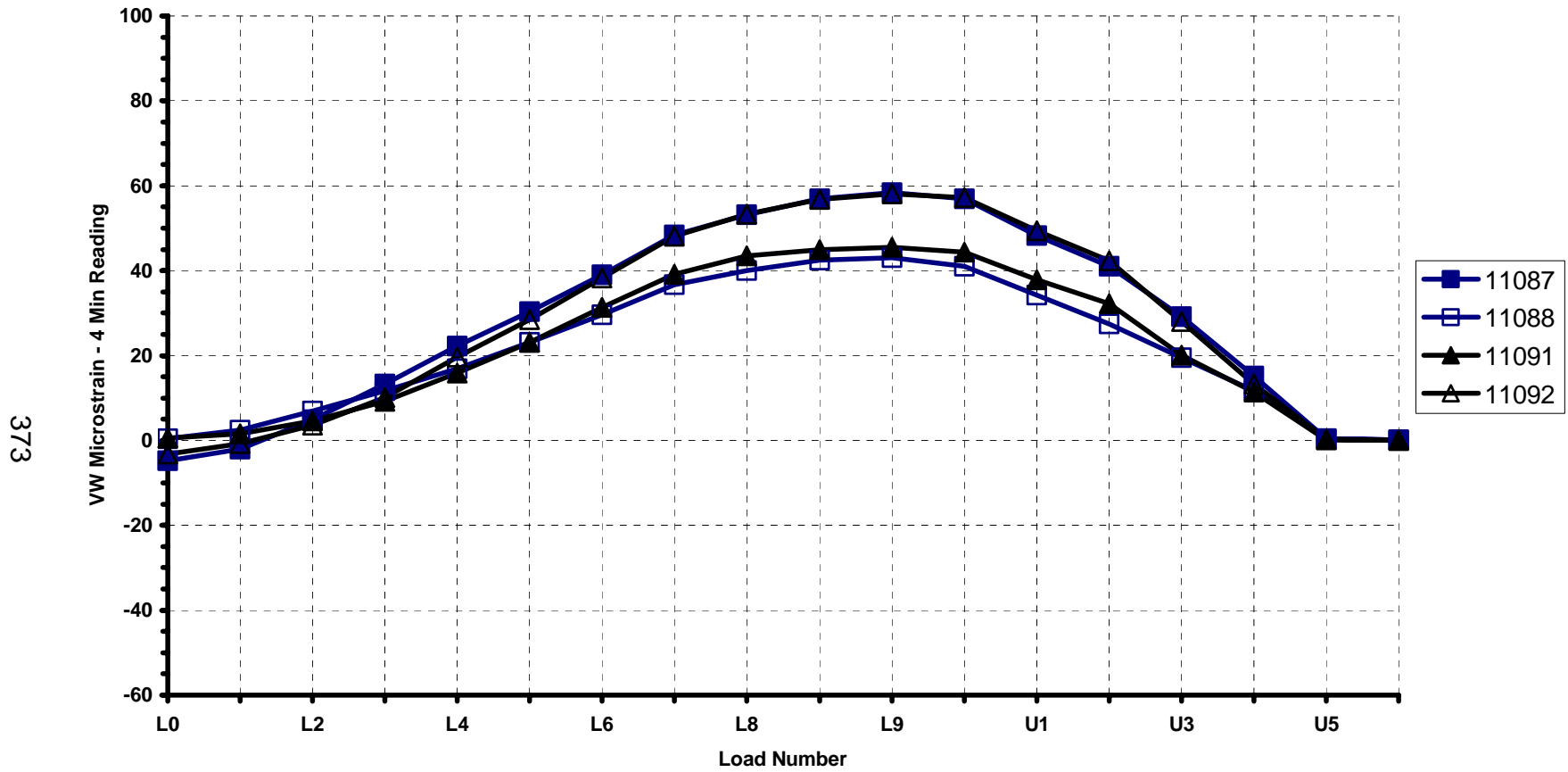


Figure J.3 Shaft Bottom VW Strain, Shaft 5 - 2002



373

Figure J.4 Shaft Top Shear Stress vs. Movement, Shaft 5 - 2002

374

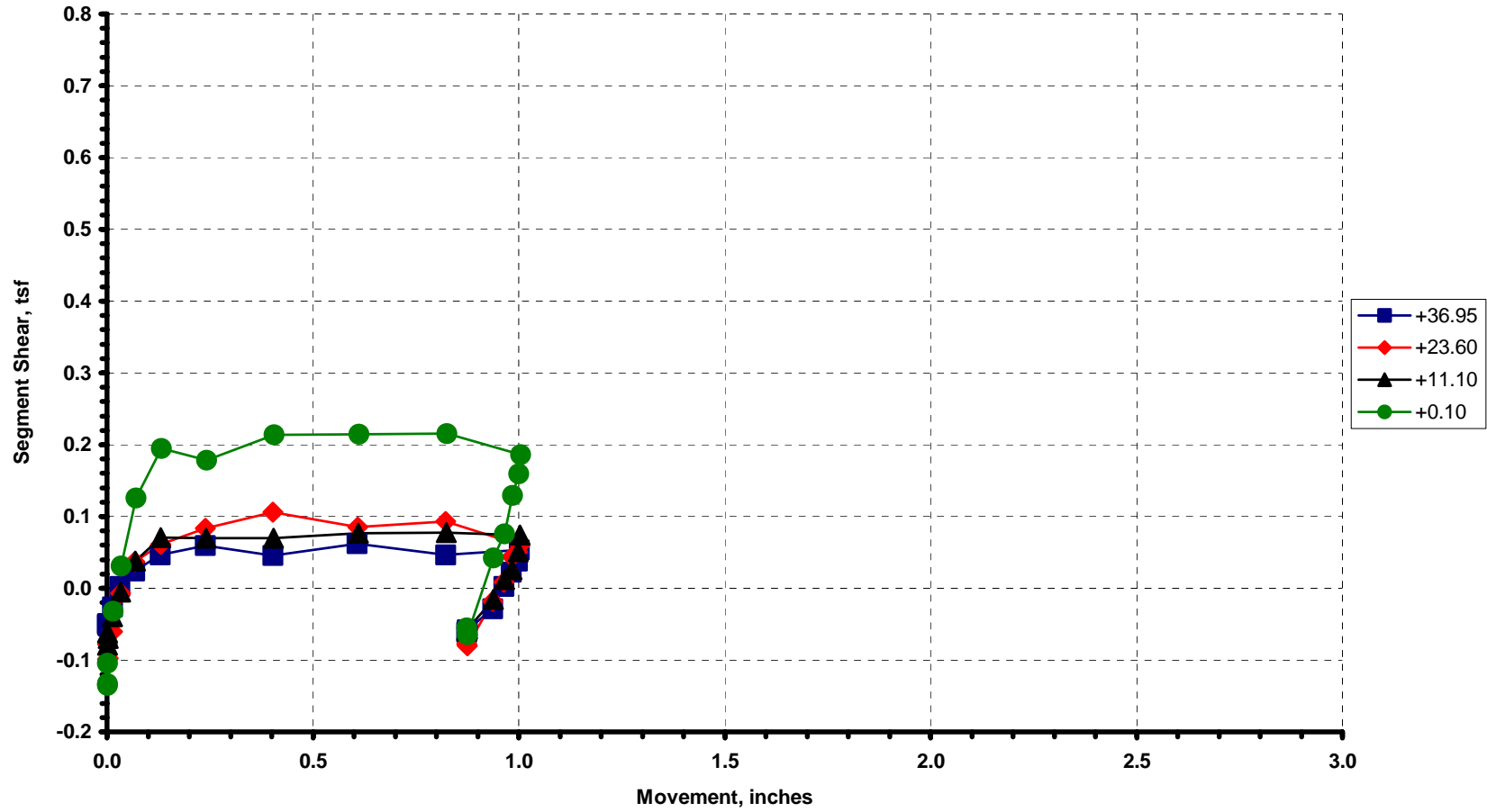


Figure J.5 Shaft Middle Shear Stress vs. Movement, Shaft 5 - 2002

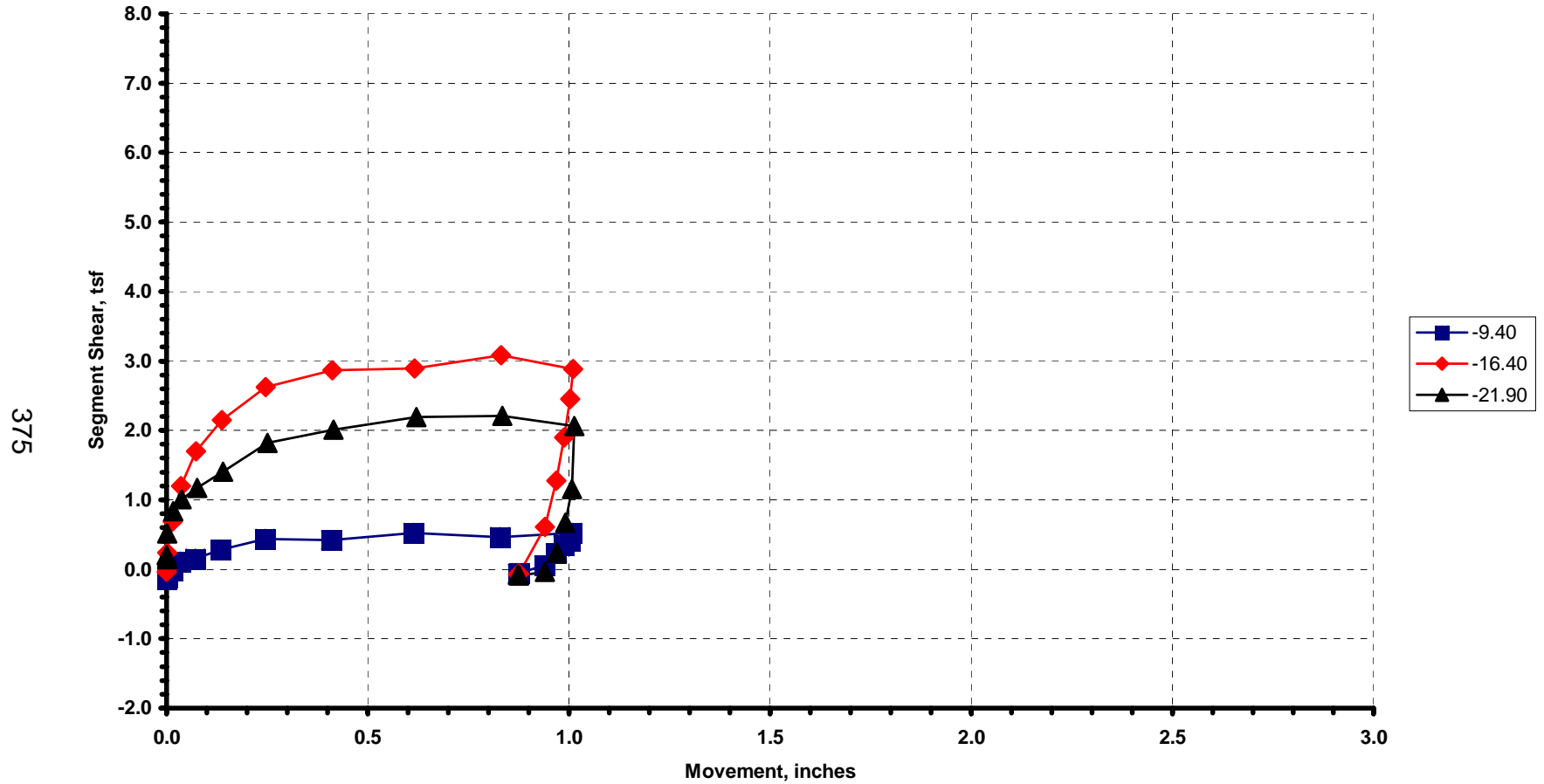
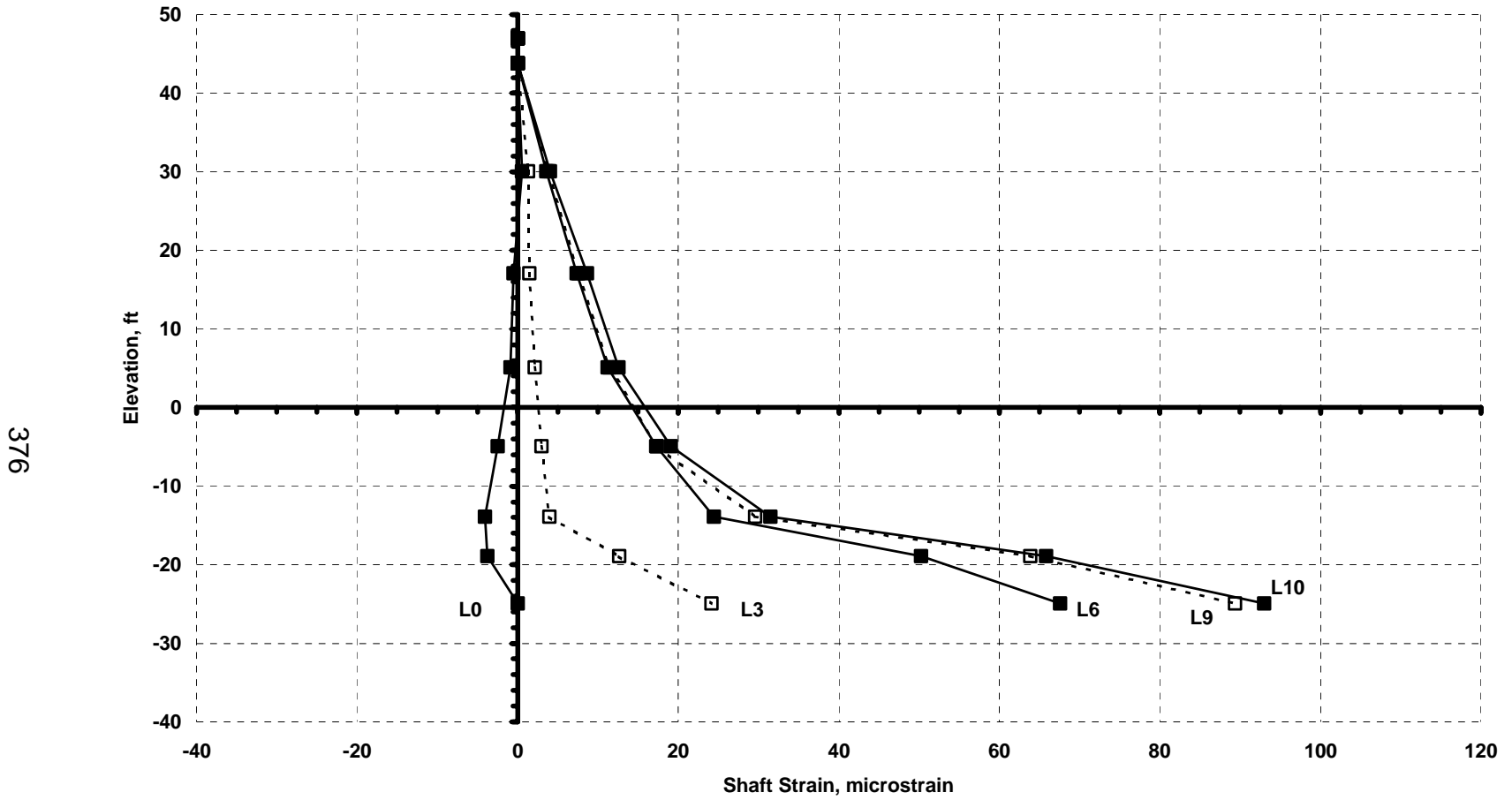


Figure J.6 Strain Distribution, Shaft 5 - 2002



376

Figure J.7 Load Distribution, Shaft 5 - 2002

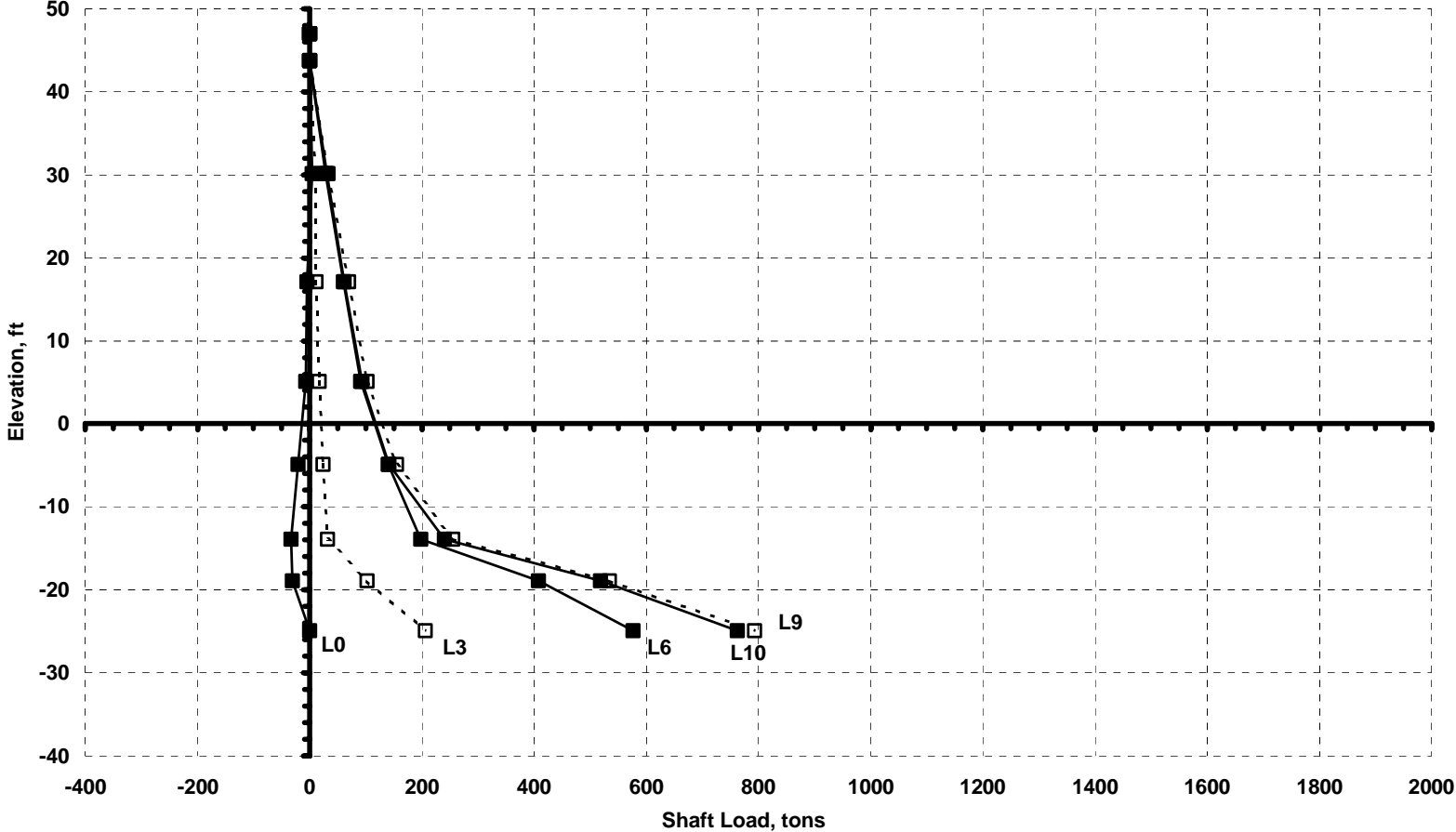
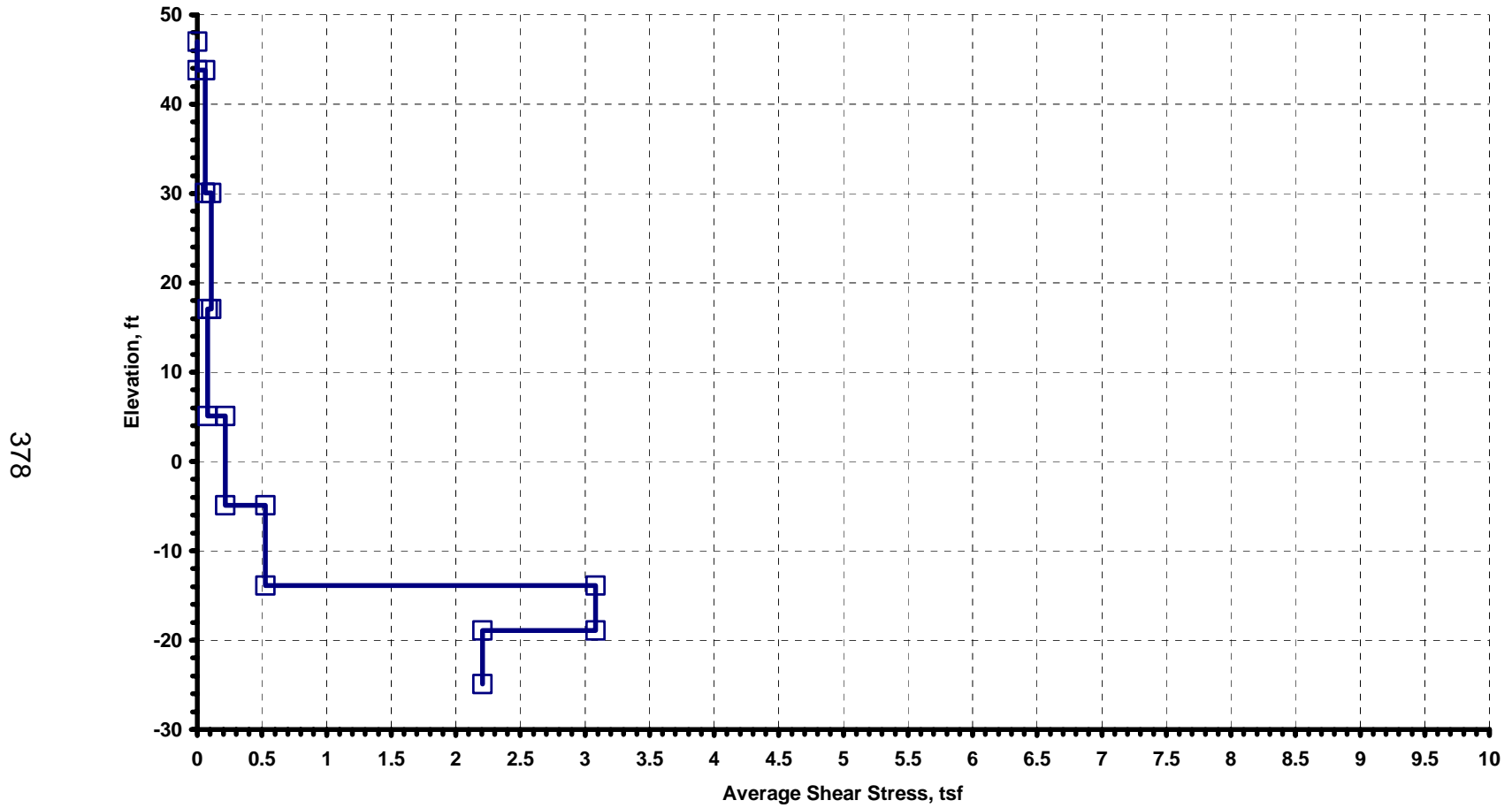
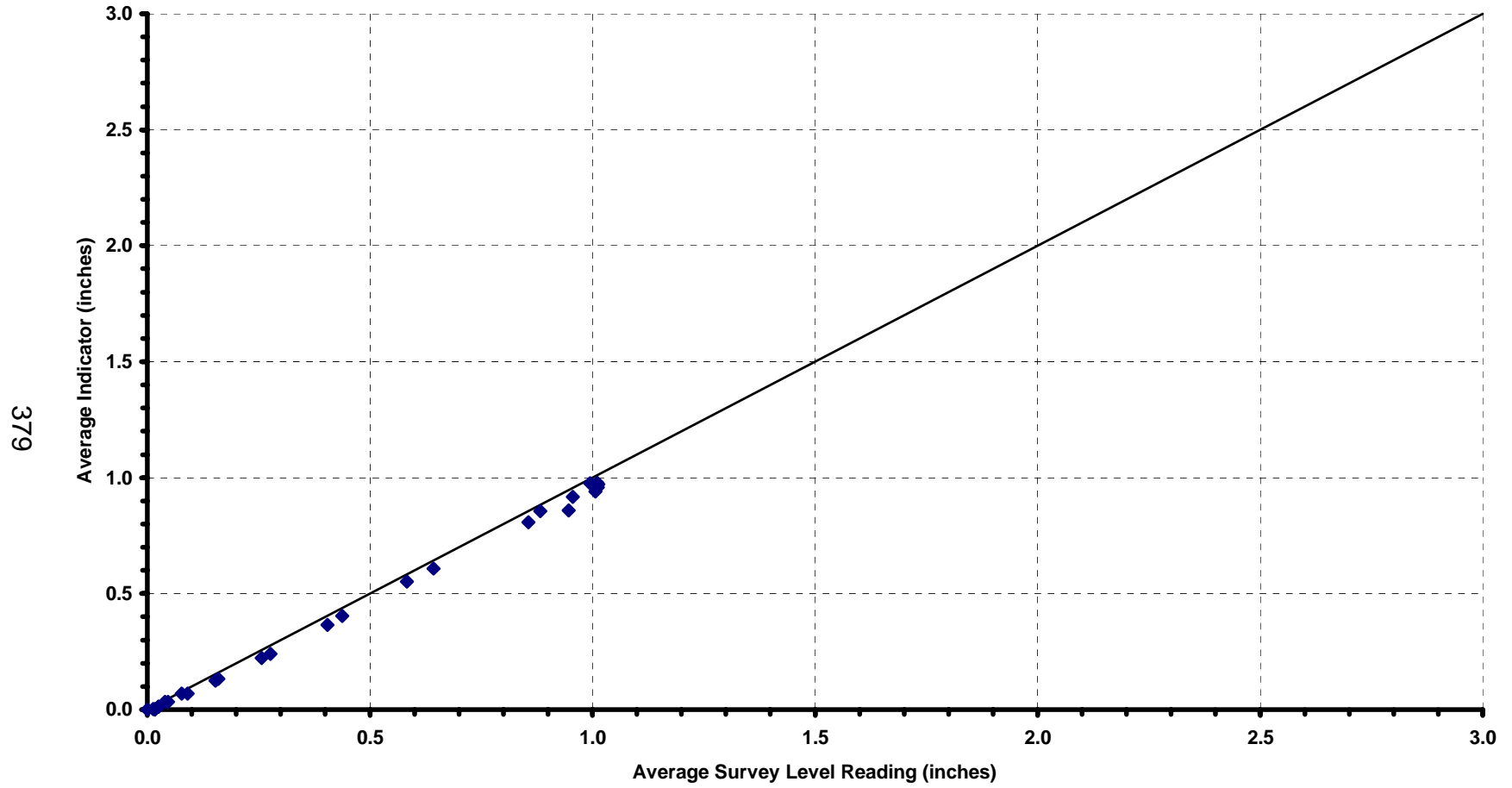


Figure J.8 Shear Stress Distribution, Shaft 5 - 2002



378

Figure J.9 Top of Shaft Indicators vs Survey Level, Stage 3 - Shaft 5 - 2002



379

Figure J.10 Average Compression vs Load, Stage 3 - Shaft 5 - 2002

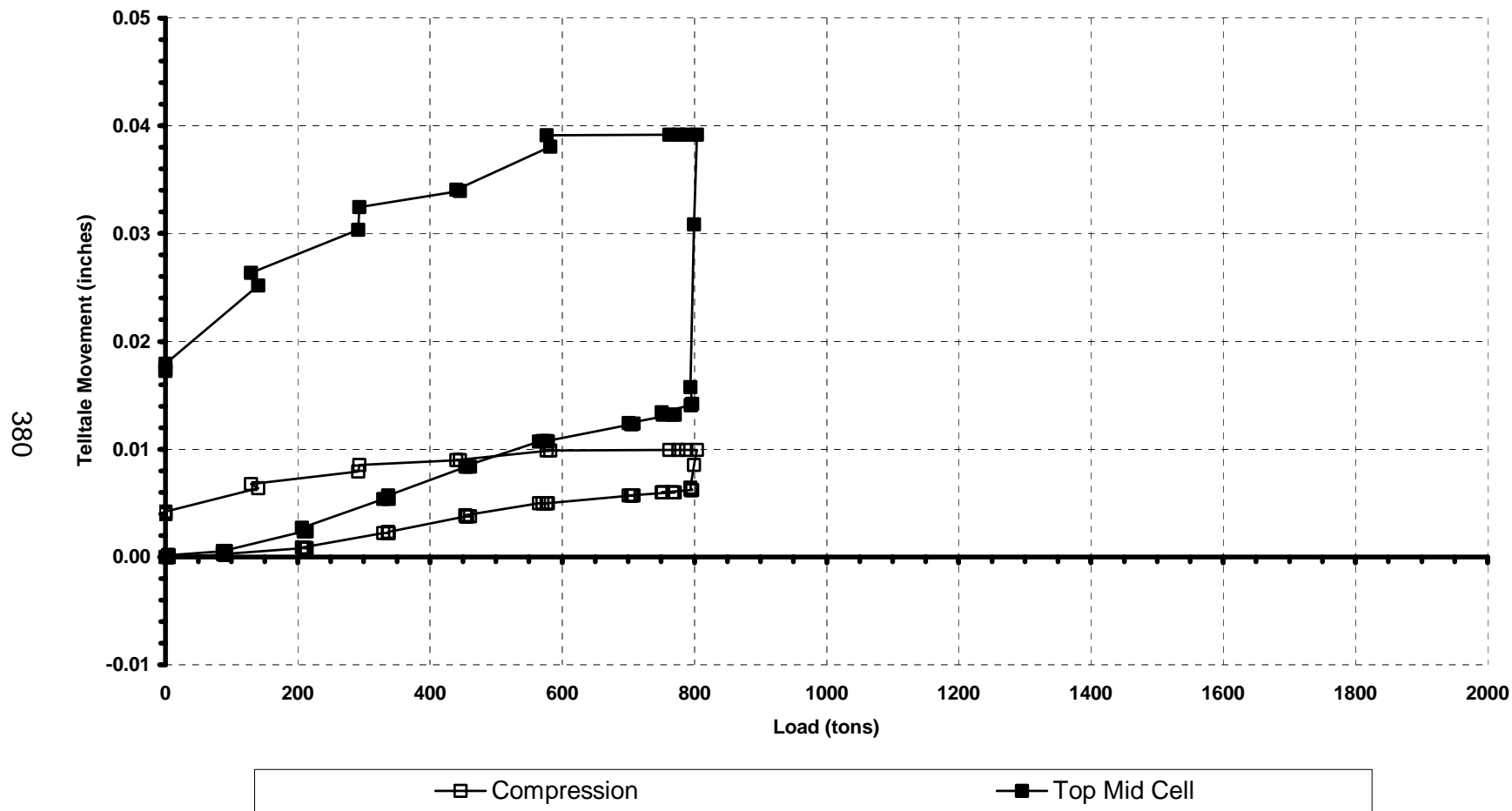


Figure J.11 Mid Cell Movement, Stage 3 - Shaft 5 - 2002

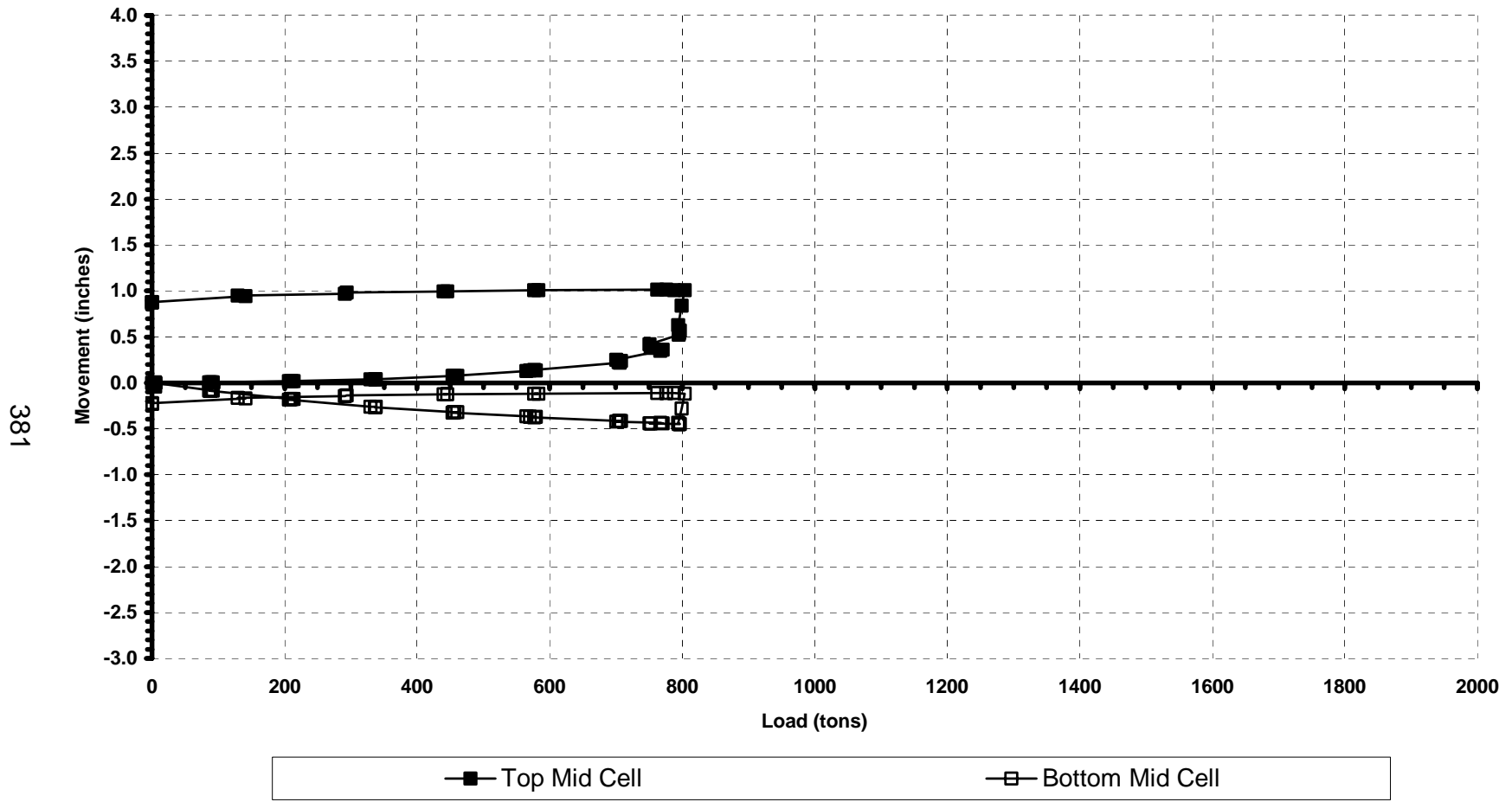
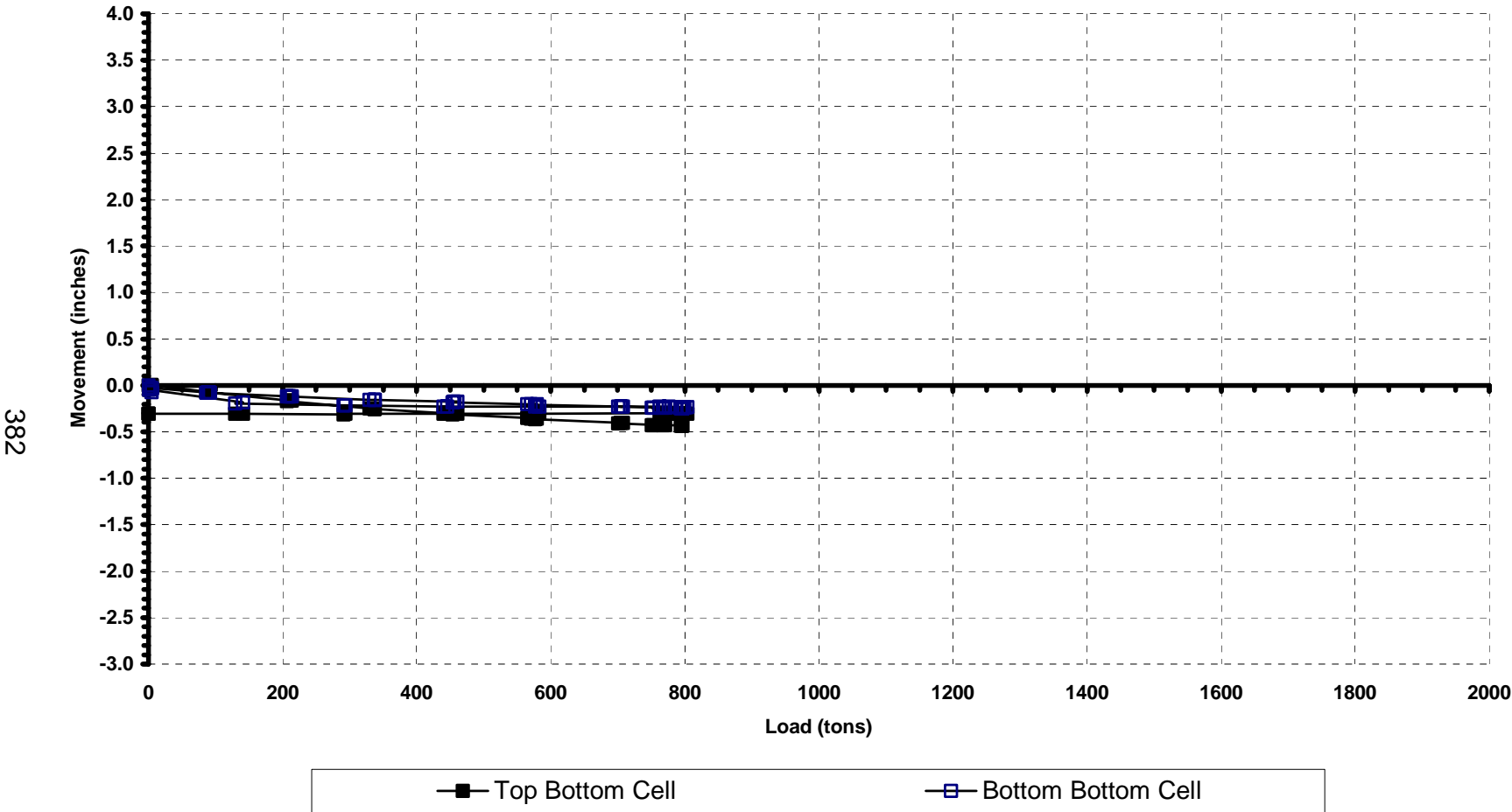


Figure J.12 Bottom Cell Movement, Stage 3 - Shaft 5 - 2002



382

Figure J.13 VW Pressure Transducer vs Pressure Gage, Mid Cell - Shaft 5 - 2002

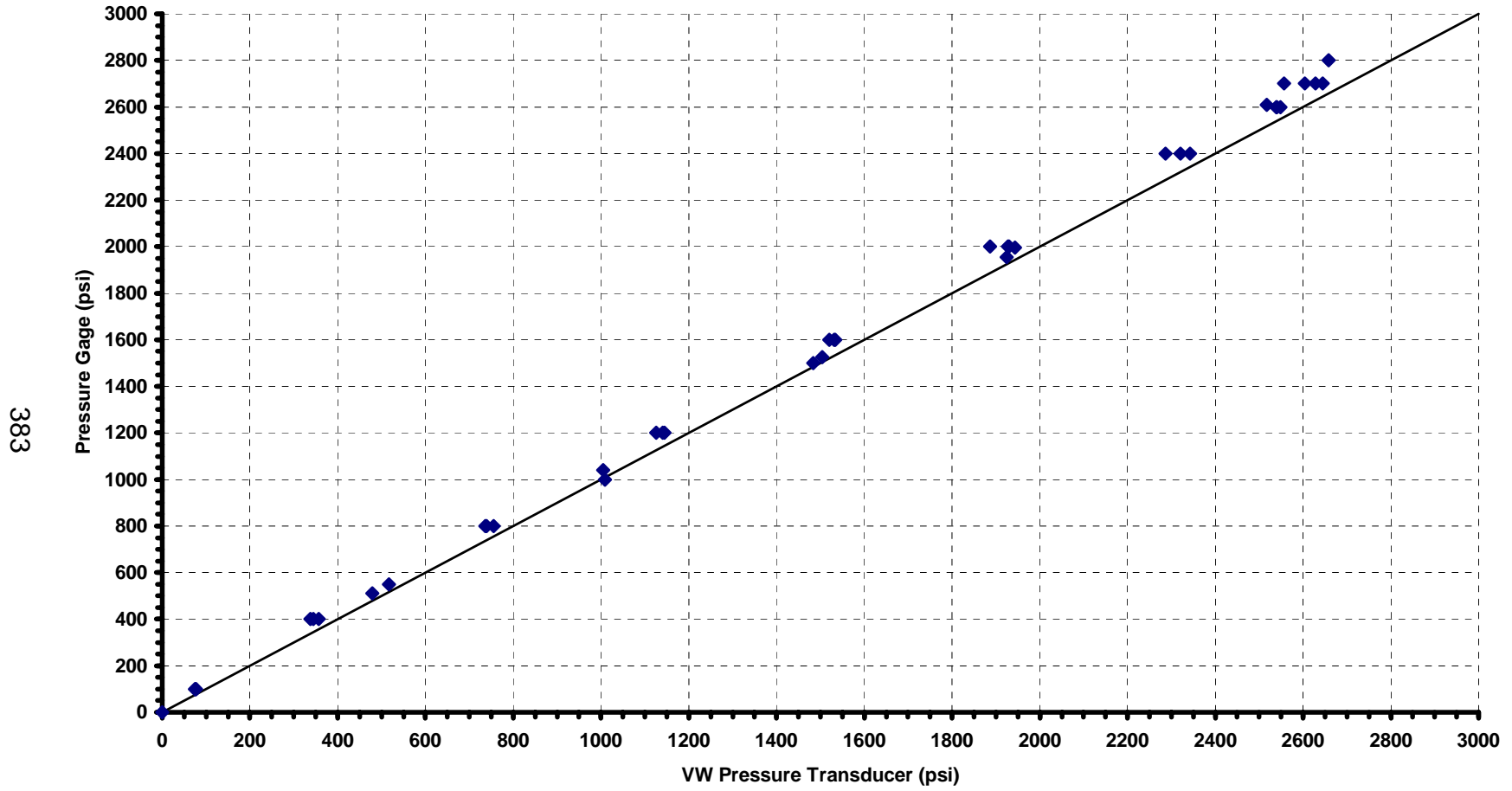
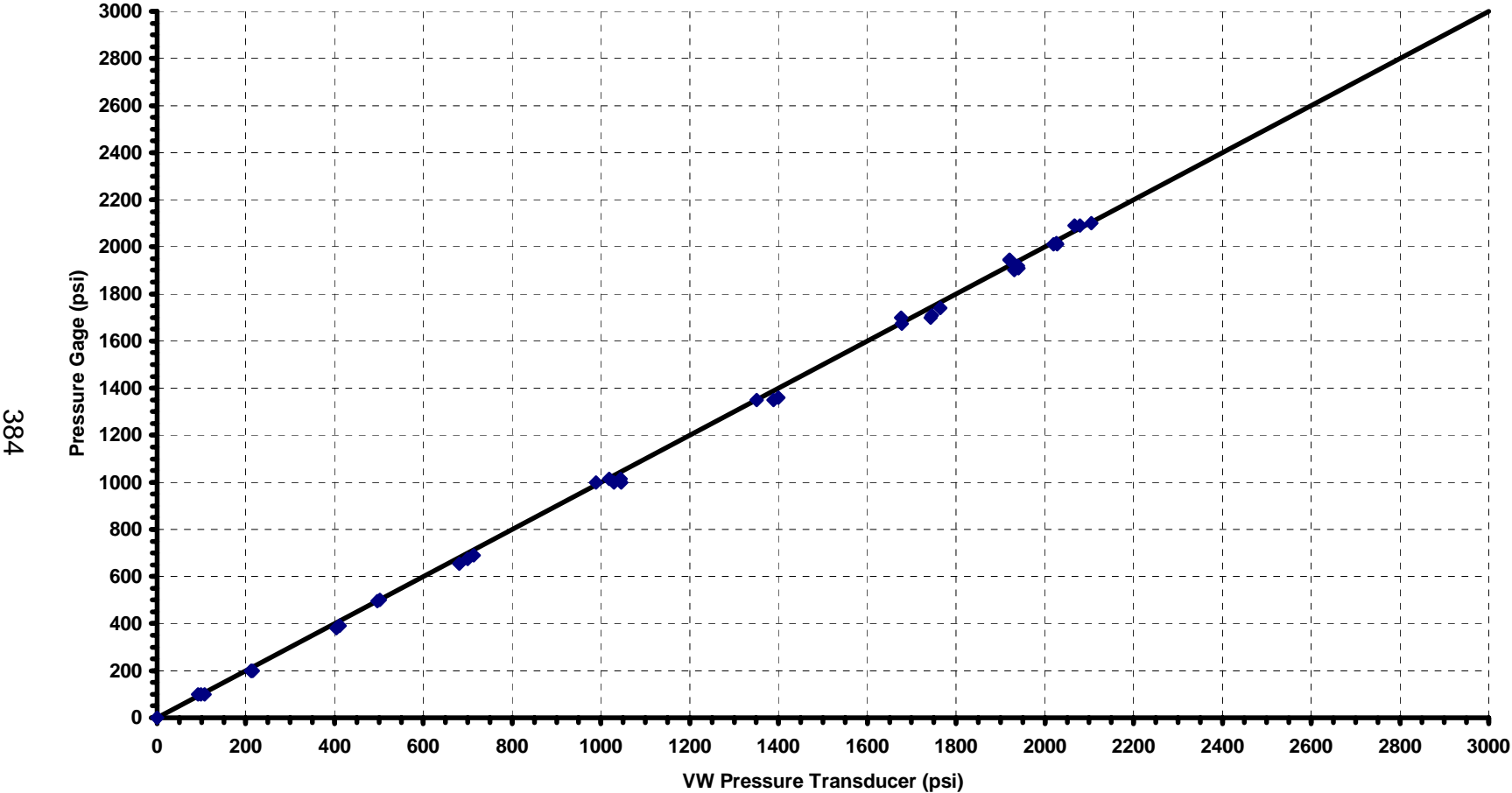


Figure J.14 VW Pressure Transducer vs Pressure Gage, Bottom Cell - Shaft 5 - 2002



**APPENDIX K
TEST SHAFT 7 – ANALYSIS OF 1996 TEST**

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Pressure (psi)	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
				A	B	Average	X	Y	Avg. Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	-16.72	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:00	37.19	0.00	0.0000	-0.0001	-0.0001	0.0000	0.0000	0.0000
L1	0:00:30	648.21	183.94	0.0166	0.0187	0.0177	0.0015	0.0000	0.0008
L1	0:01:00	963.52	281.08	0.0417	0.0435	0.0426	0.0020	0.0000	0.0010
L1	0:01:30	968.42	282.59	0.0436	0.0450	0.0443	0.0020	0.0000	0.0010
L1	0:02:00	958.61	279.57	0.0439	0.0453	0.0446	0.0020	0.0000	0.0010
L1	0:02:30	953.71	278.06	0.0441	0.0459	0.0450	0.0024	0.0000	0.0012
L2	0:00:00	1749.30	523.15	0.1075	0.1157	0.1116	0.0044	0.0000	0.0022
L2	0:00:30	1955.20	586.58	0.1312	0.1371	0.1342	0.0045	0.0000	0.0023
L2	0:01:00	1947.00	584.05	0.1335	0.1394	0.1365	0.0045	0.0000	0.0023
L2	0:01:30	1924.20	577.03	0.1341	0.1400	0.1371	0.0045	0.0000	0.0023
L2	0:02:00	1945.40	583.56	0.1350	0.1411	0.1381	0.0045	0.0000	0.0023
L2	0:02:30	1958.50	587.59	0.1364	0.1427	0.1396	0.0046	0.0000	0.0023
L3	0:00:00	2371.80	714.92	0.1647	0.1735	0.1691	0.0052	0.0000	0.0026
L3	0:00:30	2456.70	741.07	0.1837	0.1932	0.1885	0.0053	0.0000	0.0027
L3	0:01:00	2466.50	744.09	0.1906	0.2004	0.1955	0.0053	0.0000	0.0027
L3	0:01:30	2469.80	745.11	0.1946	0.2043	0.1995	0.0053	0.0000	0.0027
L3	0:02:00	2476.20	747.08	0.1983	0.2081	0.2032	0.0053	0.0000	0.0027
L3	0:02:30	2477.80	747.57	0.2015	0.2111	0.2063	0.0053	0.0000	0.0027
L4	0:00:00	2670.60	806.97	0.2265	0.2362	0.2314	0.0057	0.0000	0.0029
L4	0:00:30	2673.80	807.95	0.2390	0.2499	0.2445	0.0057	0.0000	0.0029
L4	0:01:00	2706.50	818.03	0.2477	0.2588	0.2533	0.0057	0.0000	0.0029
L4	0:01:30	2726.10	824.06	0.2575	0.2676	0.2626	0.0057	0.0000	0.0029
L4	0:02:00	2740.90	828.62	0.2656	0.2766	0.2711	0.0057	0.0000	0.0029
L4	0:02:30	2714.70	820.55	0.2735	0.2836	0.2786	0.0057	0.0000	0.0029
L5	0:00:00	2773.50	838.67	0.2777	0.2879	0.2828	0.0057	0.0000	0.0029
L5	0:00:30	2801.30	847.23	0.2917	0.3007	0.2962	0.0057	0.0000	0.0029
L5	0:01:00	2775.20	839.19	0.2974	0.3064	0.3019	0.0058	0.0000	0.0029
L5	0:01:30	2781.70	841.19	0.3024	0.3116	0.3070	0.0058	0.0000	0.0029
L5	0:02:00	2791.40	844.18	0.3079	0.3169	0.3124	0.0058	0.0000	0.0029
L5	0:02:30	2797.90	846.18	0.3130	0.3221	0.3176	0.0058	0.0000	0.0029
L5	0:03:00	2748.90	831.09	0.3160	0.3247	0.3204	0.0058	0.0000	0.0029
L5	0:03:30	2732.50	826.04	0.3169	0.3256	0.3213	0.0058	0.0000	0.0029
L5	0:04:00	2757.00	833.58	0.3182	0.3270	0.3226	0.0058	0.0000	0.0029
L5	0:04:30	2773.40	838.64	0.3208	0.3296	0.3252	0.0058	0.0000	0.0029
L6	0:00:00	2871.50	868.86	0.3333	0.3433	0.3383	0.0058	0.0000	0.0029
L6	0:00:30	2892.70	875.39	0.3477	0.3577	0.3527	0.0058	0.0000	0.0029
L6	0:01:00	2860.00	865.31	0.3530	0.3628	0.3579	0.0058	0.0000	0.0029
L6	0:01:30	2863.30	866.33	0.3576	0.3676	0.3626	0.0058	0.0000	0.0029
L6	0:02:00	2873.10	869.35	0.3621	0.3722	0.3672	0.0058	0.0000	0.0029
L6	0:02:30	2879.80	871.41	0.3686	0.3777	0.3732	0.0058	0.0000	0.0029
L6	0:03:00	2891.30	874.96	0.3739	0.3830	0.3785	0.0058	0.0000	0.0029
L6	0:03:30	2894.50	875.94	0.3789	0.3882	0.3836	0.0058	0.0000	0.0029

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Pressure (psi)	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
				A	B	Average	X	Y	Avg. Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L6	0:04:00	2871.70	868.92	0.3826	0.3919	0.3873	0.0058	0.0000	0.0029
L6	0:04:30	2865.10	866.88	0.3849	0.3942	0.3896	0.0058	0.0000	0.0029
L7	0:00:00	2964.80	897.60	0.4008	0.4117	0.4063	0.0058	0.0000	0.0029
L7	0:00:30	2973.10	900.16	0.4151	0.4260	0.4206	0.0059	0.0000	0.0030
L7	0:01:00	2968.20	898.65	0.4248	0.4356	0.4302	0.0059	0.0000	0.0030
L7	0:01:30	2974.80	900.68	0.4320	0.4428	0.4374	0.0059	0.0000	0.0030
L7	0:02:00	2979.70	902.19	0.4399	0.4497	0.4448	0.0059	0.0000	0.0030
L7	0:02:30	2979.70	902.19	0.4463	0.4562	0.4513	0.0059	0.0000	0.0030
L7	0:03:00	2989.50	905.21	0.4527	0.4627	0.4577	0.0059	0.0000	0.0030
L7	0:03:30	2989.60	905.24	0.4587	0.4690	0.4639	0.0059	0.0000	0.0030
L8	0:00:00	3059.90	926.90	0.4721	0.4837	0.4779	0.0059	0.0000	0.0030
L8	0:00:30	3074.60	931.42	0.4928	0.5036	0.4982	0.0059	0.0000	0.0030
L8	0:01:00	3092.60	936.97	0.5110	0.5219	0.5165	0.0059	0.0000	0.0030
L8	0:01:30	3102.40	939.99	0.5284	0.5400	0.5342	0.0059	0.0000	0.0030
L8	0:02:00	3079.50	932.93	0.5392	0.5494	0.5443	0.0059	0.0000	0.0030
L8	0:02:30	3074.70	931.45	0.5470	0.5571	0.5521	0.0059	0.0000	0.0030
L8	0:03:00	3082.90	933.98	0.5546	0.5649	0.5598	0.0059	0.0000	0.0030
L8	0:03:30	3086.10	934.97	0.5621	0.5726	0.5674	0.0059	0.0000	0.0030
L8	0:04:00	3087.80	935.49	0.5694	0.5801	0.5748	0.0059	0.0000	0.0030
L8	0:04:30	3089.40	935.98	0.5766	0.5872	0.5819	0.0059	0.0000	0.0030
L9	0:00:00	3107.40	941.53	0.5845	0.5959	0.5902	0.0059	0.0000	0.0030
L9	0:00:30	3172.60	961.61	0.6135	0.6249	0.6192	0.0059	0.0000	0.0030
L9	0:01:00	3190.60	967.16	0.6395	0.6519	0.6457	0.0059	0.0000	0.0030
L9	0:01:30	3210.20	973.20	0.6658	0.6780	0.6719	0.0059	0.0000	0.0030
L9	0:02:00	3184.10	965.16	0.6889	0.7005	0.6947	0.0059	0.0000	0.0030
L9	0:02:30	3195.50	968.67	0.7037	0.7155	0.7096	0.0059	0.0000	0.0030
L9	0:03:00	3177.50	963.12	0.7159	0.7276	0.7218	0.0059	0.0000	0.0030
L9	0:03:30	3164.20	959.03	0.7251	0.7364	0.7308	0.0059	0.0000	0.0030
L9	0:04:00	3170.70	961.03	0.7336	0.7450	0.7393	0.0059	0.0000	0.0030
L9	0:04:30	3170.70	961.03	0.7420	0.7534	0.7477	0.0059	0.0000	0.0030
L9	0:05:00	3167.50	960.04	0.7504	0.7616	0.7560	0.0059	0.0000	0.0030
L9	0:05:30	3169.10	960.54	0.7588	0.7706	0.7647	0.0059	0.0000	0.0030
L10	0:00:00	3281.80	995.25	0.8006	0.8142	0.8074	0.0059	0.0000	0.0030
L10	0:00:30	3272.00	992.24	0.8404	0.8537	0.8471	0.0059	0.0000	0.0030
L10	0:01:00	3288.40	997.29	0.8758	0.8889	0.8824	0.0059	0.0000	0.0030
L10	0:01:30	3276.90	993.74	0.9015	0.9148	0.9082	0.0058	0.0000	0.0029
L10	0:02:00	3283.50	995.78	0.9269	0.9403	0.9336	0.0057	0.0000	0.0029
L10	0:02:30	3280.20	994.76	0.9520	0.9659	0.9590	0.0056	0.0000	0.0028
L10	0:03:00	3275.50	993.31	0.9766	0.9908	0.9837	0.0056	0.0000	0.0028
L10	0:03:30	3277.10	993.81	1.0021	1.0167	1.0094	0.0055	0.0000	0.0028
L11	0:00:00	3363.70	1020.48	1.0727	1.0895	1.0811	0.0055	0.0000	0.0028
L11	0:00:30	3358.80	1018.98	1.1491	1.1671	1.1581	0.0052	0.0000	0.0026
L11	0:01:00	3365.30	1020.98	1.2224	1.2407	1.2316	0.0051	0.0000	0.0026

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Pressure (psi)	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
				A	B	Average	X	Y	Avg. Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L11	0:01:30	3380.00	1025.51	1.2927	1.3113	1.3020	0.0049	0.0000	0.0025
L11	0:02:00	3367.10	1021.53	1.3621	1.3809	1.3715	0.0047	0.0001	0.0024
L11	0:02:30	3372.00	1023.04	1.4322	1.4515	1.4419	0.0044	0.0002	0.0023
L11	0:03:00	3385.10	1027.08	1.5021	1.5212	1.5117	0.0043	0.0002	0.0023
L11	0:03:30	3412.80	1035.61	1.5749	1.5963	1.5856	0.0042	0.0003	0.0023
L11	0:04:00	3401.40	1032.10	1.6895	1.7108	1.7002	0.0038	0.0004	0.0021
L11	0:04:30	3407.90	1034.10	1.8046	1.8270	1.8158	0.0035	0.0005	0.0020
L11	0:05:00	3406.40	1033.64	1.9176	1.9392	1.9284	0.0033	0.0006	0.0020
U1	0:00:00	3290.40	997.90	1.9840	2.0028	1.9934	0.0028	0.0006	0.0017
U1	0:00:30	2978.30	901.76	1.9840	2.0028	1.9934	0.0027	0.0006	0.0017
U1	0:01:00	2976.70	901.26	1.9847	2.0028	1.9938	0.0027	0.0006	0.0017
U1	0:01:30	2976.70	901.26	1.9856	2.0030	1.9943	0.0026	0.0006	0.0016
U1	0:02:00	2970.20	899.26	1.9864	2.0005	1.9935	0.0018	0.0006	0.0012
U2	0:00:00	1973.40	592.18	1.9862	1.9884	1.9873	0.0018	0.0006	0.0012
U2	0:00:30	1993.00	598.22	1.9862	1.9878	1.9870	0.0018	0.0006	0.0012
U2	0:01:00	1958.70	587.66	1.9862	1.9868	1.9865	0.0018	0.0006	0.0012
U2	0:01:30	1965.30	589.69	1.9862	1.9866	1.9864	0.0018	0.0006	0.0012
U2	0:02:00	1968.50	590.68	1.9862	1.9864	1.9863	0.0018	0.0006	0.0012
U3	0:00:00	970.26	283.15	1.9861	1.9554	1.9708	0.0006	0.0006	0.0006
U3	0:00:30	957.03	279.08	1.9861	1.9530	1.9696	0.0006	0.0006	0.0006
U3	0:01:00	973.37	284.11	1.9861	1.9520	1.9691	0.0006	0.0006	0.0006
U3	0:01:30	976.64	285.12	1.9861	1.9514	1.9688	0.0006	0.0006	0.0006
U3	0:02:00	989.71	289.15	1.9861	1.9509	1.9685	0.0006	0.0006	0.0006
U3	0:02:30	992.97	290.15	1.9861	1.9504	1.9683	0.0006	0.0006	0.0006
U3	0:03:00	994.61	290.66	1.9861	1.9503	1.9682	0.0006	0.0006	0.0006
U3	0:03:30	1001.00	292.62	1.9861	1.9501	1.9681	0.0006	0.0006	0.0006
U3	0:04:00	592.59	166.81	1.9178	1.9081	1.9130	-0.0013	0.0006	-0.0004
U4	0:00:00	-11.88	0.00	1.8167	1.8160	1.8164	-0.0018	0.0006	-0.0006
U4	0:00:30	-15.15	0.00	1.8092	1.8082	1.8087	-0.0018	0.0006	-0.0006
U4	0:01:00	-15.15	0.00	1.8061	1.8046	1.8054	-0.0018	0.0006	-0.0006
U4	0:01:30	-13.51	0.00	1.8040	1.8024	1.8032	-0.0018	0.0006	-0.0006
U4	0:02:00	-18.41	0.00	1.8024	1.8008	1.8016	-0.0018	0.0006	-0.0006
U4	0:02:30	-15.14	0.00	1.8011	1.7996	1.8004	-0.0018	0.0006	-0.0006
2L1	0:00:00	1893.00	567.42	1.8837	1.8904	1.8871	0.0010	0.0006	0.0008
2L1	0:00:30	1966.40	590.03	1.8963	1.9027	1.8995	0.0011	0.0006	0.0009
2L1	0:01:00	1956.60	587.01	1.8991	1.9055	1.9023	0.0011	0.0006	0.0009
2L1	0:01:30	1938.60	581.46	1.8999	1.9062	1.9031	0.0011	0.0006	0.0009
2L1	0:02:00	1928.80	578.45	1.9001	1.9065	1.9033	0.0011	0.0006	0.0009
2L1	0:02:30	1923.90	576.94	1.9005	1.9068	1.9037	0.0011	0.0006	0.0009
2L1	0:03:00	1986.00	596.07	1.9030	1.9093	1.9062	0.0011	0.0006	0.0009
2L1	0:03:30	1968.10	590.55	1.9035	1.9098	1.9067	0.0011	0.0006	0.0009
2L2	0:00:00	2804.50	848.22	2.0261	2.0410	2.0336	0.0024	0.0006	0.0015
2L2	0:00:30	2946.60	891.99	2.1358	2.1524	2.1441	0.0024	0.0006	0.0015

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Mid Cell Pressure (psi)	Mid Cell Load (tons)	Top of Shaft Movement			Compression		
				A	B	Average	X	Y	Avg. Rdg
				(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2L2	0:01:00	2964.60	897.54	2.1998	2.2159	2.2079	0.0024	0.0006	0.0015
2L2	0:01:30	2971.10	899.54	2.2375	2.2538	2.2457	0.0023	0.0006	0.0015
2L2	0:02:00	2983.00	903.21	2.2681	2.2848	2.2765	0.0023	0.0006	0.0015
2L2	0:02:30	2978.10	901.70	2.2965	2.3134	2.3050	0.0022	0.0006	0.0014
2L2	0:03:00	2981.30	902.68	2.3201	2.3374	2.3288	0.0022	0.0006	0.0014
2L3	0:00:00	3112.00	942.95	2.4224	2.4417	2.4321	0.0021	0.0006	0.0014
2L3	0:00:30	3143.10	952.53	2.5641	2.5841	2.5741	0.0019	0.0011	0.0015
2L3	0:01:00	3126.70	947.47	2.6911	2.7115	2.7013	0.0017	0.0011	0.0014
2L3	0:01:30	3116.90	944.45	2.7983	2.8172	2.8078	0.0014	0.0011	0.0013
2U1	0:00:00	2479.70	748.16	2.8276	2.8415	2.8346	0.0011	0.0011	0.0011
2U1	0:00:30	2486.30	750.19	2.8275	2.8409	2.8342	0.0010	0.0011	0.0011
2U1	0:01:00	2484.60	749.67	2.8275	2.8409	2.8342	0.0010	0.0011	0.0011
2U1	0:01:30	2483.00	749.17	2.8274	2.8409	2.8342	0.0010	0.0011	0.0011
2U1	0:02:00	2486.30	750.19	2.8274	2.8409	2.8342	0.0010	0.0011	0.0011
2U1	0:02:30	2483.10	749.20	2.8274	2.8409	2.8342	0.0009	0.0011	0.0010
2U2	0:00:00	983.29	287.17	2.8273	2.8030	2.8152	-0.0006	0.0011	0.0003
2U2	0:00:30	1011.10	295.74	2.8273	2.8016	2.8145	-0.0006	0.0011	0.0003
2U2	0:01:00	1017.60	297.74	2.8273	2.8009	2.8141	-0.0006	0.0011	0.0003
2U2	0:01:30	476.81	131.14	2.8273	2.7540	2.7907	-0.0027	0.0011	-0.0008
2U3	0:00:00	-14.97	0.00	2.8272	2.6835	2.7554	-0.0029	0.0011	-0.0009
2U3	0:00:30	-15.00	0.00	2.8272	2.6784	2.7528	-0.0029	0.0011	-0.0009
2U3	0:01:00	-16.63	0.00	2.8272	2.6762	2.7517	-0.0029	0.0011	-0.0009
2U3	0:01:30	-15.00	0.00	2.8272	2.6738	2.7505	-0.0029	0.0011	-0.0009
2U3	0:02:00	-13.37	0.00	2.8272	2.6722	2.7497	-0.0029	0.0011	-0.0009
2U3	0:02:30	-13.37	0.00	2.8272	2.6714	2.7493	-0.0029	0.0011	-0.0009
2U3	0:03:00	-15.00	0.00	2.8272	2.6709	2.7491	-0.0029	0.0011	-0.0009
2U3	0:03:30	-13.39	0.00	2.8272	2.6707	2.7490	-0.0029	0.0011	-0.0009
2U3	0:04:00	-18.29	0.00	2.8272	2.6702	2.7487	-0.0029	0.0011	-0.0009

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9752	Mvmt.	C	D	Avg. Rdg	Mvmt.	9753	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:00	0.0001	0.0000	0.0001	0.0000	-0.0005	0.0000	-0.0003	0.0000	0.0000	0.0000	-0.0001	0.0003	0.0002	0.0002
L1	0:00:30	0.0029	0.0008	0.0019	0.0195	-0.0068	-0.0006	-0.0037	-0.0232	-0.0306	-0.0269	-0.0093	-0.0008	-0.0003	-0.0005
L1	0:01:00	0.0045	0.0023	0.0034	0.0460	-0.0093	-0.0007	-0.0050	-0.0500	-0.0563	-0.0532	-0.0106	-0.0019	-0.0012	-0.0016
L1	0:01:30	0.0046	0.0023	0.0035	0.0478	-0.0094	-0.0007	-0.0051	-0.0521	-0.0580	-0.0551	-0.0108	-0.0020	-0.0009	-0.0015
L1	0:02:00	0.0046	0.0023	0.0035	0.0481	-0.0095	-0.0008	-0.0051	-0.0525	-0.0585	-0.0555	-0.0109	-0.0021	-0.0011	-0.0016
L1	0:02:30	0.0050	0.0026	0.0038	0.0488	-0.0108	-0.0010	-0.0059	-0.0547	-0.0622	-0.0585	-0.0135	-0.0030	-0.0017	-0.0024
L2	0:00:00	0.0113	0.0083	0.0098	0.1214	-0.0271	-0.0072	-0.0172	-0.1390	-0.1492	-0.1441	-0.0325	-0.0163	-0.0080	-0.0121
L2	0:00:30	0.0119	0.0088	0.0104	0.1445	-0.0308	-0.0079	-0.0193	-0.1642	-0.1709	-0.1676	-0.0334	-0.0183	-0.0099	-0.0141
L2	0:01:00	0.0119	0.0088	0.0104	0.1468	-0.0316	-0.0080	-0.0198	-0.1673	-0.1737	-0.1705	-0.0341	-0.0189	-0.0106	-0.0147
L2	0:01:30	0.0119	0.0088	0.0104	0.1474	-0.0321	-0.0082	-0.0202	-0.1686	-0.1749	-0.1718	-0.0347	-0.0194	-0.0112	-0.0153
L2	0:02:00	0.0119	0.0088	0.0104	0.1484	-0.0327	-0.0083	-0.0205	-0.1707	-0.1771	-0.1739	-0.0359	-0.0200	-0.0118	-0.0159
L2	0:02:30	0.0119	0.0091	0.0105	0.1501	-0.0386	-0.0122	-0.0254	-0.1743	-0.1821	-0.1782	-0.0387	-0.0219	-0.0137	-0.0178
L3	0:00:00	0.0140	0.0108	0.0124	0.1815	-0.1033	-0.0540	-0.0787	-0.2699	-0.2807	-0.2753	-0.1062	-0.0580	-0.0388	-0.0484
L3	0:00:30	0.0145	0.0113	0.0129	0.2014	-0.1394	-0.0700	-0.1047	-0.3377	-0.3466	-0.3422	-0.1537	-0.0846	-0.0580	-0.0713
L3	0:01:00	0.0145	0.0113	0.0129	0.2084	-0.1506	-0.0704	-0.1105	-0.3580	-0.3664	-0.3622	-0.1667	-0.0936	-0.0650	-0.0793
L3	0:01:30	0.0145	0.0113	0.0129	0.2124	-0.1564	-0.0706	-0.1135	-0.3684	-0.3769	-0.3727	-0.1732	-0.0986	-0.0695	-0.0840
L3	0:02:00	0.0145	0.0113	0.0129	0.2161	-0.1609	-0.0708	-0.1159	-0.3777	-0.3863	-0.3820	-0.1788	-0.1028	-0.0730	-0.0879
L3	0:02:30	0.0145	0.0114	0.0130	0.2193	-0.1659	-0.0713	-0.1186	-0.3856	-0.3944	-0.3900	-0.1837	-0.1072	-0.0764	-0.0918
L4	0:00:00	0.0159	0.0126	0.0143	0.2456	-0.1984	-0.0956	-0.1470	-0.4460	-0.4567	-0.4514	-0.2200	-0.1315	-0.0916	-0.1116
L4	0:00:30	0.0159	0.0127	0.0143	0.2588	-0.2137	-0.1074	-0.1605	-0.4744	-0.4845	-0.4795	-0.2350	-0.1431	-0.1006	-0.1219
L4	0:01:00	0.0160	0.0127	0.0144	0.2676	-0.2221	-0.1217	-0.1719	-0.4924	-0.5027	-0.4976	-0.2443	-0.1497	-0.1066	-0.1281
L4	0:01:30	0.0160	0.0128	0.0144	0.2770	-0.2288	-0.1280	-0.1784	-0.5082	-0.5186	-0.5134	-0.2509	-0.1549	-0.1124	-0.1336
L4	0:02:00	0.0161	0.0129	0.0145	0.2856	-0.2348	-0.1327	-0.1837	-0.5227	-0.5333	-0.5280	-0.2569	-0.1597	-0.1172	-0.1384
L4	0:02:30	0.0162	0.0130	0.0146	0.2932	-0.2387	-0.1365	-0.1876	-0.5337	-0.5440	-0.5389	-0.2603	-0.1629	-0.1197	-0.1413
L5	0:00:00	0.0162	0.0130	0.0146	0.2974	-0.2419	-0.1400	-0.1910	-0.5407	-0.5520	-0.5464	-0.2636	-0.1655	-0.1216	-0.1436
L5	0:00:30	0.0167	0.0135	0.0151	0.3113	-0.2480	-0.1459	-0.1969	-0.5598	-0.5706	-0.5652	-0.2690	-0.1699	-0.1247	-0.1473
L5	0:01:00	0.0167	0.0135	0.0151	0.3170	-0.2515	-0.1496	-0.2005	-0.5686	-0.5794	-0.5740	-0.2721	-0.1727	-0.1271	-0.1499
L5	0:01:30	0.0167	0.0135	0.0151	0.3221	-0.2542	-0.1523	-0.2033	-0.5762	-0.5872	-0.5817	-0.2747	-0.1746	-0.1288	-0.1517
L5	0:02:00	0.0167	0.0135	0.0151	0.3275	-0.2568	-0.1549	-0.2059	-0.5839	-0.5950	-0.5895	-0.2771	-0.1767	-0.1305	-0.1536
L5	0:02:30	0.0167	0.0135	0.0151	0.3327	-0.2591	-0.1572	-0.2081	-0.5914	-0.6025	-0.5970	-0.2794	-0.1782	-0.1319	-0.1550
L5	0:03:00	0.0167	0.0135	0.0151	0.3355	-0.2603	-0.1584	-0.2093	-0.5946	-0.6057	-0.6002	-0.2798	-0.1790	-0.1328	-0.1559
L5	0:03:30	0.0167	0.0135	0.0151	0.3364	-0.2607	-0.1588	-0.2098	-0.5959	-0.6069	-0.6014	-0.2802	-0.1793	-0.1334	-0.1564
L5	0:04:00	0.0167	0.0135	0.0151	0.3377	-0.2614	-0.1595	-0.2105	-0.5979	-0.6090	-0.6035	-0.2809	-0.1797	-0.1339	-0.1568
L5	0:04:30	0.0167	0.0135	0.0151	0.3403	-0.2623	-0.1604	-0.2113	-0.6013	-0.6125	-0.6069	-0.2817	-0.1803	-0.1344	-0.1574
L6	0:00:00	0.0173	0.0140	0.0157	0.3540	-0.2669	-0.1649	-0.2159	-0.6201	-0.6318	-0.6260	-0.2877	-0.1838	-0.1361	-0.1599
L6	0:00:30	0.0175	0.0143	0.0159	0.3686	-0.2719	-0.1696	-0.2208	-0.6390	-0.6505	-0.6448	-0.2921	-0.1878	-0.1384	-0.1631
L6	0:01:00	0.0175	0.0143	0.0159	0.3738	-0.2744	-0.1717	-0.2230	-0.6461	-0.6574	-0.6518	-0.2939	-0.1895	-0.1400	-0.1648
L6	0:01:30	0.0175	0.0143	0.0159	0.3785	-0.2762	-0.1734	-0.2248	-0.6524	-0.6636	-0.6580	-0.2954	-0.1909	-0.1414	-0.1661
L6	0:02:00	0.0175	0.0143	0.0159	0.3831	-0.2778	-0.1749	-0.2263	-0.6586	-0.6699	-0.6643	-0.2971	-0.1923	-0.1425	-0.1674
L6	0:02:30	0.0175	0.0143	0.0159	0.3891	-0.2794	-0.1766	-0.2280	-0.6655	-0.6769	-0.6712	-0.2981	-0.1935	-0.1436	-0.1685
L6	0:03:00	0.0175	0.0143	0.0159	0.3944	-0.2810	-0.1782	-0.2296	-0.6724	-0.6839	-0.6782	-0.2997	-0.1948	-0.1445	-0.1697
L6	0:03:30	0.0175	0.0143	0.0159	0.3995	-0.2824	-0.1797	-0.2310	-0.6788	-0.6902	-0.6845	-0.3010	-0.1959	-0.1455	-0.1707

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9752	Mvmt.	C	D	Avg. Rdg	Mvmt.	9753	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L6	0:04:00	0.0175	0.0143	0.0159	0.4032	-0.2835	-0.1806	-0.2320	-0.6832	-0.6944	-0.6888	-0.3016	-0.1966	-0.1462	-0.1714
L6	0:04:30	0.0175	0.0143	0.0159	0.4055	-0.2844	-0.1814	-0.2329	-0.6860	-0.6972	-0.6916	-0.3021	-0.1972	-0.1468	-0.1720
L7	0:00:00	0.0181	0.0147	0.0164	0.4227	-0.2885	-0.1855	-0.2370	-0.7092	-0.7203	-0.7148	-0.3085	-0.2007	-0.1483	-0.1745
L7	0:00:30	0.0183	0.0147	0.0165	0.4371	-0.2923	-0.1888	-0.2406	-0.7267	-0.7377	-0.7322	-0.3117	-0.2033	-0.1501	-0.1767
L7	0:01:00	0.0183	0.0148	0.0166	0.4468	-0.2949	-0.1909	-0.2429	-0.7382	-0.7489	-0.7436	-0.3134	-0.2051	-0.1516	-0.1784
L7	0:01:30	0.0183	0.0148	0.0166	0.4540	-0.2968	-0.1926	-0.2447	-0.7470	-0.7577	-0.7524	-0.3150	-0.2066	-0.1529	-0.1798
L7	0:02:00	0.0183	0.0148	0.0166	0.4614	-0.2985	-0.1942	-0.2463	-0.7554	-0.7662	-0.7608	-0.3160	-0.2079	-0.1540	-0.1809
L7	0:02:30	0.0183	0.0148	0.0166	0.4678	-0.2999	-0.1957	-0.2478	-0.7633	-0.7742	-0.7688	-0.3175	-0.2091	-0.1550	-0.1821
L7	0:03:00	0.0183	0.0148	0.0166	0.4743	-0.3013	-0.1970	-0.2492	-0.7710	-0.7820	-0.7765	-0.3188	-0.2101	-0.1560	-0.1830
L7	0:03:30	0.0183	0.0148	0.0166	0.4804	-0.3025	-0.1982	-0.2503	-0.7784	-0.7893	-0.7839	-0.3200	-0.2111	-0.1568	-0.1839
L8	0:00:00	0.0187	0.0153	0.0170	0.4949	-0.3055	-0.2012	-0.2533	-0.7963	-0.8080	-0.8022	-0.3243	-0.2130	-0.1581	-0.1855
L8	0:00:30	0.0190	0.0154	0.0172	0.5154	-0.3095	-0.2042	-0.2568	-0.8195	-0.8314	-0.8255	-0.3273	-0.2147	-0.1596	-0.1872
L8	0:01:00	0.0191	0.0155	0.0173	0.5338	-0.3129	-0.2070	-0.2599	-0.8410	-0.8529	-0.8470	-0.3305	-0.2159	-0.1615	-0.1887
L8	0:01:30	0.0192	0.0155	0.0174	0.5516	-0.3159	-0.2094	-0.2627	-0.8617	-0.8734	-0.8676	-0.3334	-0.2180	-0.1632	-0.1906
L8	0:02:00	0.0192	0.0156	0.0174	0.5617	-0.3177	-0.2109	-0.2643	-0.8721	-0.8836	-0.8779	-0.3336	-0.2192	-0.1643	-0.1917
L8	0:02:30	0.0192	0.0156	0.0174	0.5695	-0.3191	-0.2121	-0.2656	-0.8811	-0.8926	-0.8869	-0.3348	-0.2201	-0.1654	-0.1927
L8	0:03:00	0.0192	0.0156	0.0174	0.5772	-0.3203	-0.2131	-0.2667	-0.8899	-0.9015	-0.8957	-0.3360	-0.2210	-0.1663	-0.1936
L8	0:03:30	0.0192	0.0156	0.0174	0.5848	-0.3213	-0.2141	-0.2677	-0.8984	-0.9100	-0.9042	-0.3369	-0.2217	-0.1671	-0.1944
L8	0:04:00	0.0192	0.0156	0.0174	0.5922	-0.3223	-0.2151	-0.2687	-0.9067	-0.9183	-0.9125	-0.3378	-0.2222	-0.1679	-0.1951
L8	0:04:30	0.0192	0.0156	0.0174	0.5993	-0.3232	-0.2159	-0.2695	-0.9147	-0.9264	-0.9206	-0.3387	-0.2226	-0.1687	-0.1957
L9	0:00:00	0.0194	0.0158	0.0176	0.6078	-0.3247	-0.2174	-0.2711	-0.9256	-0.9386	-0.9321	-0.3419	-0.2233	-0.1696	-0.1965
L9	0:00:30	0.0199	0.0161	0.0180	0.6372	-0.3276	-0.2199	-0.2738	-0.9577	-0.9702	-0.9640	-0.3448	-0.2239	-0.1709	-0.1974
L9	0:01:00	0.0200	0.0162	0.0181	0.6638	-0.3309	-0.2221	-0.2765	-0.9870	-0.9997	-0.9934	-0.3477	-0.2239	-0.1723	-0.1981
L9	0:01:30	0.0201	0.0162	0.0182	0.6901	-0.3338	-0.2243	-0.2791	-1.0155	-1.0286	-1.0221	-0.3502	-0.2241	-0.1737	-0.1989
L9	0:02:00	0.0202	0.0162	0.0182	0.7129	-0.3357	-0.2259	-0.2808	-1.0393	-1.0520	-1.0457	-0.3510	-0.2242	-0.1749	-0.1996
L9	0:02:30	0.0202	0.0162	0.0182	0.7278	-0.3371	-0.2272	-0.2822	-1.0558	-1.0683	-1.0621	-0.3525	-0.2245	-0.1761	-0.2003
L9	0:03:00	0.0202	0.0162	0.0182	0.7400	-0.3382	-0.2282	-0.2832	-1.0686	-1.0807	-1.0747	-0.3529	-0.2247	-0.1770	-0.2009
L9	0:03:30	0.0202	0.0162	0.0182	0.7490	-0.3389	-0.2290	-0.2839	-1.0780	-1.0901	-1.0841	-0.3533	-0.2248	-0.1779	-0.2013
L9	0:04:00	0.0202	0.0162	0.0182	0.7575	-0.3395	-0.2297	-0.2846	-1.0873	-1.0993	-1.0933	-0.3540	-0.2248	-0.1787	-0.2017
L9	0:04:30	0.0202	0.0162	0.0182	0.7659	-0.3402	-0.2303	-0.2852	-1.0964	-1.1085	-1.1025	-0.3548	-0.2248	-0.1794	-0.2021
L9	0:05:00	0.0202	0.0162	0.0182	0.7742	-0.3407	-0.2309	-0.2858	-1.1053	-1.1173	-1.1113	-0.3553	-0.2248	-0.1800	-0.2024
L9	0:05:30	0.0202	0.0162	0.0182	0.7829	-0.3418	-0.2320	-0.2869	-1.1162	-1.1291	-1.1227	-0.3580	-0.2250	-0.1807	-0.2028
L10	0:00:00	0.0209	0.0167	0.0188	0.8262	-0.3443	-0.2340	-0.2892	-1.1633	-1.1767	-1.1700	-0.3626	-0.2252	-0.1818	-0.2035
L10	0:00:30	0.0210	0.0167	0.0189	0.8659	-0.3464	-0.2356	-0.2910	-1.2043	-1.2173	-1.2108	-0.3638	-0.2251	-0.1828	-0.2040
L10	0:01:00	0.0210	0.0167	0.0189	0.9012	-0.3479	-0.2368	-0.2923	-1.2404	-1.2530	-1.2467	-0.3644	-0.2252	-0.1838	-0.2045
L10	0:01:30	0.0211	0.0167	0.0189	0.9271	-0.3485	-0.2377	-0.2931	-1.2674	-1.2801	-1.2738	-0.3656	-0.2251	-0.1846	-0.2048
L10	0:02:00	0.0211	0.0167	0.0189	0.9525	-0.3493	-0.2387	-0.2940	-1.2940	-1.3066	-1.3003	-0.3667	-0.2250	-0.1855	-0.2053
L10	0:02:30	0.0211	0.0167	0.0189	0.9779	-0.3497	-0.2397	-0.2947	-1.3208	-1.3331	-1.3270	-0.3680	-0.2250	-0.1864	-0.2057
L10	0:03:00	0.0211	0.0167	0.0189	1.0026	-0.3499	-0.2405	-0.2952	-1.3467	-1.3589	-1.3528	-0.3691	-0.2250	-0.1872	-0.2061
L10	0:03:30	0.0211	0.0167	0.0189	1.0283	-0.3503	-0.2417	-0.2960	-1.3743	-1.3875	-1.3809	-0.3715	-0.2250	-0.1882	-0.2066
L11	0:00:00	0.0218	0.0168	0.0193	1.1004	-0.3492	-0.2432	-0.2962	-1.4498	-1.4641	-1.4570	-0.3759	-0.2249	-0.1892	-0.2071
L11	0:00:30	0.0219	0.0168	0.0194	1.1775	-0.3655	-0.2444	-0.3049	-1.5287	-1.5431	-1.5359	-0.3778	-0.2250	-0.1899	-0.2075
L11	0:01:00	0.0221	0.0168	0.0195	1.2510	-0.3650	-0.2452	-0.3051	-1.6026	-1.6164	-1.6095	-0.3780	-0.2250	-0.1904	-0.2077

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9752	Mvmt.	C	D	Avg. Rdg	Mvmt.	9753	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L11	0:01:30	0.0222	0.0168	0.0195	1.3215	-0.3653	-0.2459	-0.3056	-1.6739	-1.6874	-1.6807	-0.3787	-0.2249	-0.1908	-0.2078
L11	0:02:00	0.0223	0.0168	0.0196	1.3911	-0.3659	-0.2466	-0.3062	-1.7447	-1.7579	-1.7513	-0.3798	-0.2250	-0.1910	-0.2080
L11	0:02:30	0.0223	0.0168	0.0196	1.4614	-0.3658	-0.2474	-0.3066	-1.8155	-1.8284	-1.8220	-0.3801	-0.2251	-0.1912	-0.2081
L11	0:03:00	0.0224	0.0168	0.0196	1.5313	-0.3658	-0.2482	-0.3070	-1.8863	-1.8991	-1.8927	-0.3811	-0.2254	-0.1913	-0.2084
L11	0:03:30	0.0225	0.0168	0.0197	1.6053	-0.3659	-0.2490	-0.3074	-1.9640	-1.9782	-1.9711	-0.3855	-0.2278	-0.1914	-0.2096
L11	0:04:00	0.0227	0.0168	0.0198	1.7199	-0.3662	-0.2496	-0.3079	-2.0794	-2.0932	-2.0863	-0.3862	-0.2339	-0.1907	-0.2123
L11	0:04:30	0.0231	0.0168	0.0200	1.8358	-0.3667	-0.2501	-0.3084	-2.1955	-2.2094	-2.2025	-0.3867	-0.2414	-0.1894	-0.2154
L11	0:05:00	0.0231	0.0167	0.0199	1.9483	-0.3661	-0.2506	-0.3083	-2.3083	-2.3212	-2.3148	-0.3864	-0.2491	-0.1880	-0.2185
U1	0:00:00	0.0230	0.0159	0.0195	2.0129	-0.3661	-0.2505	-0.3083	-2.3672	-2.3757	-2.3715	-0.3781	-0.2552	-0.1875	-0.2213
U1	0:00:30	0.0225	0.0155	0.0190	2.0124	-0.3662	-0.2502	-0.3082	-2.3672	-2.3753	-2.3713	-0.3779	-0.2570	-0.1875	-0.2223
U1	0:01:00	0.0224	0.0154	0.0189	2.0127	-0.3662	-0.2504	-0.3083	-2.3683	-2.3765	-2.3724	-0.3787	-0.2581	-0.1877	-0.2229
U1	0:01:30	0.0223	0.0154	0.0189	2.0132	-0.3664	-0.2505	-0.3085	-2.3697	-2.3778	-2.3738	-0.3795	-0.2588	-0.1879	-0.2233
U1	0:02:00	0.0202	0.0131	0.0167	2.0101	-0.3649	-0.2504	-0.3077	-2.3616	-2.3615	-2.3616	-0.3681	-0.2643	-0.1891	-0.2267
U2	0:00:00	0.0202	0.0129	0.0166	2.0039	-0.3654	-0.2504	-0.3079	-2.3532	-2.3581	-2.3557	-0.3684	-0.2646	-0.1893	-0.2270
U2	0:00:30	0.0202	0.0128	0.0165	2.0035	-0.3655	-0.2505	-0.3080	-2.3530	-2.3579	-2.3555	-0.3685	-0.2646	-0.1895	-0.2270
U2	0:01:00	0.0202	0.0128	0.0165	2.0030	-0.3654	-0.2505	-0.3079	-2.3518	-2.3568	-2.3543	-0.3678	-0.2645	-0.1895	-0.2270
U2	0:01:30	0.0202	0.0128	0.0165	2.0029	-0.3656	-0.2503	-0.3080	-2.3514	-2.3565	-2.3540	-0.3676	-0.2644	-0.1895	-0.2270
U2	0:02:00	0.0202	0.0128	0.0165	2.0028	-0.3653	-0.2502	-0.3077	-2.3510	-2.3561	-2.3536	-0.3673	-0.2643	-0.1895	-0.2269
U3	0:00:00	0.0167	0.0101	0.0134	1.9842	-0.1913	-0.2467	-0.2190	-2.3102	-2.3154	-2.3128	-0.3421	-0.2620	-0.1892	-0.2256
U3	0:00:30	0.0167	0.0100	0.0134	1.9829	0.0238	-0.2461	-0.1112	-2.3075	-2.3127	-2.3101	-0.3406	-0.2615	-0.1892	-0.2254
U3	0:01:00	0.0167	0.0099	0.0133	1.9824	0.1063	-0.2459	-0.0698	-2.3063	-2.3116	-2.3090	-0.3399	-0.2612	-0.1891	-0.2252
U3	0:01:30	0.0167	0.0099	0.0133	1.9821	0.0929	-0.2457	-0.0764	-2.3056	-2.3108	-2.3082	-0.3395	-0.2611	-0.1890	-0.2250
U3	0:02:00	0.0167	0.0099	0.0133	1.9818	0.1196	-0.2456	-0.0630	-2.3050	-2.3102	-2.3076	-0.3391	-0.2610	-0.1889	-0.2250
U3	0:02:30	0.0167	0.0099	0.0133	1.9816	-0.3482	-0.2455	-0.2968	-2.3044	-2.3097	-2.3071	-0.3388	-0.2609	-0.1888	-0.2248
U3	0:03:00	0.0167	0.0099	0.0133	1.9815	-0.3488	-0.2453	-0.2971	-2.3042	-2.3093	-2.3068	-0.3386	-0.2608	-0.1888	-0.2248
U3	0:03:30	0.0167	0.0099	0.0133	1.9814	-0.3490	-0.2452	-0.2971	-2.3038	-2.3090	-2.3064	-0.3383	-0.2608	-0.1887	-0.2247
U3	0:04:00	0.0088	0.0055	0.0072	1.9201	-0.3414	-0.2007	-0.2710	-2.2357	-2.2273	-2.2315	-0.3186	-0.2505	-0.1847	-0.2176
U4	0:00:00	0.0065	0.0035	0.0050	1.8214	-0.3211	-0.1818	-0.2514	-2.1384	-2.1412	-2.1398	-0.3235	-0.2265	-0.1828	-0.2046
U4	0:00:30	0.0065	0.0035	0.0050	1.8137	-0.3143	-0.1804	-0.2473	-2.1283	-2.1296	-2.1290	-0.3203	-0.2266	-0.1819	-0.2042
U4	0:01:00	0.0065	0.0035	0.0050	1.8104	-0.3119	-0.1803	-0.2461	-2.1233	-2.1259	-2.1246	-0.3193	-0.2268	-0.1812	-0.2040
U4	0:01:30	0.0065	0.0035	0.0050	1.8082	-0.3107	-0.1802	-0.2455	-2.1207	-2.1239	-2.1223	-0.3191	-0.2269	-0.1809	-0.2039
U4	0:02:00	0.0065	0.0035	0.0050	1.8066	-0.3098	-0.1801	-0.2450	-2.1190	-2.1224	-2.1207	-0.3191	-0.2269	-0.1807	-0.2038
U4	0:02:30	0.0065	0.0035	0.0050	1.8054	-0.3092	-0.1801	-0.2447	-2.1178	-2.1211	-2.1195	-0.3191	-0.2270	-0.1805	-0.2037
2L1	0:00:00	0.0137	0.0075	0.0106	1.8977	-0.3319	-0.2133	-0.2726	-2.2362	-2.2492	-2.2427	-0.3557	-0.2470	-0.1839	-0.2155
2L1	0:00:30	0.0138	0.0077	0.0108	1.9103	-0.3356	-0.2160	-0.2758	-2.2492	-2.2602	-2.2547	-0.3552	-0.2487	-0.1842	-0.2165
2L1	0:01:00	0.0138	0.0078	0.0108	1.9131	-0.3367	-0.2170	-0.2768	-2.2522	-2.2628	-2.2575	-0.3552	-0.2487	-0.1843	-0.2165
2L1	0:01:30	0.0138	0.0078	0.0108	1.9139	-0.3371	-0.2173	-0.2772	-2.2529	-2.2633	-2.2581	-0.3551	-0.2489	-0.1843	-0.2166
2L1	0:02:00	0.0138	0.0078	0.0108	1.9141	-0.3373	-0.2174	-0.2773	-2.2531	-2.2636	-2.2584	-0.3551	-0.2487	-0.1844	-0.2166
2L1	0:02:30	0.0138	0.0078	0.0108	1.9145	-0.3376	-0.2177	-0.2777	-2.2538	-2.2646	-2.2592	-0.3556	-0.2488	-0.1844	-0.2166
2L1	0:03:00	0.0138	0.0078	0.0108	1.9170	-0.3382	-0.2183	-0.2782	-2.2567	-2.2673	-2.2620	-0.3559	-0.2487	-0.1845	-0.2166
2L1	0:03:30	0.0138	0.0079	0.0109	1.9175	-0.3385	-0.2185	-0.2785	-2.2572	-2.2679	-2.2626	-0.3559	-0.2488	-0.1845	-0.2167
2L2	0:00:00	0.0187	0.0119	0.0153	2.0489	-0.3640	-0.2401	-0.3021	-2.4112	-2.4268	-2.4190	-0.3855	-0.2638	-0.1853	-0.2246
2L2	0:00:30	0.0192	0.0122	0.0157	2.1598	-0.3696	-0.2464	-0.3080	-2.5270	-2.5417	-2.5344	-0.3903	-0.2677	-0.1841	-0.2259

Table K.1 Adjusted Indicator Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell (Ref.Beam)			Top Bottom Cell				Bottom Bottom Cell (Ref.Beam)		
		G	H	Avg. Rdg	Mvmt.	9750	9752	Mvmt.	C	D	Avg. Rdg	Mvmt.	9753	9751	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
2L2	0:01:00	0.0193	0.0122	0.0158	2.2236	-0.3723	-0.2492	-0.3107	-2.5912	-2.6039	-2.5976	-0.3897	-0.2703	-0.1839	-0.2271
2L2	0:01:30	0.0193	0.0122	0.0158	2.2614	-0.3738	-0.2518	-0.3128	-2.6311	-2.6435	-2.6373	-0.3917	-0.2725	-0.1839	-0.2282
2L2	0:02:00	0.0193	0.0122	0.0158	2.2922	-0.3748	-0.2538	-0.3143	-2.6640	-2.6762	-2.6701	-0.3937	-0.2747	-0.1839	-0.2293
2L2	0:02:30	0.0193	0.0122	0.0158	2.3207	-0.3755	-0.2553	-0.3154	-2.6938	-2.7058	-2.6998	-0.3949	-0.2764	-0.1838	-0.2301
2L2	0:03:00	0.0193	0.0122	0.0158	2.3445	-0.3767	-0.2569	-0.3168	-2.7204	-2.7336	-2.7270	-0.3983	-0.2784	-0.1836	-0.2310
2L3	0:00:00	0.0200	0.0123	0.0162	2.4482	-0.3800	-0.2597	-0.3199	-2.8323	-2.8481	-2.8402	-0.4082	-0.2802	-0.1825	-0.2314
2L3	0:00:30	0.0202	0.0123	0.0163	2.5904	-0.3821	-0.2605	-0.3213	-2.9764	-2.9576	-2.9670	-0.3929	-0.2822	-0.1821	-0.2322
2L3	0:01:00	0.0204	0.0123	0.0164	2.7177	-0.3832	-0.2605	-0.3218	-3.1026	-3.1182	-3.1104	-0.4091	-0.2836	-0.1834	-0.2335
2L3	0:01:30	0.0206	0.0123	0.0165	2.8242	-0.3841	-0.2605	-0.3223	-3.1744	-3.2214	-3.1979	-0.3902	-0.2852	-0.1854	-0.2353
2U1	0:00:00	0.0195	0.0118	0.0157	2.8502	-0.3837	-0.2594	-0.3216	-3.1768	-3.2378	-3.2073	-0.3728	-0.2855	-0.1884	-0.2369
2U1	0:00:30	0.0194	0.0116	0.0155	2.8497	-0.3837	-0.2594	-0.3215	-3.1768	-3.2378	-3.2073	-0.3731	-0.2856	-0.1892	-0.2374
2U1	0:01:00	0.0194	0.0116	0.0155	2.8497	-0.3837	-0.2596	-0.3217	-3.1768	-3.2390	-3.2079	-0.3737	-0.2857	-0.1899	-0.2378
2U1	0:01:30	0.0194	0.0116	0.0155	2.8497	-0.3839	-0.2597	-0.3218	-3.1768	-3.2400	-3.2084	-0.3743	-0.2859	-0.1907	-0.2383
2U1	0:02:00	0.0194	0.0116	0.0155	2.8497	-0.3841	-0.2599	-0.3220	-3.1768	-3.2406	-3.2087	-0.3746	-0.2861	-0.1914	-0.2388
2U1	0:02:30	0.0193	0.0116	0.0155	2.8496	-0.3833	-0.2586	-0.3209	-3.1768	-3.2409	-3.2089	-0.3747	-0.2865	-0.1929	-0.2397
2U2	0:00:00	0.0152	0.0075	0.0114	2.8265	-0.3795	-0.2551	-0.3173	-3.1703	-3.1882	-3.1793	-0.3641	-0.2835	-0.1949	-0.2392
2U2	0:00:30	0.0152	0.0075	0.0114	2.8258	-0.3792	-0.2548	-0.3170	-3.1696	-3.1870	-3.1783	-0.3639	-0.2832	-0.1957	-0.2394
2U2	0:01:00	0.0152	0.0074	0.0113	2.8254	-0.3790	-0.2547	-0.3168	-3.1690	-3.1862	-3.1776	-0.3635	-0.2830	-0.1961	-0.2395
2U2	0:01:30	0.0104	0.0034	0.0069	2.7976	-0.3352	-0.2038	-0.2695	-3.0951	-3.0927	-3.0939	-0.3033	-0.2510	-0.1937	-0.2224
2U3	0:00:00	0.0086	0.0022	0.0054	2.7608	-0.3134	-0.1891	-0.2512	-3.0135	-3.0211	-3.0173	-0.2620	-0.2324	-0.1917	-0.2120
2U3	0:00:30	0.0085	0.0020	0.0053	2.7581	-0.3097	-0.1877	-0.2487	-3.0048	-3.0123	-3.0086	-0.2558	-0.2322	-0.1907	-0.2115
2U3	0:01:00	0.0084	0.0020	0.0052	2.7569	-0.3086	-0.1876	-0.2481	-3.0013	-3.0086	-3.0050	-0.2533	-0.2322	-0.1902	-0.2112
2U3	0:01:30	0.0084	0.0020	0.0052	2.7557	-0.3088	-0.1877	-0.2482	-3.0006	-3.0080	-3.0043	-0.2538	-0.2120	-0.1842	-0.1981
2U3	0:02:00	0.0084	0.0020	0.0052	2.7549	-0.3091	-0.1880	-0.2485	-3.0006	-3.0080	-3.0043	-0.2546	-0.1889	-0.1769	-0.1829
2U3	0:02:30	0.0084	0.0020	0.0052	2.7545	-0.3094	-0.1882	-0.2488	-3.0006	-3.0080	-3.0043	-0.2550	-0.1707	-0.1659	-0.1683
2U3	0:03:00	0.0083	0.0020	0.0052	2.7542	-0.3096	-0.1882	-0.2489	-3.0006	-3.0080	-3.0043	-0.2553	-0.1533	-0.1521	-0.1527
2U3	0:03:30	0.0083	0.0020	0.0052	2.7541	-0.3096	-0.1882	-0.2489	-2.3971	-3.0080	-2.7026	0.0464	-0.1501	-0.1477	-0.1489
2U3	0:04:00	0.0064	0.0020	0.0042	2.7529	-0.3108	-0.1884	-0.2496	-2.3971	-3.0080	-2.7026	0.0461	-0.1503	-0.1460	-0.1481

Table K.2 Calculated Strain, Shaft 7 - 1996

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L0	0:00:00		0.79	-0.85	-2.21	-1.83	-2.91	-5.15	-1.65	-14.56	1.60	-22.30	-5.67	-8.46	2.63	-11.51	-2.33	-8.25
L1	0:00:00		1.54	-0.41	-1.33	-0.71	-1.27	-4.29	0.07	-12.82	4.63	-19.28	2.76	-1.34	10.87	-5.07	0.74	-4.84
L1	0:00:30		3.15	0.70	1.93	1.98	3.58	-0.79	7.46	-4.91	16.69	-6.03	21.14	15.33	24.95	7.77	6.41	2.68
L1	0:01:00		3.41	0.70	2.31	1.68	3.80	-0.64	7.57	-4.80	17.04	-5.88	21.61	15.85	25.86	8.47	7.05	3.48
L1	0:01:30		3.52	0.70	2.00	1.64	3.99	-0.75	7.46	-5.09	16.85	-5.73	21.25	15.70	25.75	8.74	7.12	3.41
L1	0:02:00		3.41	0.67	2.03	1.83	3.77	-0.79	7.32	-5.02	16.77	-6.11	20.99	15.66	25.86	8.70	7.01	3.45
L1	0:02:30		4.79	1.63	4.59	3.55	7.35	1.79	11.62	-0.47	22.92	0.46	31.35	23.64	32.06	14.17	9.48	6.71
L2	0:00:00		6.22	2.36	7.08	5.42	11.19	4.94	16.55	6.21	31.52	10.38	48.35	39.08	48.00	30.91	17.02	17.28
L2	0:00:30		6.18	2.33	7.05	5.42	11.11	4.72	16.29	6.03	31.09	10.27	47.29	38.41	47.49	30.68	16.88	17.02
L2	0:01:00		6.10	2.29	6.98	5.31	10.97	4.54	16.03	5.71	30.78	9.89	46.60	38.04	46.91	30.09	16.60	16.65
L2	0:01:30		6.07	2.25	6.87	5.19	10.93	4.47	15.96	5.42	30.51	9.66	46.28	38.34	46.73	29.54	16.63	16.65
L2	0:02:00		5.95	2.36	7.01	5.31	10.97	4.54	16.14	5.78	30.82	10.16	46.82	39.00	47.46	30.48	16.95	17.13
L2	0:02:30		6.70	2.77	8.17	6.13	12.31	5.90	17.91	8.02	33.74	13.40	53.10	43.46	53.11	35.71	19.38	20.29
L3	0:00:00		7.08	3.03	9.12	6.76	13.65	7.05	19.60	10.04	36.58	16.23	58.52	47.61	60.48	42.77	24.98	26.67
L3	0:00:30		7.00	3.03	9.22	6.73	13.43	7.12	19.56	10.26	36.66	16.53	59.02	48.43	61.32	44.10	26.60	28.47
L3	0:01:00		6.74	2.96	9.12	6.61	13.28	6.97	19.34	9.97	36.15	16.38	58.52	48.13	61.32	44.69	26.99	28.91
L3	0:01:30		6.70	3.10	9.15	6.61	13.17	6.97	19.34	10.15	36.23	16.49	58.70	48.47	61.64	44.80	27.45	29.42
L3	0:02:00		6.66	3.10	8.98	6.73	13.24	7.01	19.38	10.11	36.62	16.68	58.88	48.80	62.08	45.66	27.91	30.12
L3	0:02:30		7.19	3.44	9.68	7.21	14.06	7.87	20.30	11.49	38.21	18.48	61.89	51.73	65.84	48.71	29.91	32.25
L4	0:00:00		7.04	3.29	9.85	7.29	14.36	8.26	21.03	12.35	38.80	19.66	63.53	52.66	68.43	51.71	33.51	36.21
L4	0:00:30		6.96	3.25	9.85	7.36	14.32	8.30	20.70	12.43	39.58	19.89	63.82	53.11	69.12	52.61	34.64	36.79
L4	0:01:00		7.08	3.21	10.17	7.40	14.40	8.37	21.14	12.68	39.19	20.50	64.29	53.59	70.18	53.66	35.69	38.63
L4	0:01:30		6.89	3.44	9.99	7.40	14.58	8.44	21.21	12.90	39.42	20.85	64.76	54.63	70.84	54.75	36.54	39.22
L4	0:02:00		6.89	3.25	10.13	7.36	14.66	8.55	20.99	13.11	39.58	21.07	65.16	54.63	71.64	55.11	37.35	40.13
L4	0:02:30		6.81	3.10	9.75	7.21	14.28	8.30	20.81	12.68	39.11	20.69	63.93	53.63	70.44	54.29	37.00	39.84
L5	0:00:00		7.00	3.29	10.24	7.55	14.62	8.83	21.29	13.62	40.04	21.84	66.07	55.59	72.70	56.71	38.65	41.01
L5	0:00:30		6.74	3.33	10.31	7.51	14.62	8.83	21.51	13.69	40.71	22.18	66.33	56.07	73.02	57.10	39.29	41.97
L5	0:01:00		6.66	3.33	10.24	7.40	14.55	8.80	21.10	13.58	39.62	22.18	66.07	55.74	73.21	57.76	39.60	41.97
L5	0:01:30		6.81	3.18	10.10	7.40	14.77	8.80	21.40	13.65	39.65	22.18	66.29	56.41	74.05	57.72	39.96	42.44
L5	0:02:00		6.78	3.18	10.24	7.40	14.58	8.87	21.18	13.83	40.28	22.53	66.54	56.30	74.01	59.13	40.38	42.44
L5	0:02:30		6.55	3.14	10.17	7.36	14.55	8.87	21.07	13.87	39.97	22.37	66.47	56.15	73.75	58.11	40.59	42.63
L5	0:03:00		6.55	3.03	9.85	7.25	14.36	8.62	20.70	13.51	39.46	21.88	65.42	55.56	72.92	57.41	40.17	42.44
L5	0:03:30		6.51	2.99	9.89	7.10	14.36	8.51	20.81	13.22	39.19	21.80	64.95	55.48	72.59	57.14	39.99	41.93
L5	0:04:00		6.33	3.21	9.89	7.10	14.32	8.58	20.96	13.47	39.46	22.11	65.82	56.04	73.65	58.07	40.59	42.41
L5	0:04:30		6.74	3.33	10.03	7.47	14.73	8.83	21.25	13.80	39.93	22.45	66.54	56.33	74.19	58.42	40.70	42.92
L6	0:00:00		6.89	3.40	10.62	7.74	15.70	9.55	22.21	15.17	41.17	24.28	69.01	59.01	76.78	60.88	42.88	45.08
L6	0:00:30		6.59	3.44	10.45	7.62	15.33	9.48	21.62	14.99	40.98	24.09	68.76	58.30	76.56	61.12	43.27	45.67
L6	0:01:00		6.55	3.18	10.38	7.59	15.52	9.37	21.73	14.92	40.78	23.94	68.58	58.30	76.64	61.27	43.44	45.38
L6	0:01:30		6.55	3.29	10.24	7.59	15.33	9.37	21.44	14.88	40.78	24.09	68.65	58.49	76.89	61.31	43.69	45.97
L6	0:02:00		6.74	3.21	10.38	7.55	15.66	9.41	21.47	15.10	40.90	24.17	68.94	58.97	77.07	61.70	43.94	45.89
L6	0:02:30		6.78	3.18	10.27	7.59	15.52	9.51	21.73	15.24	40.74	24.51	69.05	59.08	77.73	62.09	44.33	46.63
L6	0:03:00		6.63	3.21	10.27	7.62	15.89	9.48	21.88	15.32	40.86	24.43	69.38	59.15	77.66	62.33	44.61	46.81
L6	0:03:30		6.81	3.29	10.45	7.55	15.66	9.51	21.55	15.28	41.02	24.66	69.09	59.75	78.13	62.72	44.71	47.07

Table K.2 Calculated Strain, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L6	0:04:00		6.55	3.10	10.17	7.44	15.59	9.41	21.62	15.17	40.74	24.43	68.61	58.93	77.55	62.17	44.61	46.81
L6	0:04:30		7.00	3.33	10.84	7.81	16.56	9.98	22.13	16.11	41.95	25.66	71.19	60.94	79.55	64.36	45.84	48.17
L7	0:00:00		6.93	3.33	10.94	7.92	16.82	10.23	22.57	16.65	42.34	26.19	71.81	61.79	80.94	65.02	46.86	48.94
L7	0:00:30		7.08	3.44	10.98	7.96	16.90	10.26	22.35	16.76	42.22	26.34	72.03	61.68	81.27	65.45	47.39	49.82
L7	0:01:00		7.00	3.25	10.73	7.81	16.82	10.16	22.17	16.62	42.03	26.23	71.70	61.60	81.09	65.76	47.57	49.93
L7	0:01:30		7.00	3.36	10.77	7.81	16.63	10.12	22.39	16.62	41.99	26.38	71.48	62.09	80.72	65.68	47.74	49.67
L7	0:02:00		6.85	3.25	10.91	7.77	16.93	10.12	22.39	16.72	41.91	26.50	71.88	62.24	81.56	65.92	48.03	49.82
L7	0:02:30		7.04	3.21	10.77	7.77	16.82	10.19	22.35	16.76	42.03	26.61	71.74	62.35	81.71	66.31	48.31	50.11
L7	0:03:00		7.00	3.21	10.84	7.77	16.78	10.23	22.32	16.87	41.99	26.76	71.88	62.35	81.31	66.93	48.48	50.48
L7	0:03:30		7.08	3.25	11.08	7.81	17.16	10.26	22.13	16.76	42.11	26.80	72.03	62.27	81.16	66.38	48.55	50.40
L8	0:00:00		7.08	3.36	11.50	8.22	17.68	10.87	23.20	17.99	43.35	28.37	74.46	64.20	83.71	68.88	50.17	52.31
L8	0:00:30		7.11	3.55	11.47	8.22	17.98	10.98	23.31	18.53	43.43	28.60	74.90	64.28	84.08	69.35	50.88	53.41
L8	0:01:00		7.11	3.36	11.64	8.15	18.09	11.05	23.35	18.75	43.58	29.02	75.01	65.17	84.95	70.21	51.65	54.11
L8	0:01:30		7.00	3.25	11.36	8.11	17.90	10.91	22.94	18.28	43.23	28.75	74.90	64.54	84.33	70.29	51.76	54.29
L8	0:02:00		7.11	3.21	11.43	8.00	17.83	10.87	22.94	18.31	42.96	28.60	74.61	64.50	84.41	70.52	51.83	53.93
L8	0:02:30		6.96	3.21	11.33	7.96	17.57	10.80	22.91	18.13	42.85	28.75	74.39	64.68	84.48	70.21	51.97	54.51
L8	0:03:00		7.08	3.18	11.50	7.88	17.79	10.77	22.87	18.21	42.81	28.86	74.50	64.87	84.73	70.99	52.08	54.22
L8	0:03:30		6.89	3.18	11.50	7.92	17.60	10.87	22.83	18.49	42.81	28.94	74.83	65.20	84.88	70.56	52.32	54.37
L8	0:04:00		6.85	3.29	11.54	7.92	17.79	10.80	22.87	18.28	42.81	28.90	74.86	64.87	84.95	71.54	52.46	54.95
L8	0:04:30		6.85	3.14	11.47	7.92	17.79	10.87	22.87	18.31	42.81	29.09	74.90	65.20	85.17	71.97	52.61	55.06
L9	0:00:00		7.08	3.29	12.06	8.26	18.31	11.41	23.64	19.58	44.05	30.51	76.90	66.99	87.47	72.94	53.84	56.38
L9	0:00:30		7.11	3.40	12.17	8.26	18.50	11.62	23.94	19.94	44.25	31.15	77.30	67.69	88.16	73.88	54.76	57.23
L9	0:01:00		7.30	3.25	12.17	8.33	18.57	11.66	24.05	20.48	44.25	31.46	77.91	68.43	88.20	74.00	55.46	58.03
L9	0:01:30		7.26	3.21	12.38	8.30	18.76	11.80	23.94	20.34	44.13	31.76	77.80	68.69	89.33	74.81	56.06	58.36
L9	0:02:00		7.19	3.10	12.17	8.11	18.35	11.45	23.71	20.26	43.58	31.42	77.55	68.62	89.04	75.09	56.13	58.66
L9	0:02:30		7.00	3.07	12.06	8.07	18.39	11.55	23.64	20.30	43.47	31.46	77.40	68.80	89.11	74.81	56.24	58.51
L9	0:03:00		7.04	2.99	12.03	7.92	18.13	11.19	23.31	19.65	42.92	31.23	77.00	68.06	88.71	74.42	56.16	58.62
L9	0:03:30		6.81	2.99	11.96	7.88	17.94	11.23	23.27	19.58	42.77	31.08	76.97	68.17	87.94	74.97	56.13	58.33
L9	0:04:00		6.89	3.10	11.99	7.85	18.01	11.12	23.20	19.61	42.73	31.27	76.68	68.80	87.98	74.39	56.20	58.62
L9	0:04:30		6.70	3.07	11.85	7.81	17.79	11.19	22.98	19.61	42.65	31.27	76.64	68.47	88.67	75.13	56.27	58.73
L9	0:05:00		6.66	2.92	11.92	7.74	17.87	11.09	23.09	19.98	42.50	31.34	76.68	68.40	88.75	75.17	56.27	58.69
L9	0:05:30		7.04	3.14	12.52	8.26	18.57	11.87	24.01	21.06	44.01	33.06	79.26	71.07	90.35	77.08	57.64	60.05
L10	0:00:00		6.85	3.21	12.59	8.33	18.72	12.02	24.34	21.56	44.01	33.52	79.80	71.70	90.79	77.74	58.42	61.15
L10	0:00:30		6.93	3.25	12.55	8.26	18.76	12.05	24.30	21.38	43.74	33.60	79.80	71.33	90.83	78.60	58.88	61.63
L10	0:01:00		6.63	3.29	12.45	8.11	18.57	11.84	24.05	21.13	43.12	33.44	79.22	71.25	90.79	78.68	59.05	61.63
L10	0:01:30		6.74	3.36	12.31	8.07	18.46	11.66	23.83	21.28	42.81	33.56	79.33	71.59	90.97	78.80	59.16	61.81
L10	0:02:00		6.66	3.21	12.27	8.03	18.20	11.77	23.75	21.28	42.57	33.79	79.33	71.59	90.83	78.91	59.34	62.29
L10	0:02:30		6.59	3.18	12.34	7.96	18.28	11.59	23.79	21.10	42.18	33.90	79.55	71.96	90.75	79.54	59.51	62.14
L10	0:03:00		6.37	3.33	12.27	7.88	18.24	11.59	23.75	21.31	42.07	34.09	79.73	72.51	90.61	79.54	59.69	62.33
L10	0:03:30		6.48	3.47	12.59	8.30	18.57	12.09	24.34	22.22	42.88	35.24	81.29	73.81	92.58	81.49	60.53	63.72
L11	0:00:00		6.51	3.44	12.59	8.18	18.65	12.02	24.38	22.03	42.11	35.70	81.07	74.30	92.69	81.84	61.17	64.12
L11	0:00:30		6.33	3.55	12.48	8.07	18.24	11.95	23.97	22.00	41.09	35.81	80.75	74.07	93.45	101.78	61.41	64.89
L11	0:01:00		6.22	3.58	12.41	7.96	18.16	11.62	23.68	21.93	40.39	35.96	80.49	74.56	92.90	82.43	61.59	65.19

Table K.2 Calculated Strain, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L11	0:01:30		6.14	3.58	12.38	7.77	17.79	11.48	23.49	21.67	39.81	36.23	80.31	74.59	92.94	#####	61.77	65.04
L11	0:02:00		5.80	3.44	12.27	7.62	17.60	11.34	23.27	21.60	39.11	36.19	80.16	74.96	92.69	#####	61.87	65.55
L11	0:02:30		5.69	3.44	12.31	7.44	17.45	11.27	22.98	21.49	38.76	36.19	80.13	74.52	92.72	83.32	61.87	65.33
L11	0:03:00		5.58	3.51	12.24	7.32	17.42	11.16	22.50	21.49	38.21	36.58	79.55	74.78	92.76	83.17	61.98	65.77
L11	0:03:30		5.62	3.55	12.55	7.21	17.27	11.12	22.72	21.85	37.79	37.15	79.95	75.04	93.23	#####	62.23	66.03
L11	0:04:00		5.62	3.40	12.52	6.91	17.04	10.84	22.10	21.53	36.81	37.07	79.40	75.52	92.90	84.06	62.12	66.25
L11	0:04:30		5.43	3.40	12.48	6.84	16.78	10.66	21.88	21.49	35.65	37.11	79.37	75.22	91.92	#####	62.15	66.32
L11	0:05:00		5.20	3.25	12.24	6.24	16.49	10.19	20.81	20.73	34.32	36.65	78.13	74.70	91.41	83.95	61.87	65.99
U1	0:00:00		4.64	2.92	11.40	5.53	14.70	9.08	18.86	18.57	31.87	33.48	73.66	67.76	84.73	77.94	58.17	62.47
U1	0:00:30		4.23	2.70	11.08	5.27	14.25	8.80	18.60	18.39	31.17	32.91	73.48	67.06	84.66	77.78	58.07	61.96
U1	0:01:00		4.23	2.66	10.94	5.27	13.95	8.66	18.09	17.92	30.82	32.60	73.08	67.02	84.66	77.59	58.00	62.14
U1	0:01:30		3.89	2.59	10.77	5.04	13.65	8.55	17.87	17.77	30.63	32.30	72.50	66.73	84.51	77.62	57.93	61.78
U1	0:02:00		3.11	1.96	8.98	4.07	11.52	7.05	15.00	14.92	25.45	26.23	55.94	50.10	61.72	57.99	46.23	49.16
U2	0:00:00		3.18	2.00	8.94	4.04	11.45	7.22	15.07	15.17	25.72	26.27	56.30	50.14	62.01	58.27	46.26	48.79
U2	0:00:30		2.96	2.00	8.77	4.07	11.45	7.22	14.93	15.14	25.57	26.15	56.08	49.77	61.24	57.68	45.88	48.79
U2	0:01:00		2.85	2.00	8.77	4.26	11.19	7.26	14.93	15.21	25.64	26.15	56.30	49.80	61.39	57.92	45.95	48.64
U2	0:01:30		2.88	2.03	8.73	4.11	11.23	7.26	14.89	15.14	25.68	26.11	56.48	50.25	61.54	57.49	45.95	48.86
U2	0:02:00		1.91	1.15	6.42	2.69	8.47	5.40	11.58	12.35	21.60	22.75	49.11	43.75	55.84	53.74	44.68	47.98
U3	0:00:00		1.80	1.26	6.14	2.65	8.02	5.19	10.70	10.91	18.95	18.02	36.58	27.50	35.89	34.93	32.80	32.36
U3	0:00:30		1.80	1.22	6.24	2.65	8.09	5.26	10.66	10.98	18.91	17.83	36.07	27.20	35.20	34.38	32.45	32.14
U3	0:01:00		1.91	1.26	6.14	2.84	8.02	5.33	10.74	11.09	19.03	17.91	36.87	27.46	35.35	34.27	32.63	31.84
U3	0:01:30		1.95	1.26	6.10	2.91	8.13	5.40	10.77	11.05	19.15	18.02	37.12	27.65	35.42	34.46	32.52	32.14
U3	0:02:00		1.98	1.26	6.10	2.91	8.09	5.40	10.74	11.13	19.30	18.10	37.34	27.39	35.53	34.42	32.70	31.84
U3	0:02:30		2.17	1.29	5.96	2.88	8.17	5.47	10.74	11.23	19.34	17.98	37.23	27.87	35.53	34.50	32.70	31.84
U3	0:03:00		2.17	1.26	6.10	3.10	8.17	5.51	10.77	11.34	19.46	17.98	37.34	27.91	35.56	34.50	32.70	31.88
U3	0:03:30		2.10	1.26	5.96	2.99	8.32	5.51	10.77	11.41	19.46	18.06	37.81	27.91	35.64	34.30	32.73	32.14
U3	0:04:00		-0.34	-0.48	0.28	-0.86	0.48	-1.00	0.99	-1.44	2.57	-0.69	2.25	-0.04	7.30	4.41	16.10	8.95
U4	0:00:00		-0.30	-0.41	0.04	-0.82	0.60	-1.04	1.07	-1.84	2.18	-1.30	0.25	-0.45	6.49	3.47	15.26	7.67
U4	0:00:30		-0.22	-0.41	0.14	-0.71	0.63	-0.72	1.03	-1.77	2.30	-1.37	0.15	-0.78	5.98	3.28	15.15	7.45
U4	0:01:00		-0.15	-0.41	0.00	-0.67	0.75	-0.64	1.10	-1.70	2.41	-1.34	0.04	-0.82	6.16	3.16	15.01	7.26
U4	0:01:30		-0.19	-0.37	0.07	-0.60	0.78	-0.57	1.14	-1.44	2.57	-1.45	0.11	-0.63	6.13	2.89	14.94	7.19
U4	0:02:00		0.07	-0.37	0.00	-0.11	0.71	-0.54	1.18	-1.44	2.61	-1.41	0.22	-0.71	5.76	2.97	14.90	7.08
U4	0:02:30		0.15	-0.33	0.04	-0.52	0.78	-0.72	1.29	-1.52	2.61	-1.41	0.18	-1.00	5.69	3.01	14.87	7.08
2L1	0:00:00		3.11	2.25	6.35	4.52	10.37	6.15	15.15	10.84	25.64	18.17	47.91	44.79	57.96	49.64	41.79	41.38
2L1	0:00:30		3.18	2.18	6.31	4.37	10.37	6.08	15.22	10.84	25.68	18.59	47.91	46.05	58.73	50.81	42.39	42.00
2L1	0:01:00		3.11	2.11	6.38	4.26	10.44	5.94	15.00	10.51	25.14	18.25	46.97	45.05	58.18	50.11	42.11	42.15
2L1	0:01:30		3.15	2.14	6.42	4.19	10.41	5.83	14.93	10.48	24.98	18.06	46.57	45.20	58.00	49.92	42.11	41.67
2L1	0:02:00		3.15	2.14	6.28	4.22	10.37	5.79	14.82	10.37	24.83	18.06	46.49	45.05	57.89	49.88	42.00	41.67
2L1	0:02:30		3.26	2.14	6.59	4.37	10.52	5.94	15.11	10.66	25.29	18.48	47.44	46.54	59.09	51.16	42.56	42.52
2L1	0:03:00		3.26	2.14	6.59	4.37	10.56	5.94	15.11	10.76	25.29	18.52	47.29	46.43	59.24	51.13	42.60	42.66
2L1	0:03:30		3.44	2.29	6.84	4.52	10.74	6.15	15.41	10.91	25.64	18.78	47.91	46.09	59.02	50.93	42.53	42.44
2L2	0:00:00		4.98	3.25	10.10	6.35	14.73	9.91	20.66	18.64	32.88	30.24	65.82	64.76	82.65	73.06	59.23	61.04
2L2	0:00:30		4.83	3.40	10.06	6.17	14.36	9.66	19.82	18.35	31.40	30.62	65.89	64.91	84.00	76.02	61.27	62.69

396

Table K.2 Calculated Strain, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
2L2	0:01:00		4.79	3.25	10.03	5.98	14.32	9.48	19.49	17.92	30.63	30.77	65.82	65.43	83.89	76.88	61.73	63.54
2L2	0:01:30		4.61	3.29	9.99	5.90	14.17	9.37	19.19	17.99	30.31	30.47	65.49	65.09	84.55	76.84	61.87	63.68
2L2	0:02:00		4.57	3.21	9.75	5.83	13.91	9.37	18.82	17.95	29.96	30.81	65.89	65.24	83.97	77.31	62.19	63.83
2L2	0:02:30		4.53	3.18	9.89	5.83	13.84	9.26	18.49	17.84	29.61	30.70	65.64	65.76	84.73	77.35	62.30	63.79
2L2	0:03:00		4.94	3.51	10.52	6.20	14.43	9.94	19.49	19.40	30.59	32.18	68.21	67.58	86.78	79.65	63.49	65.55
2L3	0:00:00		4.79	3.51	10.73	6.05	14.58	9.98	19.19	19.76	29.96	33.14	69.27	68.25	88.34	81.25	64.73	66.87
2L3	0:00:30		4.94	3.47	10.80	5.79	14.32	9.66	18.49	19.76	28.60	33.64	68.98	68.95	88.38	81.96	65.47	67.83
2L3	0:01:00		4.87	3.36	10.84	5.46	14.06	9.41	17.83	19.54	27.28	34.21	68.03	69.84	90.06	81.49	65.92	67.87
2L3	0:01:30		4.16	2.81	9.96	4.33	12.76	8.26	15.74	18.53	24.44	33.10	64.91	68.51	88.71	79.50	65.57	66.84
2U1	0:00:00		3.89	2.70	9.61	4.26	12.16	7.80	14.52	17.01	22.42	30.16	58.23	59.79	77.00	70.09	59.48	60.57
2U1	0:00:30		4.01	2.62	9.43	4.19	11.75	7.62	14.34	16.69	22.14	29.78	58.15	60.01	76.96	69.94	59.55	60.42
2U1	0:01:00		3.71	2.55	9.50	4.11	11.56	7.51	14.16	16.69	21.95	29.74	58.33	59.64	77.07	69.90	59.41	60.38
2U1	0:01:30		3.78	2.59	9.33	4.07	11.56	7.44	14.01	16.58	21.75	29.63	58.15	59.56	76.96	70.25	59.34	60.05
2U1	0:02:00		3.63	2.55	9.12	3.92	11.26	7.44	13.90	16.47	21.71	29.36	57.75	59.93	77.04	70.29	59.30	60.31
2U1	0:02:30		1.98	1.29	5.89	1.72	6.90	4.33	7.76	10.58	12.18	17.98	30.95	29.61	37.53	41.21	38.97	39.66
2U2	0:00:00		2.02	1.40	5.79	1.98	6.79	4.61	8.16	10.66	13.04	17.56	31.02	28.13	35.45	38.91	37.28	37.12
2U2	0:00:30		1.95	1.48	5.58	2.06	6.94	4.76	8.27	10.73	13.31	17.52	32.07	28.28	35.67	38.87	37.38	37.16
2U2	0:01:00		1.95	1.40	5.54	2.32	6.94	4.83	8.27	10.91	13.35	17.56	32.55	28.39	35.78	38.95	37.42	36.90
2U2	0:01:30		-0.30	-0.15	0.28	-0.52	-0.34	-0.64	-0.55	-0.58	-0.93	0.15	0.00	0.74	4.81	6.75	15.68	9.17
2U3	0:00:00		-0.26	-0.11	0.14	-0.82	-0.41	-0.72	-0.44	-0.58	-0.74	-0.15	-0.51	0.19	4.23	5.74	14.80	8.07
2U3	0:00:30		-0.34	-0.07	0.04	-0.26	-0.19	-0.57	-0.18	-0.54	-0.58	-0.23	-0.47	0.04	4.12	5.42	14.59	7.63
2U3	0:01:00		-0.41	-0.04	0.00	-0.60	-0.34	-0.50	-0.15	-0.36	-0.51	-0.11	-0.54	0.22	4.19	5.11	14.06	7.48
2U3	0:01:30		-0.26	-0.04	0.04	-0.15	-0.07	-0.46	-0.26	-0.33	-0.35	-0.23	-0.44	-0.11	2.37	2.61	7.79	3.30
2U3	0:02:00		-0.22	0.00	0.00	-0.56	-0.15	-0.39	-0.22	-0.29	-0.19	-0.08	-0.29	-0.11	1.17	1.48	3.70	1.83
2U3	0:02:30		-0.34	0.00	0.00	-0.11	0.07	-0.14	-0.04	-0.07	-0.16	0.00	-0.07	0.07	0.44	0.55	1.20	0.77
2U3	0:03:00		-0.26	0.04	0.07	-0.49	-0.07	-0.29	0.00	-0.07	-0.08	0.04	-0.11	-0.15	0.33	0.39	0.14	0.22
2U3	0:03:30		0.00	0.11	0.11	0.00	0.11	-0.04	-0.15	0.00	-0.04	0.04	-0.04	-0.19	0.07	0.31	0.11	0.11
2U3	0:04:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table K.3 Calculated Strain, 4 Minute Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L0	0:00:00		0.79	-0.85	-2.21	-1.83	-2.91	-5.15	-1.65	-14.56	1.60	-22.30	-5.67	-8.46	2.63	-11.51	-2.33	-8.25
L1	0:02:30		4.79	1.63	4.59	3.55	7.35	1.79	11.62	-0.47	22.92	0.46	31.35	23.64	32.06	14.17	9.48	6.71
L2	0:02:30		6.70	2.77	8.17	6.13	12.31	5.90	17.91	8.02	33.74	13.40	53.10	43.46	53.11	35.71	19.38	20.29
L3	0:02:30		7.19	3.44	9.68	7.21	14.06	7.87	20.30	11.49	38.21	18.48	61.89	51.73	65.84	48.71	29.91	32.25
L4	0:02:30		6.81	3.10	9.75	7.21	14.28	8.30	20.81	12.68	39.11	20.69	63.93	53.63	70.44	54.29	37.00	39.84
L5	0:04:00		6.33	3.21	9.89	7.10	14.32	8.58	20.96	13.47	39.46	22.11	65.82	56.04	73.65	58.07	40.59	42.41
L6	0:04:00		6.55	3.10	10.17	7.44	15.59	9.41	21.62	15.17	40.74	24.43	68.61	58.93	77.55	62.17	44.61	46.81
L7	0:03:30		7.08	3.25	11.08	7.81	17.16	10.26	22.13	16.76	42.11	26.80	72.03	62.27	81.16	66.38	48.55	50.40
L8	0:04:00		6.85	3.29	11.54	7.92	17.79	10.80	22.87	18.28	42.81	28.90	74.86	64.87	84.95	71.54	52.46	54.95
L9	0:04:00		6.89	3.10	11.99	7.85	18.01	11.12	23.20	19.61	42.73	31.27	76.68	68.80	87.98	74.39	56.20	58.62
L10	0:03:30		6.48	3.47	12.59	8.30	18.57	12.09	24.34	22.22	42.88	35.24	81.29	73.81	92.58	81.49	60.53	63.72
L11	0:04:00		5.62	3.40	12.52	6.91	17.04	10.84	22.10	21.53	36.81	37.07	79.40	75.52	92.90	84.06	62.12	66.25
U1	0:02:00		3.11	1.96	8.98	4.07	11.52	7.05	15.00	14.92	25.45	26.23	55.94	50.10	61.72	57.99	46.23	49.16
U2	0:02:00		1.91	1.15	6.42	2.69	8.47	5.40	11.58	12.35	21.60	22.75	49.11	43.75	55.84	53.74	44.68	47.98
U3	0:02:00		1.98	1.26	6.10	2.91	8.09	5.40	10.74	11.13	19.30	18.10	37.34	27.39	35.53	34.42	32.70	31.84
U3	0:04:00		-0.34	-0.48	0.28	-0.86	0.48	-1.00	0.99	-1.44	2.57	-0.69	2.25	-0.04	7.30	4.41	16.10	8.95
U4	0:02:00		0.07	-0.37	0.00	-0.11	0.71	-0.54	1.18	-1.44	2.61	-1.41	0.22	-0.71	5.76	2.97	14.90	7.08
2L1	0:03:30		3.44	2.29	6.84	4.52	10.74	6.15	15.41	10.91	25.64	18.78	47.91	46.09	59.02	50.93	42.53	42.44
2L2	0:03:00		4.94	3.51	10.52	6.20	14.43	9.94	19.49	19.40	30.59	32.18	68.21	67.58	86.78	79.65	63.49	65.55
2L3	0:01:30		4.16	2.81	9.96	4.33	12.76	8.26	15.74	18.53	24.44	33.10	64.91	68.51	88.71	79.50	65.57	66.84
2U1	0:02:30		1.98	1.29	5.89	1.72	6.90	4.33	7.76	10.58	12.18	17.98	30.95	29.61	37.53	41.21	38.97	39.66
2U2	0:01:00		1.95	1.40	5.54	2.32	6.94	4.83	8.27	10.91	13.35	17.56	32.55	28.39	35.78	38.95	37.42	36.90
2U3	0:02:00		-0.22	0.00	0.00	-0.56	-0.15	-0.39	-0.22	-0.29	-0.19	-0.08	-0.29	-0.11	1.17	1.48	3.70	1.83
2U3	0:04:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table K.4 Average Calculated Strain, 4 Minute Readings, Shaft 7 - 1996

Load Interval	Elapsed Time h:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+45.30	+25.10	+15.10	+5.10	-4.90	-14.90	-24.90	-28.40
L0	0:00:00	0.00	0.00	-0.03	-2.02	-4.03	-8.11	-10.35	-7.06	0.00
L1	0:02:30	0.00	0.00	3.21	4.07	4.57	5.57	11.69	27.49	40.35
L2	0:02:30	0.00	0.00	4.74	7.15	9.10	12.96	23.57	48.28	85.26
L3	0:02:30	0.00	0.00	5.31	8.45	10.96	15.89	28.35	56.81	108.47
L4	0:02:30	0.00	0.00	4.96	8.48	11.29	16.74	29.90	58.78	119.06
L5	0:04:00	0.00	0.00	4.77	8.49	11.45	17.22	30.78	60.93	120.95
L6	0:04:00	0.00	0.00	4.83	8.80	12.50	18.40	32.59	63.77	126.08
L7	0:03:30	0.00	0.00	5.16	9.45	13.71	19.45	34.45	67.15	131.35
L8	0:04:00	0.00	0.00	5.07	9.73	14.30	20.57	35.85	69.87	135.74
L9	0:04:00	0.00	0.00	5.00	9.92	14.57	21.41	37.00	72.74	139.44
L10	0:03:30	0.00	0.00	4.98	10.44	15.33	23.28	39.06	77.55	144.20
L11	0:04:00	0.00	0.00	4.51	9.72	13.94	21.81	36.94	77.46	149.75
U1	0:02:00	0.00	0.00	2.53	6.53	9.29	14.96	25.84	53.02	130.48
U2	0:02:00	0.00	0.00	1.53	4.55	6.93	11.97	22.18	46.43	85.71
U3	0:02:00	0.00	0.00	1.62	4.51	6.75	10.93	18.70	32.36	41.95
U3	0:04:00	0.00	0.00	-0.41	-0.29	-0.26	-0.23	0.94	1.11	24.20
U4	0:02:00	0.00	0.00	-0.15	-0.06	0.09	-0.13	0.60	-0.24	0.00
2L1	0:03:30	0.00	0.00	2.87	5.68	8.45	13.16	22.21	47.00	85.69
2L2	0:03:00	0.00	0.00	4.23	8.36	12.19	19.44	31.39	67.90	130.98
2L3	0:01:30	0.00	0.00	3.48	7.15	10.51	17.13	28.77	66.71	137.04
2U1	0:02:30	0.00	0.00	1.64	3.81	5.61	9.17	15.08	30.28	108.71
2U2	0:01:00	0.00	0.00	1.68	3.93	5.88	9.59	15.46	30.47	43.20
2U3	0:02:00	0.00	0.00	-0.11	-0.28	-0.27	-0.25	-0.14	-0.20	0.00
2U3	0:04:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Top of Shaft Ground Surface

Top of Mid Cell

Table K.5 Shaft Load, 4 Minute Readings, Shaft 7 - 1996

Load Interval	Elapsed Time hmmss	Shaft Load, tons								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+45.30	+25.10	+15.10	+5.10	-4.90	-14.90	-24.90	-28.40
L0	0:00:00	0.00	0.00	-0.21	-13.15	-26.23	-52.76	-67.29	-45.92	0.00
L1	0:02:30	0.00	0.00	20.89	26.50	29.73	36.29	75.99	178.73	278.06
L2	0:02:30	0.00	0.00	30.83	46.54	59.27	84.38	153.23	313.87	587.59
L3	0:02:30	0.00	0.00	34.58	54.97	71.37	103.44	184.28	369.34	747.57
L4	0:02:30	0.00	0.00	32.28	55.20	73.50	108.99	194.39	382.11	820.55
L5	0:04:00	0.00	0.00	31.06	55.29	74.55	112.06	200.12	396.09	833.58
L6	0:04:00	0.00	0.00	31.43	57.30	81.35	119.74	211.86	414.59	868.92
L7	0:03:30	0.00	0.00	33.61	61.48	89.25	126.59	223.98	436.54	905.24
L8	0:04:00	0.00	0.00	33.00	63.33	93.06	133.92	233.09	454.20	935.49
L9	0:04:00	0.00	0.00	32.52	64.57	94.83	139.34	240.53	472.89	961.03
L10	0:03:30	0.00	0.00	32.39	67.97	99.80	151.52	253.94	504.17	993.81
L11	0:04:00	0.00	0.00	29.34	63.24	90.75	141.99	240.16	503.58	1032.10
U1	0:02:00	0.00	0.00	16.49	42.47	60.44	97.38	167.98	344.67	899.26
U2	0:02:00	0.00	0.00	9.94	29.64	45.13	77.90	144.17	301.85	590.68
U3	0:02:00	0.00	0.00	10.55	29.34	43.92	71.15	121.56	210.40	289.15
U3	0:04:00	0.00	0.00	-2.66	-1.88	-1.68	-1.47	6.11	7.20	166.81
U4	0:02:00	0.00	0.00	-0.96	-0.36	0.56	-0.87	3.88	-1.58	0.00
2L1	0:03:30	0.00	0.00	18.67	36.97	54.98	85.64	144.42	305.55	590.55
2L2	0:03:00	0.00	0.00	27.51	54.43	79.34	126.55	204.04	441.40	902.68
2L3	0:01:30	0.00	0.00	22.67	46.52	68.40	111.53	187.03	433.67	944.45
2U1	0:02:30	0.00	0.00	10.67	24.77	36.54	59.70	98.04	196.86	749.20
2U2	0:01:00	0.00	0.00	10.91	25.57	38.29	62.43	100.47	198.07	297.74
2U3	0:02:00	0.00	0.00	-0.73	-1.82	-1.77	-1.66	-0.88	-1.31	0.00
2U3	0:04:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Modulus, ksi		4312	4312	4312	4312	4312	4312	4307	4307	4285
Diameter, in		62.00	62.00	62.00	62.00	62.00	62.00	62.00	62.00	64.00
		Top of Shaft	Ground Surface							Top of Mid Cell

Table K.6 Average Segment Side Shear, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf							
		CL Elev., ft	+35.20	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65
		Length, ft	20.20	10.00	10.00	10.00	10.00	10.00	3.50
L0	0:00:00		-0.06	-0.14	-0.14	-0.22	-0.15	0.08	0.74
L1	0:02:30		0.01	-0.02	-0.04	-0.02	0.19	0.58	1.66
L2	0:02:30		0.04	0.04	0.02	0.10	0.37	0.93	4.68
L3	0:02:30		0.05	0.07	0.04	0.14	0.44	1.08	6.49
L4	0:02:30		0.04	0.08	0.06	0.16	0.47	1.10	7.54
L5	0:04:00		0.04	0.09	0.06	0.17	0.49	1.15	7.52
L6	0:04:00		0.04	0.10	0.09	0.18	0.51	1.19	7.81
L7	0:03:30		0.05	0.12	0.11	0.17	0.54	1.25	8.06
L8	0:04:00		0.04	0.13	0.13	0.20	0.55	1.31	8.28
L9	0:04:00		0.04	0.14	0.13	0.22	0.57	1.37	8.40
L10	0:03:30		0.04	0.16	0.14	0.26	0.57	1.49	8.42
L11	0:04:00		0.03	0.15	0.11	0.26	0.55	1.57	9.10
U1	0:02:00		-0.01	0.10	0.05	0.17	0.38	1.03	9.55
U2	0:02:00		-0.03	0.06	0.04	0.15	0.35	0.91	4.95
U3	0:02:00		-0.02	0.06	0.03	0.11	0.25	0.49	1.31
U3	0:04:00		-0.06	-0.05	-0.06	-0.06	-0.01	-0.05	2.71
U4	0:02:00		-0.06	-0.05	-0.05	-0.07	-0.03	-0.09	-0.03
2L1	0:03:30		0.00	0.06	0.05	0.13	0.31	0.94	4.88
2L2	0:03:00		0.03	0.11	0.10	0.23	0.42	1.41	7.93
2L3	0:01:30		0.01	0.09	0.08	0.21	0.41	1.46	8.79
2U1	0:02:30		-0.02	0.03	0.02	0.09	0.18	0.55	9.51
2U2	0:01:00		-0.02	0.03	0.02	0.09	0.18	0.54	1.67
2U3	0:02:00		-0.06	-0.06	-0.06	-0.06	-0.05	-0.06	-0.03
2U3	0:04:00		-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
Segment Wt., tons			18.55	9.18	9.18	9.18	9.18	9.18	3.32
Maximum Shear, tsf			0.05	0.16	0.14	0.26	0.57	1.57	9.55

Table K.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 7 -1996

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain								Shaft Compression				
		CL Elev., ft	+35.20	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65	Strain Gage		TT in	Error in	Error %
		Length, ft	20.20	10.00	10.00	10.00	10.00	10.00	3.50	Net, in	Change, in			
L0	0:00:00		-0.02	-1.03	-3.02	-6.07	-9.23	-8.71	-3.53	-0.0035	0.0000	0.0000	0.0000	
L1	0:02:30		1.60	3.64	4.32	5.07	8.63	19.59	33.92	0.0068	0.0103	0.0038	-0.0065	-170.6%
L2	0:02:30		2.37	5.94	8.13	11.03	18.27	35.93	66.77	0.0129	0.0164	0.0105	-0.0059	-56.3%
L3	0:02:30		2.66	6.88	9.70	13.43	22.12	42.58	82.64	0.0155	0.0190	0.0130	-0.0060	-46.7%
L4	0:02:30		2.48	6.72	9.89	14.02	23.32	44.34	88.92	0.0161	0.0196	0.0146	-0.0050	-34.6%
L5	0:04:00		2.39	6.63	9.97	14.33	24.00	45.86	90.94	0.0165	0.0200	0.0151	-0.0049	-32.5%
L6	0:04:00		2.41	6.82	10.65	15.45	25.49	48.18	94.93	0.0174	0.0209	0.0159	-0.0050	-31.3%
L7	0:03:30		2.58	7.30	11.58	16.58	26.95	50.80	99.25	0.0184	0.0219	0.0166	-0.0053	-32.3%
L8	0:04:00		2.54	7.40	12.01	17.43	28.21	52.86	102.80	0.0191	0.0226	0.0174	-0.0052	-29.9%
L9	0:04:00		2.50	7.46	12.24	17.99	29.20	54.87	106.09	0.0197	0.0232	0.0182	-0.0050	-27.4%
L10	0:03:30		2.49	7.71	12.89	19.30	31.17	58.31	110.88	0.0208	0.0243	0.0189	-0.0054	-28.6%
L11	0:04:00		2.25	7.11	11.83	17.88	29.38	57.20	113.61	0.0201	0.0236	0.0198	-0.0039	-19.7%
U1	0:02:00		1.27	4.53	7.91	12.12	20.40	39.43	91.75	0.0143	0.0178	0.0167	-0.0012	-6.9%
U2	0:02:00		0.76	3.04	5.74	9.45	17.07	34.30	66.07	0.0113	0.0148	0.0165	0.0017	10.1%
U3	0:02:00		0.81	3.06	5.63	8.84	14.82	25.53	37.16	0.0087	0.0122	0.0133	0.0011	8.1%
U3	0:04:00		-0.20	-0.35	-0.27	-0.24	0.36	1.02	12.66	0.0005	0.0041	0.0072	0.0031	43.2%
U4	0:02:00		-0.07	-0.10	0.02	-0.02	0.23	0.18	-0.12	0.0000	0.0035	0.0050	0.0015	29.4%
2L1	0:03:30		1.43	4.27	7.06	10.80	17.69	34.61	66.34	0.0121	0.0156	0.0109	-0.0047	-43.6%
2L2	0:03:00		2.11	6.29	10.27	15.82	25.41	49.64	99.44	0.0176	0.0211	0.0158	-0.0053	-34.0%
2L3	0:01:30		1.74	5.31	8.83	13.82	22.95	47.74	101.87	0.0165	0.0201	0.0165	-0.0036	-21.9%
2U1	0:02:30		0.82	2.72	4.71	7.39	12.13	22.68	69.49	0.0091	0.0126	0.0155	0.0029	18.5%
2U2	0:01:00		0.84	2.80	4.91	7.74	12.52	22.96	36.83	0.0079	0.0114	0.0113	-0.0001	-0.7%
2U3	0:02:00		-0.06	-0.20	-0.28	-0.26	-0.20	-0.17	-0.10	-0.0001	0.0034	0.0052	0.0018	35.2%
2U3	0:04:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0035	0.0042	0.0007	16.2%

Table K.8 Movement at Segment Centerline, Shaft 7 - 1996

Load Interval	Elapsed Time hhmmss	Segment Movement, in								Mid Cell
		CL Elev., ft	+35.20	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65	-28.40
		Length, ft	20.20	10.00	10.00	10.00	10.00	10.00	3.50	-
L0	0:00:00		0.004	0.003	0.003	0.003	0.002	0.001	0.000	0.000
L1	0:02:30		0.042	0.043	0.043	0.044	0.045	0.046	0.048	0.049
L2	0:02:30		0.137	0.138	0.139	0.140	0.142	0.145	0.149	0.150
L3	0:02:30		0.204	0.205	0.206	0.207	0.209	0.213	0.218	0.219
L4	0:02:30		0.277	0.278	0.279	0.280	0.283	0.287	0.291	0.293
L5	0:04:00		0.321	0.322	0.323	0.325	0.327	0.331	0.336	0.338
L6	0:04:00		0.386	0.387	0.388	0.389	0.392	0.396	0.401	0.403
L7	0:03:30		0.462	0.463	0.464	0.466	0.469	0.473	0.478	0.480
L8	0:04:00		0.573	0.574	0.575	0.577	0.580	0.585	0.590	0.592
L9	0:04:00		0.738	0.739	0.740	0.742	0.745	0.750	0.755	0.758
L10	0:03:30		1.008	1.009	1.010	1.012	1.015	1.020	1.026	1.028
L11	0:04:00		1.700	1.701	1.702	1.704	1.707	1.712	1.718	1.720
U1	0:02:00		1.996	1.996	1.997	1.998	2.000	2.004	2.008	2.010
U2	0:02:00		1.992	1.992	1.992	1.993	1.995	1.998	2.001	2.003
U3	0:02:00		1.973	1.973	1.974	1.975	1.976	1.979	1.981	1.982
U3	0:04:00		1.920	1.919	1.919	1.919	1.919	1.920	1.920	1.920
U4	0:02:00		1.807	1.807	1.807	1.807	1.807	1.807	1.807	1.807
2L1	0:03:30		1.906	1.906	1.907	1.908	1.909	1.913	1.916	1.918
2L2	0:03:00		2.327	2.328	2.329	2.330	2.333	2.337	2.342	2.345
2L3	0:01:30		2.808	2.808	2.809	2.811	2.813	2.817	2.822	2.824
2U1	0:02:30		2.841	2.841	2.841	2.842	2.843	2.845	2.848	2.850
2U2	0:01:00		2.818	2.818	2.818	2.819	2.820	2.822	2.825	2.825
2U3	0:02:00		2.755	2.755	2.755	2.755	2.755	2.755	2.755	2.755
2U3	0:04:00		2.753	2.753	2.753	2.753	2.753	2.753	2.753	2.753

Table K.9 Section Properties, Shaft 7 - 1996

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	16	1.561	24.983
3/4" Galvanized Steel Teltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			28.927

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375" O.D. Schedule 40 PVC Pipes	4	4.431	17.724
Area of Pipe =			19.492

404

Concrete Modulus 4100 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
46.5	62	3019.07	28.93	19.49	2970.65	4312.11	4PVC pipe, 4hose
-11.9	62	3019.07	28.26	19.49	2971.32	4306.62	4PVC pipe, 4hose
-26	64	3216.99	26.93	18.61	3171.45	4284.72	4PVC pipe, 2hose

Figure K.1 Shaft Top VW Strain, Shaft 7 - 1996

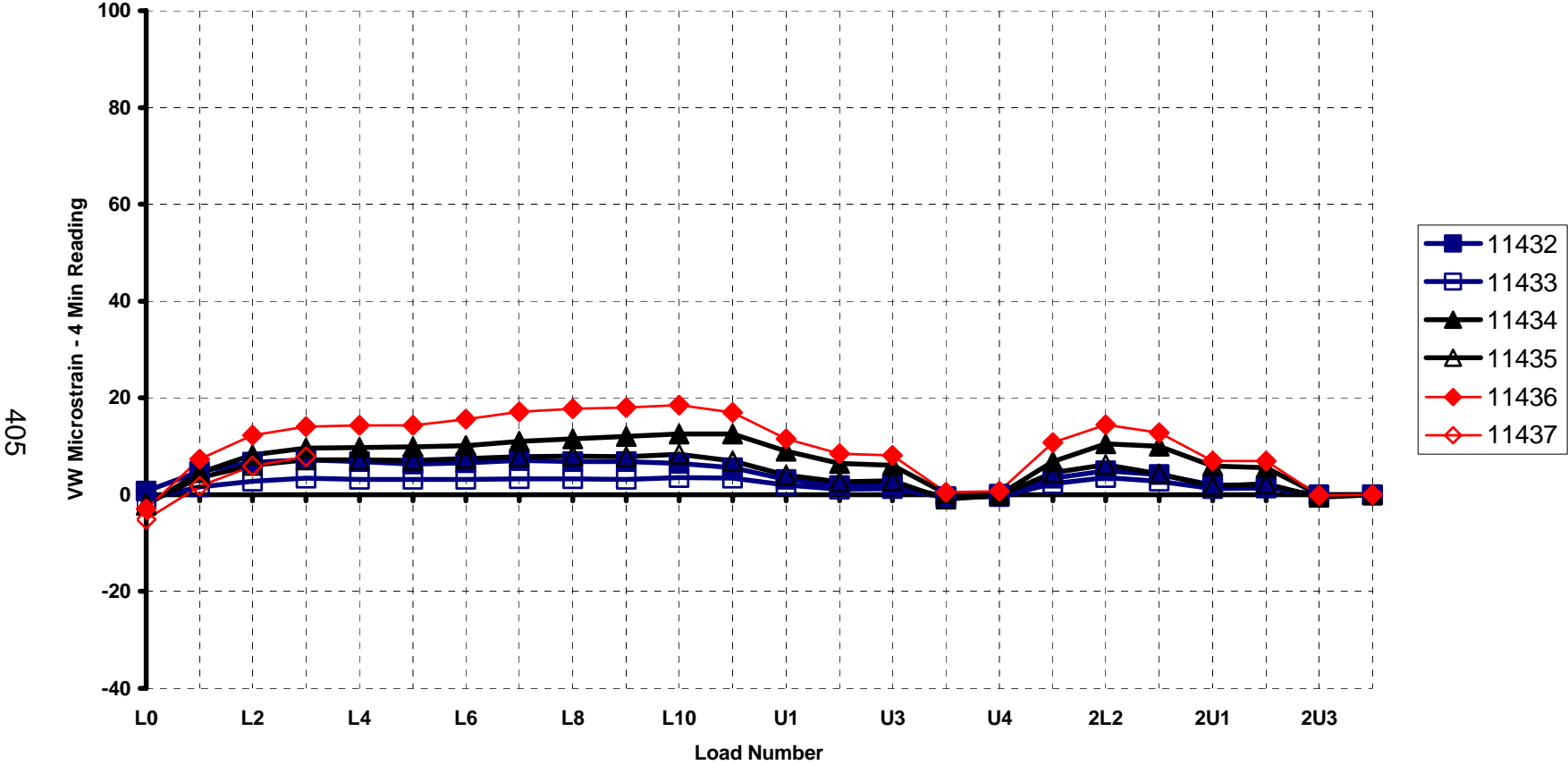


Figure K.2 Shaft Middle VW Strain, Shaft 7 - 1996

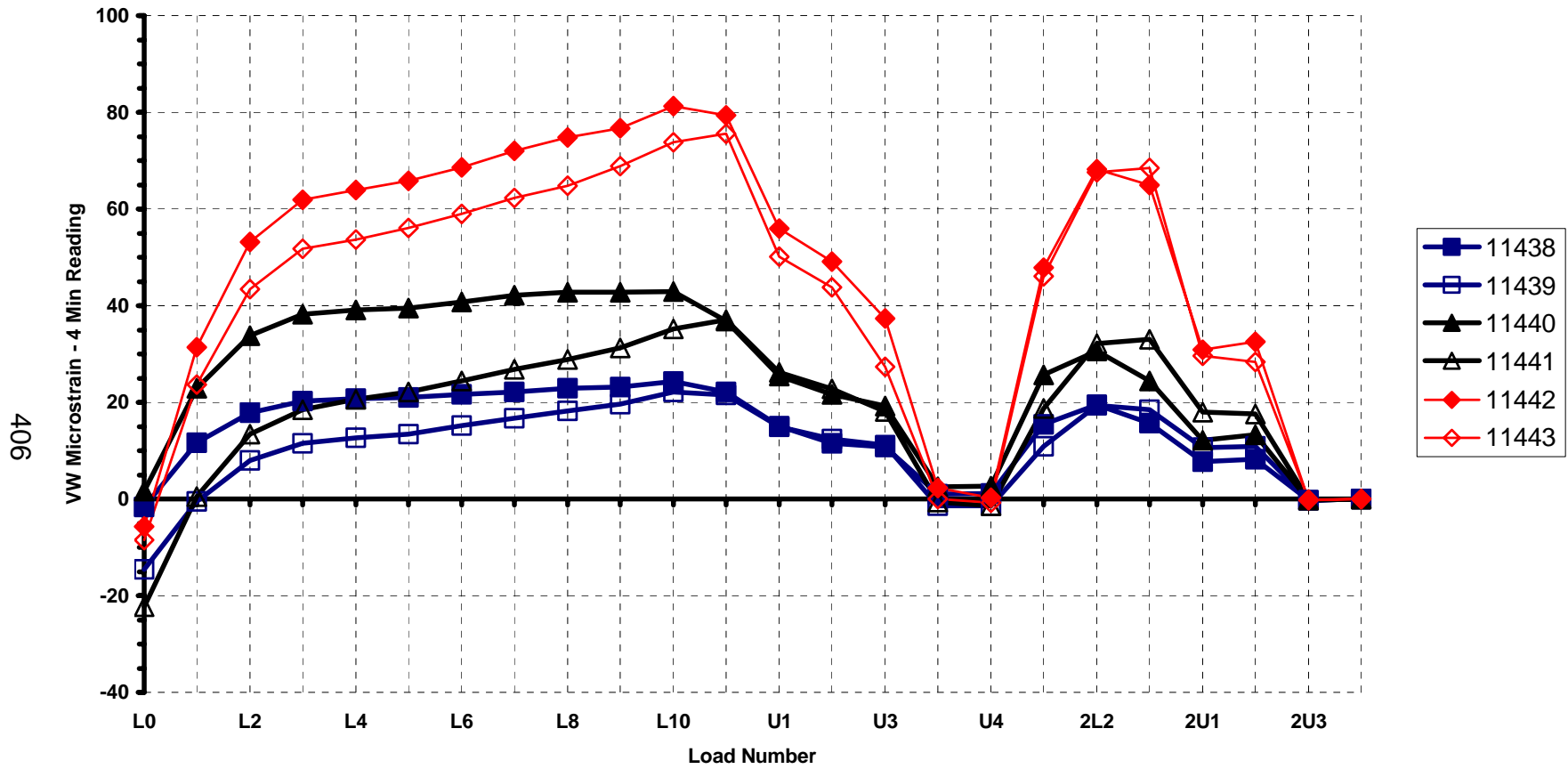
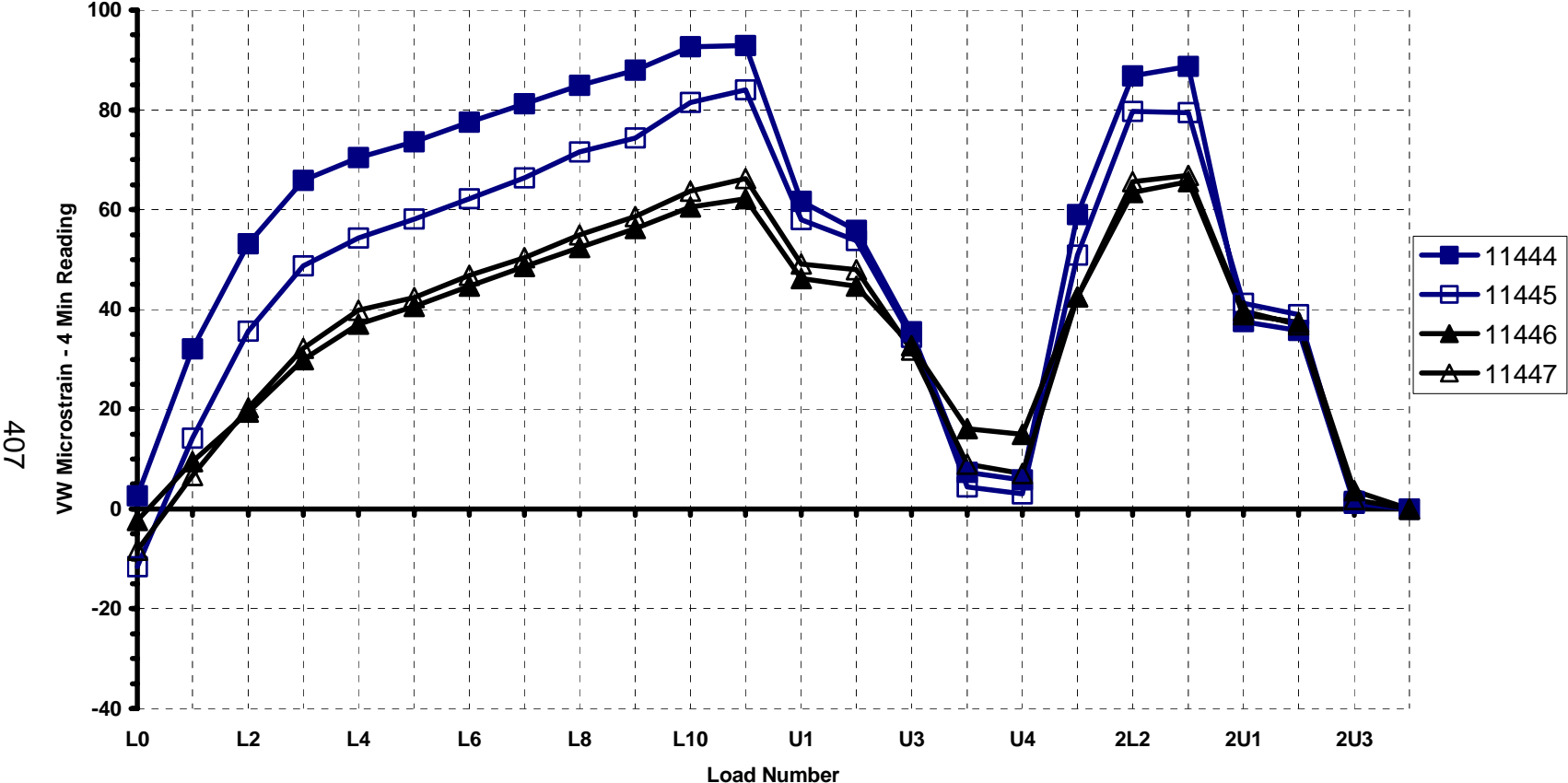


Figure K.3 Shaft Bottom VW Strain, Shaft 7 - 1996



407

Figure K.4 Shaft Top Shear Stress vs. Movement, Shaft 7 - 1996

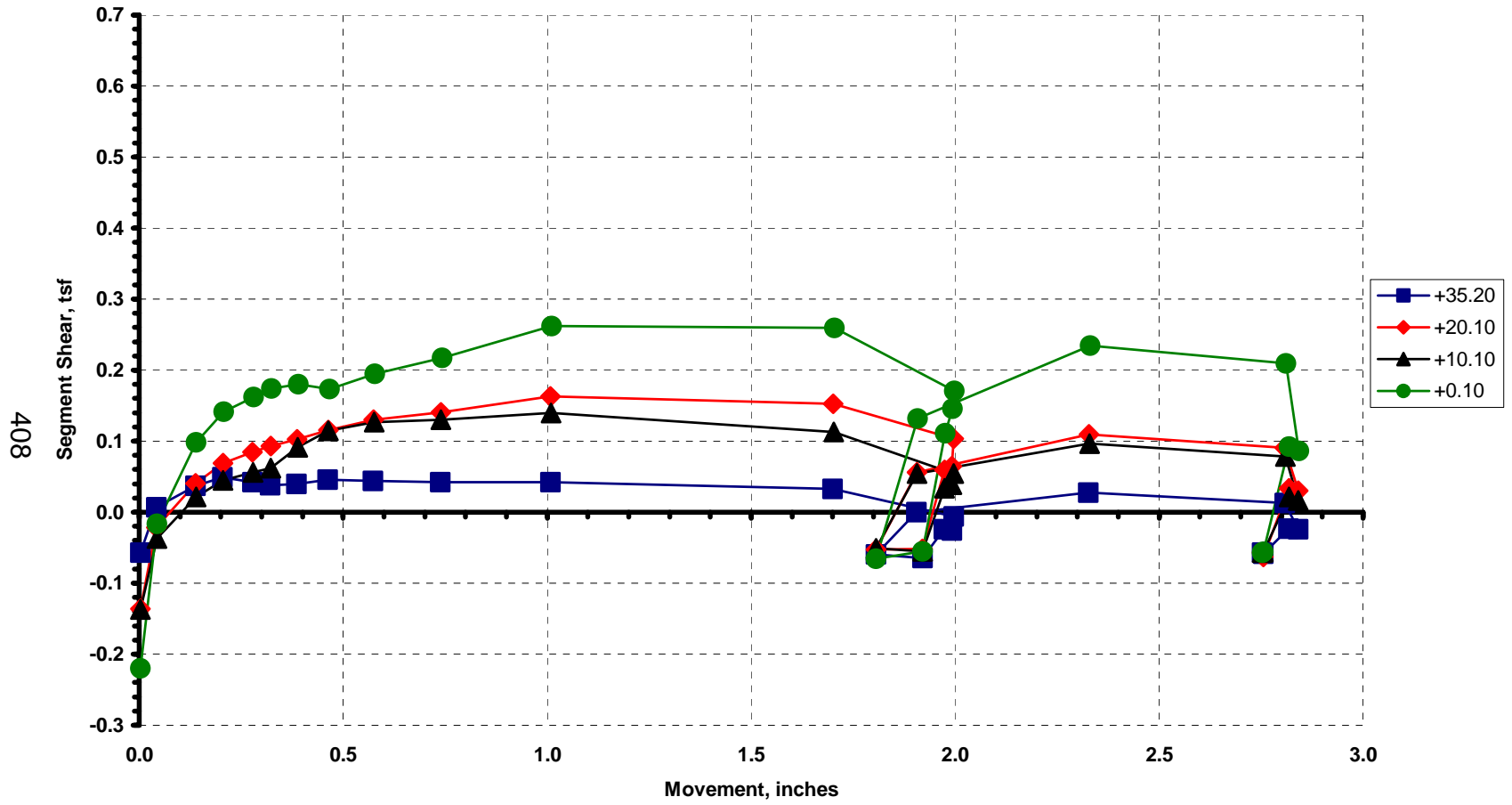


Figure K.5 Shaft Middle Shear Stress vs. Movement, Shaft 7 - 1996

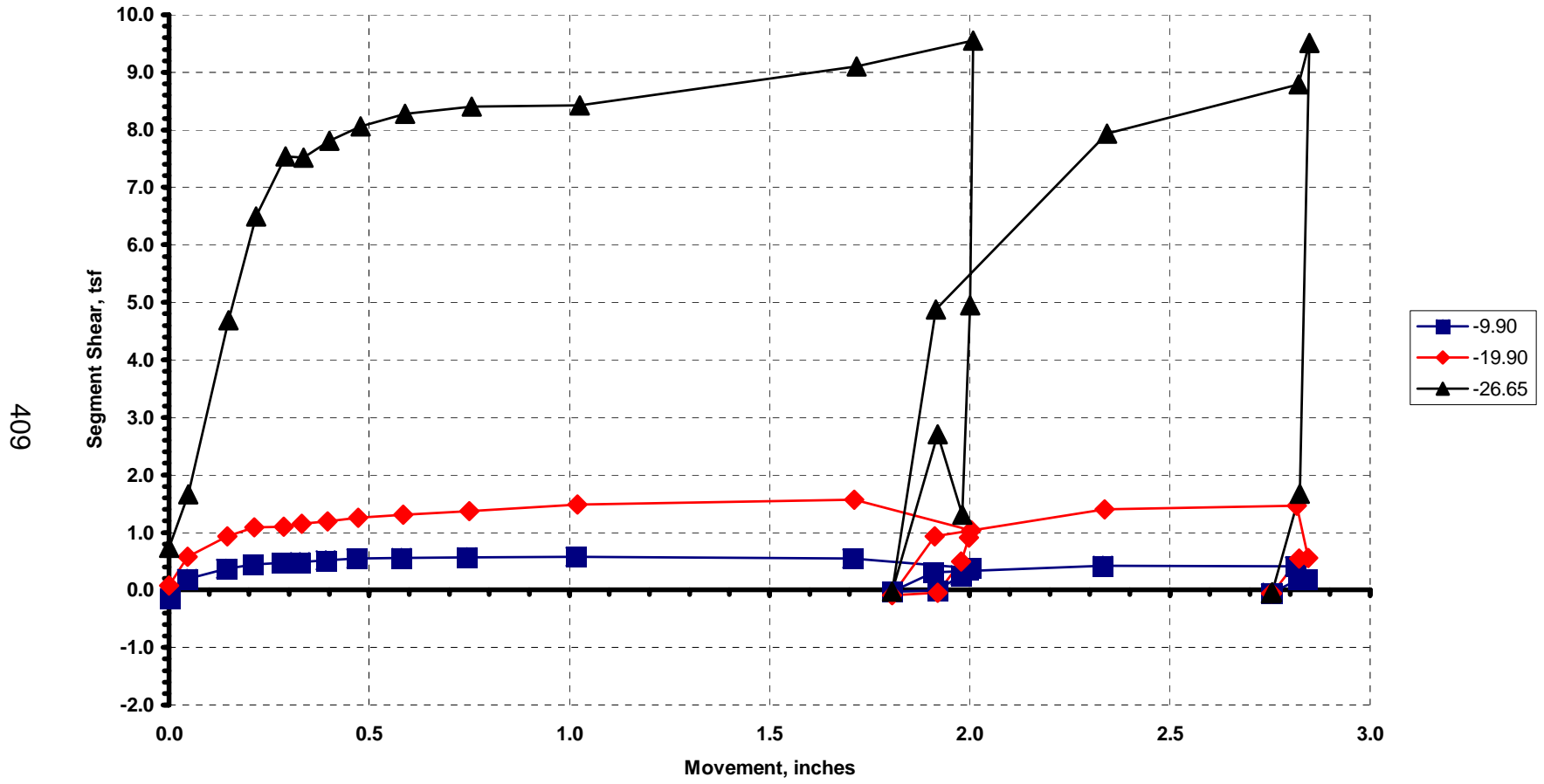


Figure K.6 Strain Distribution, Shaft 7 - 1996

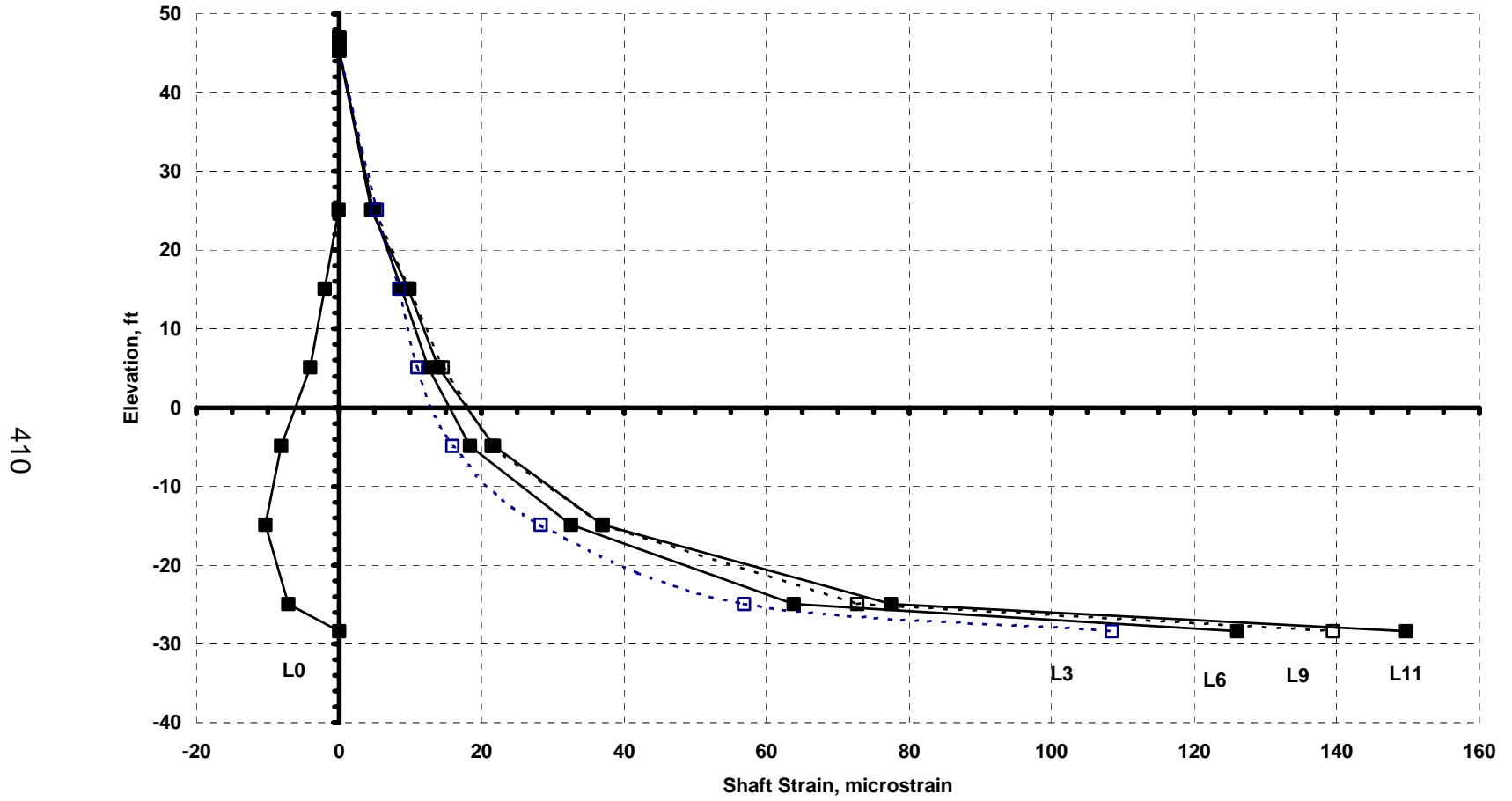


Figure K.7 Load Distribution, Shaft 7 - 1996

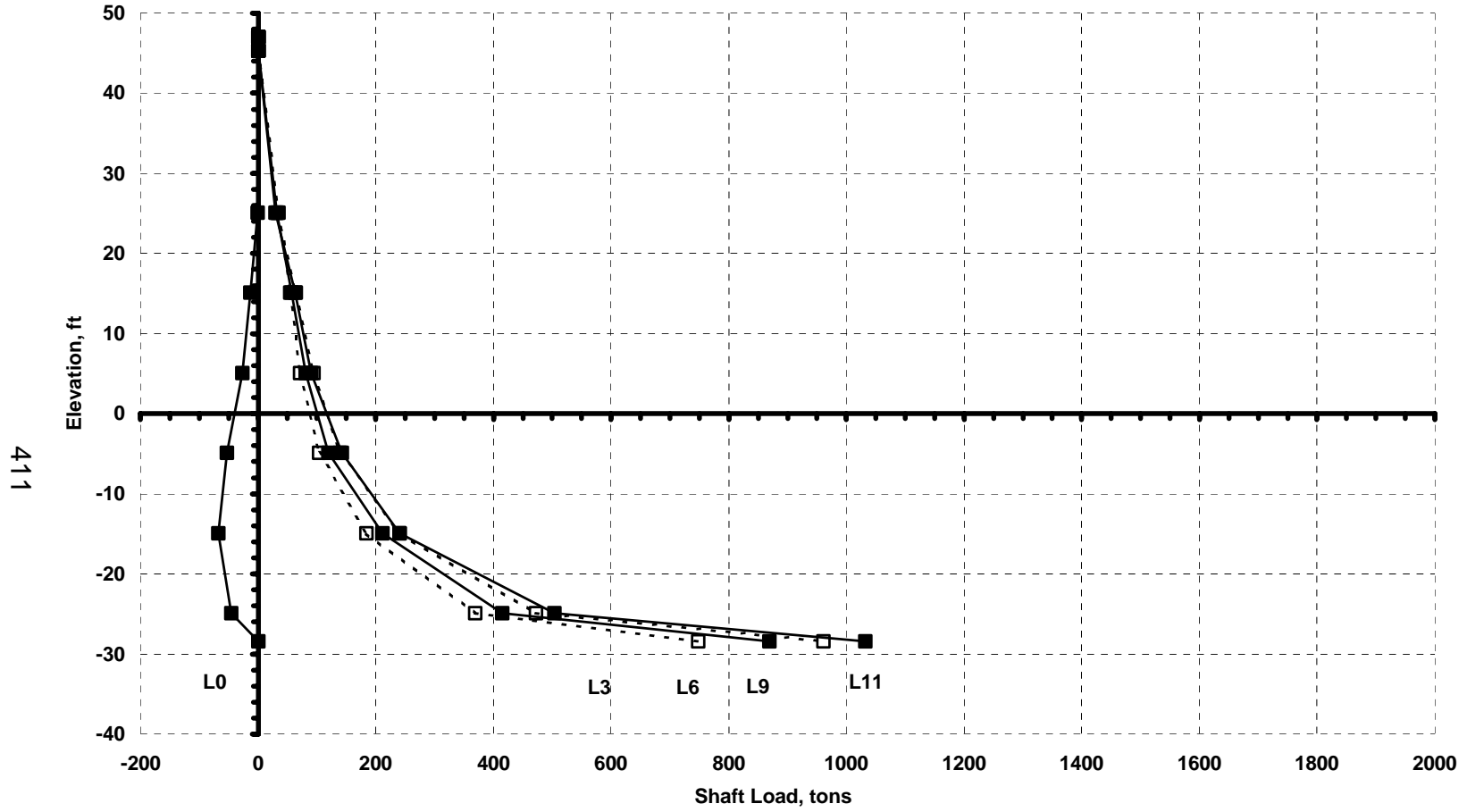


Figure K.8 Shear Stress Distribution, Shaft 7 - 1996

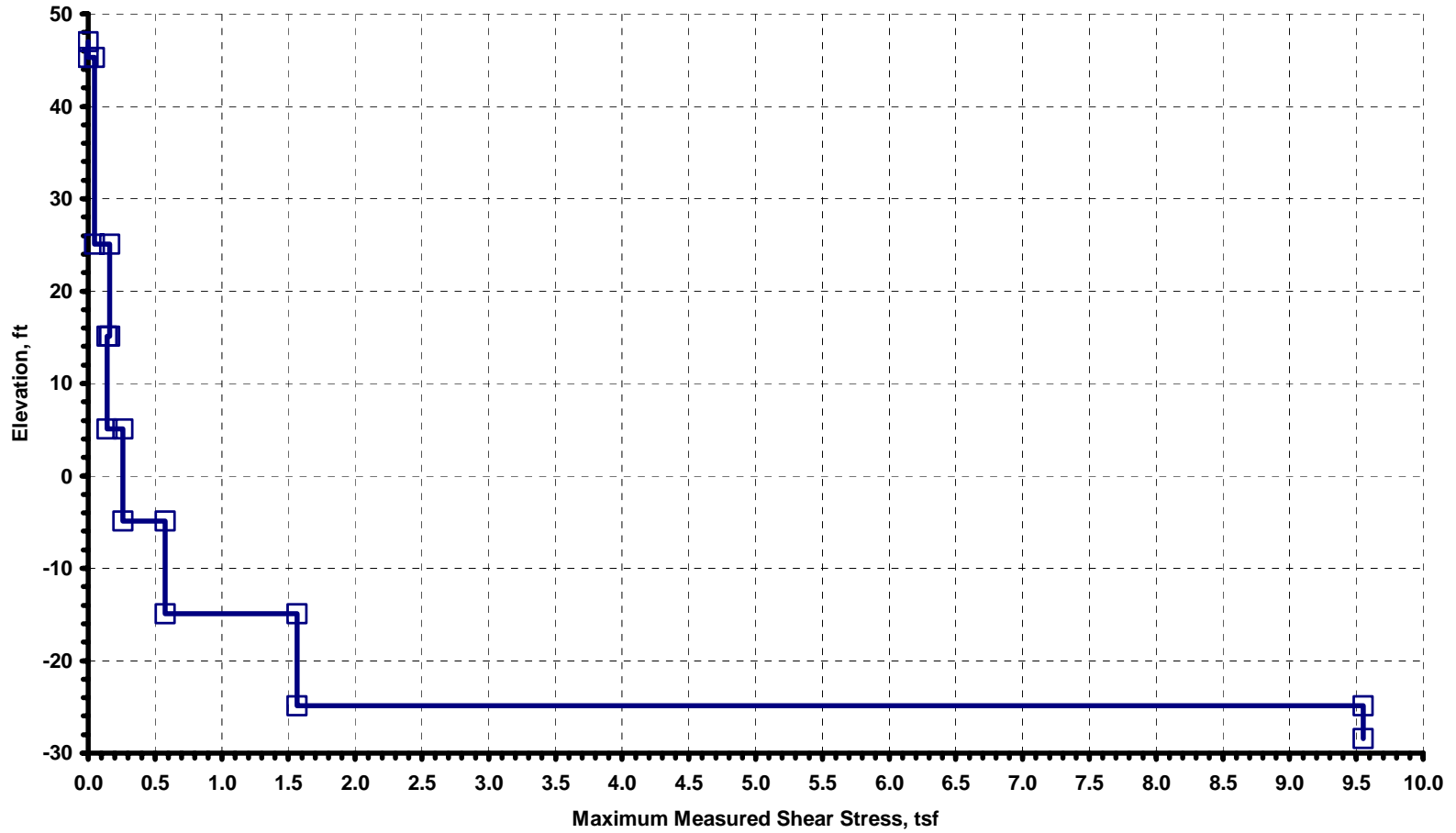


Figure K.9 Average Compression vs Load, Stage 3 - Shaft 7 - 1996

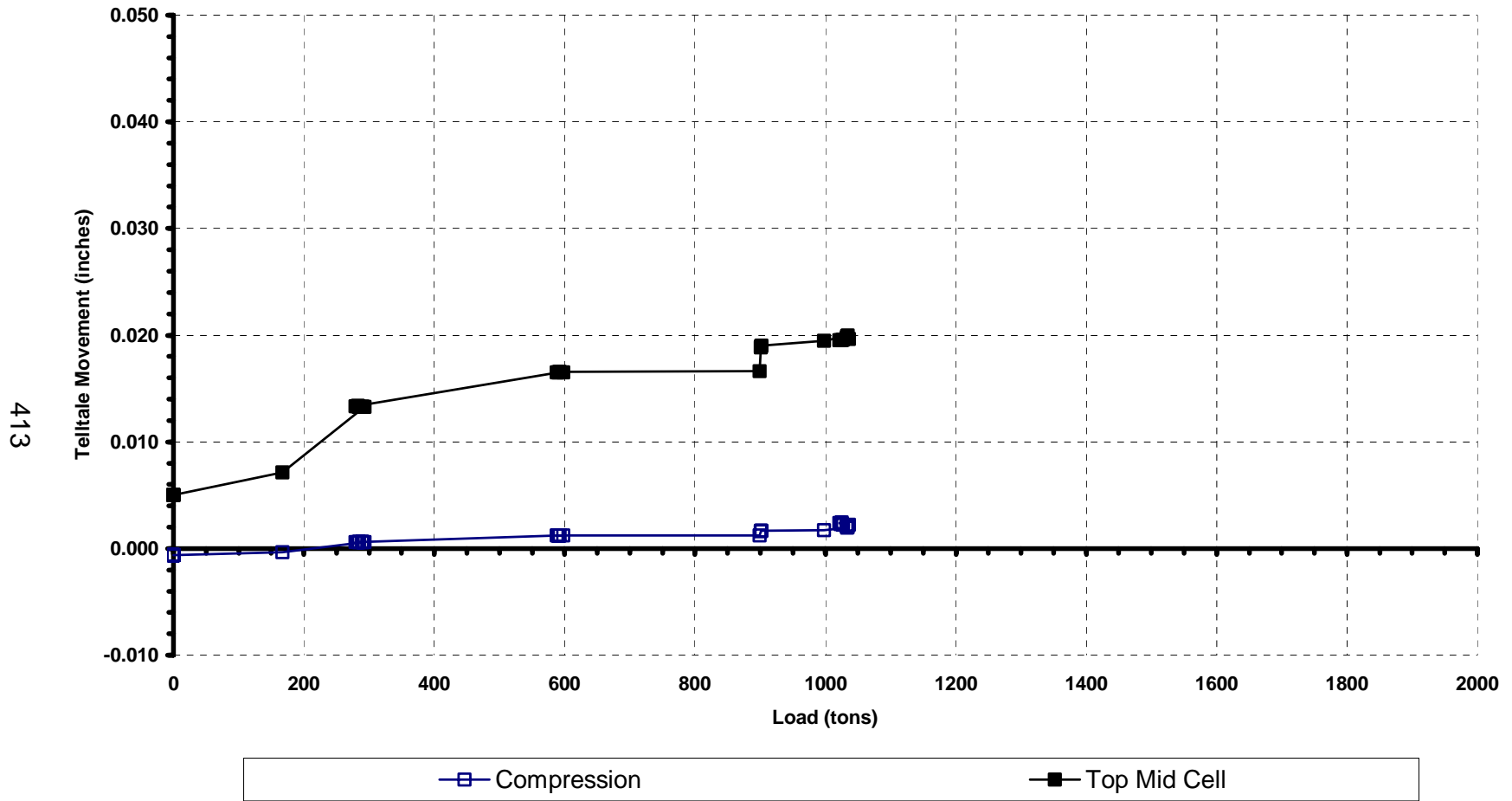


Figure K.10 Bottom Cell Movement, Stage 3 - Shaft 7 - 1996

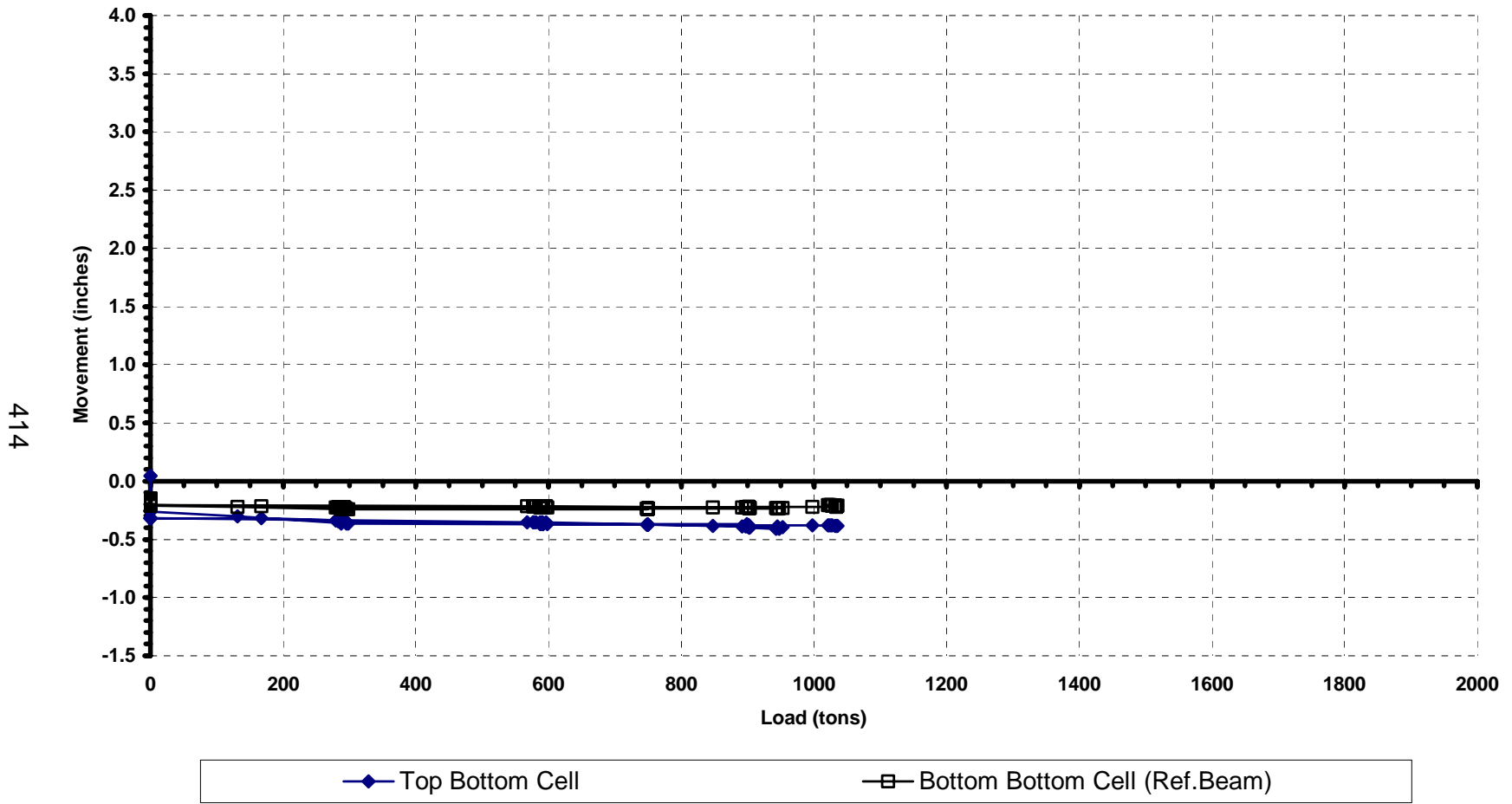
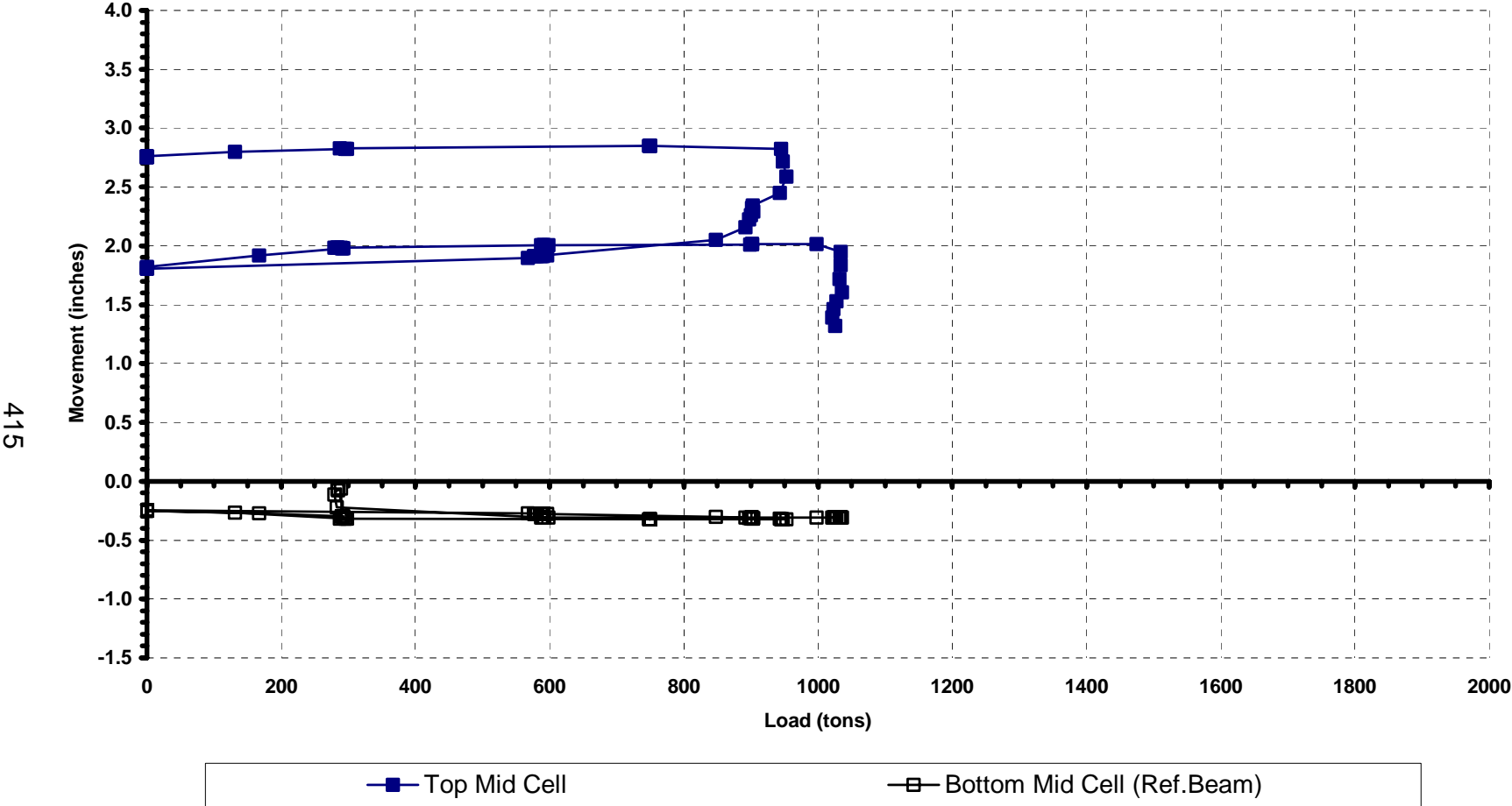


Figure K.11 Mid Cell Movement, Stage 3 - Shaft 7 - 1996



**APPENDIX L
TEST SHAFT 7 – ANALYSIS OF 2002 TEST**

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement										
				Indicators				Survey Level Readings				Compression		
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT #3 (inches)	TT #8 (inches)	Avg. Rdg (inches)
L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:00:30	0.0	104.0	-0.0012	-0.0020	0.0009	-0.0008					0.0000	0.0000	0.0000
L1	0:01:00	0.0	104.2	-0.0012	-0.0024	0.0014	-0.0007	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:02:00	0.0	103.1	-0.0024	-0.0032	0.0011	-0.0015	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L1	0:04:00	0.0	101.6	-0.0024	-0.0028	0.0021	-0.0010	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L2	0:00:30	0.0	218.7	-0.0027	-0.0008	0.0035	0.0000					0.0000	0.0000	0.0000
L2	0:01:00	0.0	220.3	-0.0027	-0.0002	0.0040	0.0004	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L2	0:02:00	0.0	219.2	-0.0019	0.0001	0.0044	0.0009	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L2	0:04:00	0.0	218.8	-0.0022	-0.0025	0.0038	-0.0003	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000
L3	0:00:30	0.0	255.7	0.0001	0.0024	0.0060	0.0028					0.0000	0.0000	0.0000
L3	0:01:00	0.0	238.1	0.0001	0.0034	0.0057	0.0031	0.01	0.01	0.01	0.01	0.0000	0.0000	0.0000
L3	0:02:00	0.0	218.3	0.0016	0.0051	0.0061	0.0043	0.01	0.01	0.00	0.01	0.0001	0.0000	0.0001
L3	0:04:00	0.0	212.1	0.0049	0.0095	0.0088	0.0077	0.01	0.01	0.01	0.01	0.0001	0.0008	0.0005
L3	0:08:00	0.0	205.7	0.0060	0.0117	0.0105	0.0094	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
L4	0:00:30	0.0	206.2	0.0064	0.0134	0.0103	0.0100					0.0001	0.0013	0.0007
L4	0:01:00	0.0	203.0	0.0064	0.0135	0.0110	0.0103	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
L4	0:02:00	0.0	186.8	0.0064	0.0144	0.0110	0.0106	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
L4	0:04:00	0.0	174.9	0.0073	0.0173	0.0110	0.0119	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
L4	0:08:00	0.0	164.5	0.0087	0.0191	0.0128	0.0135	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
U1	0:00:30	0.0	152.2	0.0044	0.0134	0.0122	0.0100	0.01	0.01	0.01	0.01	0.0001	0.0013	0.0007
U1	0:03:00	0.0	68.2	0.0025	0.0124	0.0123	0.0091	0.01	0.00	0.00	0.00	0.0001	0.0012	0.0007
U2	0:00:30	0.0	0.0	0.0054	0.0158	0.0136	0.0116	0.01	0.00	0.00	0.00	0.0001	0.0012	0.0007
U2	0:03:00	0.0	0.0	0.0067	0.0180	0.0121	0.0123	0.01	0.00	0.00	0.00	0.0001	0.0012	0.0007
2L1	0:00:30	0.0	178.9	0.0116	0.0249	0.0136	0.0167					0.0001	0.0011	0.0006
2L1	0:01:00	0.0	182.3	0.0117	0.0237	0.0155	0.0170	0.01	0.00	0.00	0.00	0.0001	0.0011	0.0006
2L1	0:02:00	0.0	192.3	0.0121	0.0247	0.0159	0.0176	0.01	0.00	0.00	0.00	0.0001	0.0011	0.0006
2L1	0:04:00	0.0	202.8	0.0128	0.0263	0.0158	0.0183	0.01	0.00	0.00	0.00	0.0001	0.0011	0.0006
2L1	0:08:00	0.0	240.6	0.0133	0.0278	0.0165	0.0192	0.01	0.01	0.01	0.01	0.0001	0.0011	0.0006
2L1	0:12:00	0.0	304.5	0.0136	0.0283	0.0159	0.0193	0.01	0.01	0.01	0.01	0.0001	0.0011	0.0006
2L1	0:16:00	0.0	381.0	0.0145	0.0291	0.0167	0.0201	0.01	0.01	0.01	0.01	0.0001	0.0011	0.0006
2U1	0:00:30	0.0	231.3	0.0140	0.0289	0.0152	0.0194					0.0001	0.0011	0.0006
2U1	0:03:00	0.0	190.5	0.0139	0.0294	0.0155	0.0196	0.01	0.01	0.01	0.01	0.0001	0.0011	0.0006
2U2	0:00:30	0.0	1.6	0.0140	0.0291	0.0151	0.0194	0.01	0.00	0.00	0.00	0.0001	0.0011	0.0006
2U2	0:03:00	0.0	0.0	0.0134	0.0287	0.0149	0.0190	0.01	0.00	0.00	0.00	0.0001	0.0011	0.0006
3L0	0:00:00	0.0	0.0	0.0000	0.0000	0.0000	0.0000	0.01	0.00	0.00	0.00	0.0000	0.0000	0.0000
3L1	0:00:30	90.3	68.4	0.0255	0.0016	0.0048	0.0106					0.0000	0.0001	0.0001
3L1	0:01:00	92.7	69.1	0.0255	0.0011	0.0050	0.0105	0.01	0.00	0.00	0.00	0.0000	0.0001	0.0001
3L1	0:02:00	93.9	70.1	0.0254	0.0011	0.0045	0.0103	0.01	0.00	0.00	0.00	0.0000	0.0001	0.0001
3L1	0:04:00	91.1	69.5	0.0246	-0.0004	0.0038	0.0093	0.01	0.00	0.00	0.00	0.0000	0.0001	0.0001
3L1	0:08:00	89.4	68.4	0.0225	-0.0025	0.0024	0.0075	0.01	0.00	0.00	0.00	0.0000	0.0001	0.0001
3L1	0:29:54	86.7	65.0	0.0239	-0.0041	0.0032	0.0077	0.01	0.00	0.00	0.00	0.0000	0.0001	0.0001
3L2	0:00:30	217.6	182.7	0.0301	0.0043	0.0124	0.0156					0.0001	0.0004	0.0002

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hh:mm:ss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement										
				Indicators				Survey Level Readings				Compression		
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT #3 (inches)	TT #8 (inches)	Avg. Rdg (inches)
3L2	0:01:00	214.0	181.4	0.0302	0.0044	0.0127	0.0158	0.02	0.01	0.01	0.01	0.0001	0.0004	0.0002
3L2	0:02:00	214.0	181.0	0.0331	0.0040	0.0111	0.0161	0.02	0.01	0.01	0.01	0.0001	0.0004	0.0002
3L2	0:04:00	216.5	181.6	0.0324	0.0050	0.0119	0.0164	0.02	0.01	0.01	0.01	0.0001	0.0004	0.0002
3L3	0:00:30	336.7	294.1	0.0552	0.0299	0.0373	0.0408					0.0009	0.0017	0.0013
3L3	0:01:00	338.2	292.4	0.0553	0.0299	0.0378	0.0410	0.05	0.04	0.04	0.04	0.0009	0.0017	0.0013
3L3	0:02:00	336.5	291.2	0.0553	0.0303	0.0375	0.0410	0.05	0.04	0.04	0.04	0.0009	0.0017	0.0013
3L3	0:04:00	327.5	283.7	0.0577	0.0318	0.0360	0.0418	0.05	0.04	0.04	0.04	0.0009	0.0017	0.0013
3L4	0:00:30	399.7	352.5	0.0849	0.0599	0.0656	0.0701					0.0018	0.0026	0.0022
3L4	0:01:00	404.0	352.5	0.0856	0.0604	0.0652	0.0704	0.09	0.08	0.08	0.08	0.0018	0.0026	0.0022
3L4	0:02:00	403.0	352.7	0.0881	0.0633	0.0689	0.0734	0.09	0.08	0.08	0.08	0.0018	0.0027	0.0023
3L4	0:04:00	402.5	346.8	0.0895	0.0653	0.0706	0.0751	0.09	0.08	0.08	0.08	0.0018	0.0027	0.0023
3L5	0:00:30	465.6	408.1	0.1321	0.1081	0.1097	0.1166					0.0026	0.0034	0.0030
3L5	0:01:00	457.8	404.9	0.1354	0.1101	0.1131	0.1195	0.14	0.12	0.12	0.13	0.0026	0.0035	0.0031
3L5	0:02:00	464.0	407.7	0.1383	0.1138	0.1147	0.1223	0.19	0.19	0.19	0.19	0.0026	0.0035	0.0031
3L5	0:04:00	463.5	405.2	0.1426	0.1163	0.1196	0.1262	0.14	0.13	0.13	0.13	0.0026	0.0035	0.0031
3L6	0:00:30	524.6	465.6	0.1865	0.1617	0.1615	0.1699					0.0032	0.0041	0.0037
3L6	0:01:00	522.1	461.7	0.1895	0.1646	0.1641	0.1727	0.18	0.18	0.19	0.18	0.0032	0.0041	0.0037
3L6	0:02:00	518.6	463.0	0.1979	0.1709	0.1697	0.1795	0.19	0.19	0.19	0.19	0.0032	0.0041	0.0037
3L6	0:04:00	518.9	462.6	0.2030	0.1760	0.1747	0.1846	0.19	0.19	0.19	0.19	0.0032	0.0041	0.0037
3L7	0:00:30	584.6	521.1	0.2499	0.2250	0.2180	0.2310					0.0036	0.0044	0.0040
3L7	0:01:00	578.0	517.8	0.2553	0.2303	0.2235	0.2364	0.16	0.26	0.25	0.22	0.0036	0.0044	0.0040
3L7	0:02:00	584.6	521.9	0.2606	0.2348	0.2297	0.2417	0.16	0.26	0.25	0.22	0.0036	0.0044	0.0040
3L7	0:04:00	588.2	525.3	0.2679	0.2424	0.2358	0.2487	0.16	0.26	0.25	0.22	0.0036	0.0044	0.0040
3L8	0:00:30	634.9	565.0	0.2857	0.2607	0.2803	0.2756					0.0037	0.0045	0.0041
3L8	0:01:00	643.0	576.0	0.3048	0.2802	0.2869	0.2906	0.31	0.31	0.32	0.31	0.0039	0.0046	0.0043
3L8	0:01:45	647.0	578.7	0.3155	0.2917	0.2887	0.2986	0.33	0.32	0.32	0.32	0.0039	0.0046	0.0043
3L8	0:03:45	649.3	579.6	0.3300	0.3059	0.3041	0.3133	0.33	0.33	0.33	0.33	0.0039	0.0046	0.0043
3L9	0:00:30	707.3	632.0	0.3886	0.3651	0.3559	0.3699					0.0042	0.0046	0.0044
3L9	0:01:00	710.1	632.9	0.3952	0.3714	0.3625	0.3764	0.40	0.39	0.38	0.39	0.0042	0.0046	0.0044
3L9	0:02:00	708.2	631.4	0.4049	0.3809	0.3736	0.3865	0.40	0.39	0.39	0.39	0.0042	0.0046	0.0044
3L9	0:04:00	705.6	632.3	0.4180	0.3944	0.3867	0.3997	0.41	0.40	0.39	0.40	0.0042	0.0046	0.0044
3L10	0:00:30	771.7	687.8	0.4695	0.4461	0.4379	0.4512					0.0044	0.0046	0.0045
3L10	0:01:00	772.1	689.0	0.4822	0.4586	0.4495	0.4634	0.50	0.51	0.49	0.50	0.0044	0.0046	0.0045
3L10	0:02:00	771.2	684.9	0.4961	0.4722	0.4652	0.4778	0.50	0.51	0.49	0.50	0.0044	0.0046	0.0045
3L10	0:04:00	772.2	684.9	0.5143	0.4906	0.4821	0.4957	0.52	0.51	0.50	0.51	0.0044	0.0046	0.0045
3L11	0:00:30	824.2	727.3	0.5965	0.5723	0.5640	0.5776					0.0046	0.0046	0.0046
3L11	0:01:00	827.2	730.1	0.6161	0.5920	0.6058	0.6046	0.60	0.61	0.62	0.61	0.0046	0.0046	0.0046
3L11	0:02:00	826.9	729.6	0.6448	0.6207	0.6134	0.6263	0.67	0.66	0.63	0.65	0.0046	0.0046	0.0046
3L11	0:04:00	830.3	731.3	0.6841	0.6599	0.6519	0.6653	0.67	0.68	0.68	0.68	0.0046	0.0046	0.0046
3L12	0:00:30	880.0	767.7	0.8961	0.8720	0.8616	0.8766					0.0049	0.0044	0.0047
3L12	0:01:00	883.1	769.4	0.9215	0.8974	0.8964	0.9051	0.94	0.93	0.90	0.92	0.0049	0.0043	0.0046
3L12	0:02:00	881.9	770.1	0.9631	0.9387	0.9379	0.9466	0.97	1.02	1.22	1.07	0.0049	0.0041	0.0045

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hh:mm:ss	Mid Cell Load (tons)	Bottom Cell Load (tons)	Top of Shaft Movement										
				Indicators				Survey Level Readings				Compression		
				DG #11 (inches)	DG #12 (inches)	DG #13 (inches)	Average (inches)	Ruler 1 (inches)	Ruler 2 (inches)	Ruler 3 (inches)	Average (inches)	TT #3 (inches)	TT #8 (inches)	Avg. Rdg (inches)
3L12	0:04:00	879.1	764.0	1.0474	1.0233	1.0249	1.0319	1.06	1.04	1.23	1.11	0.0050	0.0040	0.0045
3L13	0:00:30	896.7	777.3	1.3020	1.2775	1.2354	1.2716					0.0052	0.0037	0.0045
3L13	0:01:00	905.0	784.7	1.3371	1.3125	1.2704	1.3067	1.35	1.33	1.29	1.32	0.0052	0.0036	0.0044
3L13	0:02:00	906.2	783.9	1.4106	1.3854	1.3549	1.3836	1.38	1.40	1.42	1.40	0.0052	0.0035	0.0044
3L13	0:04:00	903.3	778.6	1.5546	1.5292	1.4981	1.5273	1.54	1.52	1.50	1.52	0.0052	0.0033	0.0043
3L14	0:00:30	913.8	786.1	1.7431	1.7172	1.7081	1.7228					0.0054	0.0030	0.0042
3L14	0:01:00	906.1	784.7	1.7801	1.7541	1.7481	1.7608	1.80	1.76	1.72	1.76	0.0054	0.0030	0.0042
3L14	0:02:00	913.2	783.5	1.8554	1.8292	1.8184	1.8343	1.86	1.88	1.90	1.88	0.0054	0.0030	0.0042
3L14	0:04:00	912.2	780.5	2.0066	1.9805	1.9679	1.9850	2.02	2.00	1.98	2.00	0.0054	0.0028	0.0041
3U1	0:00:30	719.2	661.4	2.0522	2.0257	2.0120	2.0300	2.02	2.02	2.02	2.02	0.0054	0.0019	0.0037
3U1	0:03:00	628.8	530.4	2.0436	2.0183	2.0064	2.0228	2.02	2.02	2.01	2.02	0.0054	0.0014	0.0034
3U2	0:00:30	579.3	489.4	2.0394	2.0148	2.0021	2.0188	2.01	2.01	2.00	2.01	0.0054	0.0013	0.0034
3U2	0:03:00	583.4	468.2	2.0374	2.0131	2.0007	2.0171	2.01	2.01	2.00	2.01	0.0054	0.0012	0.0033
3U3	0:00:30	440.3	418.0	2.0270	2.0029	1.9896	2.0065	2.00	2.00	1.99	2.00	0.0054	0.0005	0.0030
3U3	0:02:43	420.2	364.6	2.0224	1.9984	1.9863	2.0024	1.99	2.00	1.99	1.99	0.0054	0.0005	0.0030
3U4	0:00:30	280.2	296.5	2.0059	1.9820	1.9679	1.9853	1.97	1.98	1.97	1.97	0.0054	-0.0003	0.0026
3U4	0:02:57	277.4	269.8	2.0010	1.9774	1.9651	1.9812	1.94	1.97	1.92	1.94	0.0054	-0.0003	0.0026
3U5	0:00:30	136.4	140.4	1.9663	1.9432	1.9301	1.9465	1.93	1.94	1.92	1.93	0.0046	-0.0013	0.0017
3U5	0:03:00	136.4	140.4	1.9631	1.9403	1.9280	1.9438	1.84	1.84	1.84	1.84	0.0046	-0.0013	0.0017
3U6	0:00:30	0.0	0.0	1.8849	1.8620	1.8538	1.8669	1.86	1.85	1.84	1.85	0.0031	-0.0027	0.0002
3U6	0:03:00	0.0	0.0	1.8746	1.8506	1.8414	1.8555	1.84	1.84	1.84	1.84	0.0031	-0.0028	0.0001
3U6	0:05:59	0.0	0.0	1.8703	1.8473	1.8376	1.8517	1.84	1.84	1.83	1.84	0.0031	-0.0028	0.0001

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Avg Mvmt	TT #1	TT #6	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
L1	0:00:30	0.0003	0.0000	0.0002	-0.0006	0.0029	0.0021	0.0025	0.0017	0.0000	0.0008	0.0004	-0.0004	-0.0252	-0.0277	-0.0265	-0.0272
L1	0:01:00	0.0003	0.0000	0.0002	-0.0006	0.0029	0.0022	0.0026	0.0018	0.0000	0.0009	0.0005	-0.0003	-0.0261	-0.0286	-0.0274	-0.0281
L1	0:02:00	0.0003	0.0000	0.0002	-0.0014	0.0032	0.0026	0.0029	0.0014	0.0000	0.0010	0.0005	-0.0010	-0.0264	-0.0293	-0.0279	-0.0294
L1	0:04:00	0.0004	0.0000	0.0002	-0.0008	0.0032	0.0026	0.0029	0.0019	0.0000	0.0010	0.0005	-0.0005	-0.0265	-0.0293	-0.0279	-0.0289
L2	0:00:30	0.0005	0.0000	0.0003	0.0003	0.0230	0.0235	0.0233	0.0233	0.0007	0.0205	0.0106	0.0106	-0.0764	-0.0906	-0.0835	-0.0835
L2	0:01:00	0.0006	0.0000	0.0003	0.0007	0.0238	0.0244	0.0241	0.0245	0.0007	0.0213	0.0110	0.0114	-0.0773	-0.0917	-0.0845	-0.0841
L2	0:02:00	0.0006	0.0000	0.0003	0.0012	0.0246	0.0250	0.0248	0.0257	0.0008	0.0222	0.0115	0.0124	-0.0775	-0.0920	-0.0848	-0.0839
L2	0:04:00	0.0006	0.0000	0.0003	0.0000	0.0258	0.0261	0.0260	0.0257	0.0010	0.0235	0.0123	0.0120	-0.0787	-0.0933	-0.0860	-0.0863
L3	0:00:30	0.0006	0.0000	0.0003	0.0031	0.3022	0.3099	0.3061	0.3089	0.1070	0.3066	0.2068	0.2096	-0.0965	-0.1181	-0.1073	-0.1045
L3	0:01:00	0.0006	0.0000	0.0003	0.0034	0.3584	0.3663	0.3624	0.3654	0.1407	0.3627	0.2517	0.2548	-0.0965	-0.1181	-0.1073	-0.1042
L3	0:02:00	0.0006	0.0000	0.0003	0.0046	0.3809	0.3874	0.3842	0.3884	0.1711	0.3841	0.2776	0.2819	-0.0965	-0.1167	-0.1066	-0.1023
L3	0:04:00	0.0006	0.0000	0.0003	0.0080	0.3835	0.3874	0.3855	0.3932	0.1782	0.3849	0.2816	0.2893	-0.0965	-0.1165	-0.1065	-0.0988
L3	0:08:00	0.0006	0.0000	0.0003	0.0097	0.3838	0.3876	0.3857	0.3951	0.1819	0.3850	0.2835	0.2929	-0.0965	-0.1165	-0.1065	-0.0971
L4	0:00:30	0.0006	0.0000	0.0003	0.0103	0.5536	0.5611	0.5574	0.5674	0.2859	0.5560	0.4210	0.4310	-0.0969	-0.1169	-0.1069	-0.0969
L4	0:01:00	0.0006	0.0000	0.0003	0.0106	0.6166	0.6229	0.6198	0.6301	0.3315	0.6183	0.4749	0.4852	-0.0965	-0.1160	-0.1063	-0.0960
L4	0:02:00	0.0006	0.0000	0.0003	0.0109	0.7401	0.7434	0.7418	0.7524	0.4560	0.7392	0.5976	0.6082	-0.0958	-0.1144	-0.1051	-0.0945
L4	0:04:00	0.0006	0.0000	0.0003	0.0122	0.9824	0.9857	0.9841	0.9959	0.6882	0.9802	0.8342	0.8461	-0.0945	-0.1123	-0.1034	-0.0915
L4	0:08:00	0.0006	0.0000	0.0003	0.0138	1.5024	1.5061	1.5043	1.5178	1.1034	1.5025	1.3030	1.3165	-0.0934	-0.1112	-0.1023	-0.0888
U1	0:00:30	0.0005	0.0000	0.0003	0.0103	1.5057	1.5079	1.5068	1.5168	1.1106	1.5053	1.3080	1.3180	-0.0930	-0.1100	-0.1015	-0.0915
U1	0:03:00	0.0004	0.0000	0.0002	0.0093	1.5060	1.5086	1.5073	1.5164	1.1128	1.5053	1.3091	1.3181	-0.0843	-0.1015	-0.0929	-0.0838
U2	0:00:30	0.0004	0.0000	0.0002	0.0118	1.5017	1.5034	1.5026	1.5142	1.1140	1.5007	1.3074	1.3190	-0.0341	-0.0444	-0.0393	-0.0277
U2	0:03:00	0.0004	0.0000	0.0002	0.0125	1.5010	1.5026	1.5018	1.5141	1.1149	1.4999	1.3074	1.3197	-0.0305	-0.0401	-0.0353	-0.0230
2L1	0:00:30	0.0004	0.0000	0.0002	0.0169	1.5954	1.5996	1.5975	1.6142	1.1591	1.5960	1.3776	1.3943	-0.0799	-0.0990	-0.0895	-0.0728
2L1	0:01:00	0.0004	0.0000	0.0002	0.0172	1.6549	1.6605	1.6577	1.6747	1.1897	1.6566	1.4232	1.4401	-0.0802	-0.1002	-0.0902	-0.0732
2L1	0:02:00	0.0004	0.0000	0.0002	0.0178	1.7732	1.7813	1.7773	1.7948	1.2424	1.7770	1.5097	1.5273	-0.0825	-0.1015	-0.0920	-0.0744
2L1	0:04:00	0.0004	0.0000	0.0002	0.0185	2.0112	2.0188	2.0150	2.0333	1.7437	2.0153	1.8795	1.8978	-0.0877	-0.1076	-0.0977	-0.0794
2L1	0:08:00	0.0004	0.0000	0.0002	0.0194	2.4887	2.4954	2.4921	2.5113	1.8518	2.4927	2.1723	2.1915	-0.0974	-0.1230	-0.1102	-0.0910
2L1	0:12:00	0.0004	0.0000	0.0002	0.0195	2.9367	2.9457	2.9412	2.9605	2.2347	2.9438	2.5893	2.6085	-0.1129	-0.1439	-0.1284	-0.1091
2L1	0:16:00	0.0004	0.0000	0.0002	0.0203	3.3884	3.3995	3.3940	3.4141	2.4538	3.3991	2.9265	2.9466	-0.1308	-0.1678	-0.1493	-0.1292
2U1	0:00:30	0.0003	0.0000	0.0002	0.0195	3.6117	3.6238	3.6178	3.6371	2.6166	3.6227	3.1197	3.1390	-0.1394	-0.1751	-0.1573	-0.1379
2U1	0:03:00	0.0003	0.0000	0.0002	0.0198	3.6117	3.6238	3.6178	3.6374	2.6199	3.6214	3.1207	3.1403	-0.1290	-0.1622	-0.1456	-0.1260
2U2	0:00:30	0.0001	0.0000	0.0001	0.0195	3.6098	3.6160	3.6129	3.6323	2.6219	3.6127	3.1173	3.1367	-0.0562	-0.0749	-0.0656	-0.0462
2U2	0:03:00	0.0001	0.0000	0.0001	0.0191	3.6041	3.6101	3.6071	3.6261	2.6238	3.6067	3.1153	3.1343	0.0019	-0.0006	0.0007	0.0197
3L0	0:00:00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3L1	0:00:30	0.0000	0.0000	0.0000	0.0106	-0.1811	-0.1800	-0.1806	-0.1699	0.0058	-0.1747	-0.0844	-0.0738	-0.0663	-0.0655	-0.0659	-0.0553
3L1	0:01:00	0.0000	0.0001	0.0001	0.0106	-0.1833	-0.1740	-0.1787	-0.1681	0.0062	-0.1768	-0.0853	-0.0748	-0.0673	-0.0671	-0.0672	-0.0567
3L1	0:02:00	0.0000	0.0001	0.0001	0.0104	-0.1847	-0.1836	-0.1842	-0.1738	0.0063	-0.1782	-0.0860	-0.0756	-0.0681	-0.0679	-0.0680	-0.0577
3L1	0:04:00	0.0000	0.0001	0.0001	0.0094	-0.1854	-0.1843	-0.1849	-0.1755	0.0068	-0.1788	-0.0860	-0.0767	-0.0687	-0.0687	-0.0687	-0.0594
3L1	0:08:00	0.0000	0.0001	0.0001	0.0075	-0.1855	-0.1847	-0.1851	-0.1776	0.0078	-0.1792	-0.0857	-0.0782	-0.0688	-0.0693	-0.0691	-0.0616
3L1	0:29:54	0.0000	0.0001	0.0001	0.0077	-0.1864	-0.1864	-0.1864	-0.1787	0.0111	-0.1800	-0.0845	-0.0768	-0.0690	-0.0698	-0.0694	-0.0617
3L2	0:00:30	0.0011	0.0019	0.0015	0.0171	-0.2902	-0.2918	-0.2910	-0.2754	0.0116	-0.2778	-0.1331	-0.1175	-0.1233	-0.1369	-0.1301	-0.1145

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2	TT #7	Avg. Rdg	Avg Mvmt	TT #1	TT #6	Avg. Rdg	Mvmt.	TT #4	TT #9	Avg. Rdg	Mvmt.	TT #5	TT #10	Avg. Rdg	Mvmt.
		(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)
3L2	0:01:00	0.0011	0.0019	0.0015	0.0173	-0.2923	-0.2946	-0.2935	-0.2777	0.0116	-0.2798	-0.1341	-0.1183	-0.1244	-0.1385	-0.1315	-0.1157
3L2	0:02:00	0.0011	0.0019	0.0015	0.0176	-0.2937	-0.2967	-0.2952	-0.2791	0.0118	-0.2812	-0.1347	-0.1186	-0.1250	-0.1392	-0.1321	-0.1160
3L2	0:04:00	0.0011	0.0021	0.0016	0.0180	-0.2966	-0.2997	-0.2982	-0.2817	0.0120	-0.2841	-0.1361	-0.1196	-0.1261	-0.1407	-0.1334	-0.1170
3L3	0:00:30	0.0040	0.0056	0.0048	0.0456	-0.3814	-0.3835	-0.3825	-0.3417	0.0123	-0.3631	-0.1754	-0.1346	-0.1794	-0.2018	-0.1906	-0.1498
3L3	0:01:00	0.0040	0.0056	0.0048	0.0458	-0.3836	-0.3856	-0.3846	-0.3436	0.0123	-0.3651	-0.1764	-0.1354	-0.1806	-0.2031	-0.1919	-0.1509
3L3	0:02:00	0.0040	0.0056	0.0048	0.0458	-0.3868	-0.3886	-0.3877	-0.3467	0.0125	-0.3683	-0.1779	-0.1369	-0.1823	-0.2051	-0.1937	-0.1527
3L3	0:04:00	0.0040	0.0056	0.0048	0.0466	-0.3881	-0.3896	-0.3889	-0.3470	0.0128	-0.3699	-0.1786	-0.1367	-0.1824	-0.2052	-0.1938	-0.1520
3L4	0:00:30	0.0061	0.0076	0.0069	0.0770	-0.4491	-0.4508	-0.4500	-0.3798	0.0131	-0.4288	-0.2079	-0.1377	-0.2247	-0.2516	-0.2382	-0.1680
3L4	0:01:00	0.0061	0.0076	0.0069	0.0773	-0.4519	-0.4535	-0.4527	-0.3823	0.0131	-0.4315	-0.2092	-0.1388	-0.2264	-0.2534	-0.2399	-0.1695
3L4	0:02:00	0.0061	0.0076	0.0069	0.0803	-0.4605	-0.4619	-0.4612	-0.3878	0.0132	-0.4398	-0.2133	-0.1399	-0.2317	-0.2590	-0.2454	-0.1719
3L4	0:04:00	0.0062	0.0076	0.0069	0.0820	-0.4637	-0.4648	-0.4643	-0.3891	0.0133	-0.4431	-0.2149	-0.1398	-0.2323	-0.2598	-0.2461	-0.1709
3L5	0:00:30	0.0081	0.0095	0.0088	0.1254	-0.5362	-0.5377	-0.5370	-0.4203	0.0134	-0.5139	-0.2503	-0.1336	-0.2874	-0.3177	-0.3026	-0.1859
3L5	0:01:00	0.0081	0.0095	0.0088	0.1283	-0.5412	-0.5425	-0.5419	-0.4223	0.0134	-0.5187	-0.2527	-0.1331	-0.2908	-0.3213	-0.3061	-0.1865
3L5	0:02:00	0.0081	0.0096	0.0089	0.1311	-0.5472	-0.5486	-0.5479	-0.4256	0.0134	-0.5247	-0.2557	-0.1334	-0.2940	-0.3252	-0.3096	-0.1873
3L5	0:04:00	0.0083	0.0097	0.0090	0.1352	-0.5577	-0.5590	-0.5584	-0.4322	0.0137	-0.5351	-0.2607	-0.1345	-0.2993	-0.3311	-0.3152	-0.1890
3L6	0:00:30	0.0099	0.0112	0.0106	0.1805	-0.6308	-0.6323	-0.6316	-0.4617	0.0137	-0.6064	-0.2964	-0.1265	-0.3557	-0.3885	-0.3721	-0.2022
3L6	0:01:00	0.0099	0.0112	0.0106	0.1833	-0.6365	-0.6379	-0.6372	-0.4645	0.0137	-0.6119	-0.2991	-0.1264	-0.3595	-0.3920	-0.3758	-0.2030
3L6	0:02:00	0.0099	0.0112	0.0106	0.1901	-0.6497	-0.6510	-0.6504	-0.4709	0.0137	-0.6248	-0.3056	-0.1261	-0.3678	-0.4017	-0.3848	-0.2053
3L6	0:04:00	0.0099	0.0112	0.0106	0.1951	-0.6643	-0.6656	-0.6650	-0.4804	0.0137	-0.6393	-0.3128	-0.1282	-0.3745	-0.4081	-0.3913	-0.2067
3L7	0:00:30	0.0111	0.0124	0.0118	0.2427	-0.7461	-0.7475	-0.7468	-0.5158	0.0137	-0.7190	-0.3527	-0.1217	-0.4344	-0.4706	-0.4525	-0.2215
3L7	0:01:00	0.0111	0.0124	0.0118	0.2481	-0.7554	-0.7570	-0.7562	-0.5198	0.0137	-0.7282	-0.3573	-0.1209	-0.4409	-0.4771	-0.4590	-0.2226
3L7	0:02:00	0.0111	0.0124	0.0118	0.2535	-0.7665	-0.7679	-0.7672	-0.5255	0.0137	-0.7393	-0.3628	-0.1211	-0.4469	-0.4839	-0.4654	-0.2237
3L7	0:04:00	0.0111	0.0124	0.0118	0.2605	-0.7870	-0.7883	-0.7877	-0.5390	0.0137	-0.7595	-0.3729	-0.1242	-0.4561	-0.4941	-0.4751	-0.2264
3L8	0:00:30	0.0117	0.0130	0.0124	0.2879	-0.8210	-0.8227	-0.8219	-0.5463	0.0137	-0.7925	-0.3894	-0.1138	-0.4795	-0.5193	-0.4994	-0.2238
3L8	0:01:00	0.0121	0.0134	0.0128	0.3034	-0.8499	-0.8515	-0.8507	-0.5601	0.0137	-0.8208	-0.4036	-0.1129	-0.5026	-0.5429	-0.5228	-0.2321
3L8	0:01:45	0.0121	0.0134	0.0128	0.3114	-0.8694	-0.8710	-0.8702	-0.5716	0.0138	-0.8399	-0.4131	-0.1144	-0.5165	-0.5575	-0.5370	-0.2384
3L8	0:03:45	0.0121	0.0134	0.0128	0.3261	-0.8994	-0.9008	-0.9001	-0.5868	0.0138	-0.8696	-0.4279	-0.1146	-0.5335	-0.5757	-0.5546	-0.2413
3L9	0:00:30	0.0128	0.0141	0.0135	0.3833	-1.0055	-1.0069	-1.0062	-0.6363	0.0009	-0.9735	-0.4863	-0.1164	-0.6055	-0.6524	-0.6290	-0.2591
3L9	0:01:00	0.0128	0.0141	0.0135	0.3898	-1.0171	-1.0185	-1.0178	-0.6414	-0.0309	-0.9849	-0.5079	-0.1315	-0.6134	-0.6612	-0.6373	-0.2609
3L9	0:02:00	0.0128	0.0141	0.0135	0.3999	-1.0363	-1.0375	-1.0369	-0.6504	-0.0597	-1.0039	-0.5318	-0.1453	-0.6247	-0.6735	-0.6491	-0.2626
3L9	0:04:00	0.0128	0.0141	0.0135	0.4132	-1.0678	-1.0690	-1.0684	-0.6687	-0.0907	-1.0350	-0.5629	-0.1632	-0.6414	-0.6904	-0.6659	-0.2662
3L10	0:00:30	0.0132	0.0146	0.0139	0.4651	-1.1566	-1.1581	-1.1574	-0.7062	-0.1813	-1.1220	-0.6517	-0.2005	-0.7062	-0.7593	-0.7328	-0.2816
3L10	0:01:00	0.0132	0.0146	0.0139	0.4773	-1.1772	-1.1785	-1.1779	-0.7144	-0.2003	-1.1419	-0.6711	-0.2077	-0.7215	-0.7759	-0.7487	-0.2853
3L10	0:02:00	0.0132	0.0146	0.0139	0.4917	-1.2004	-1.2014	-1.2009	-0.7231	-0.2242	-1.1649	-0.6946	-0.2167	-0.7380	-0.7938	-0.7659	-0.2881
3L10	0:04:00	0.0132	0.0146	0.0139	0.5096	-1.2369	-1.2378	-1.2374	-0.7417	-0.2616	-1.2009	-0.7313	-0.2356	-0.7604	-0.8190	-0.7897	-0.2940
3L11	0:00:30	0.0134	0.0147	0.0141	0.5917	-1.3587	-1.3600	-1.3594	-0.7818	-0.3803	-1.3216	-0.8510	-0.2734	-0.8570	-0.9204	-0.8887	-0.3111
3L11	0:01:00	0.0134	0.0147	0.0141	0.6187	-1.3860	-1.3874	-1.3867	-0.7821	-0.4074	-1.3489	-0.8782	-0.2735	-0.8797	-0.9444	-0.9121	-0.3074
3L11	0:02:00	0.0134	0.0147	0.0141	0.6404	-1.4301	-1.4312	-1.4307	-0.8044	-0.4505	-1.3927	-0.9216	-0.2953	-0.9134	-0.9788	-0.9461	-0.3198
3L11	0:04:00	0.0134	0.0147	0.0141	0.6794	-1.4989	-1.4998	-1.4994	-0.8341	-0.5163	-1.4613	-0.9888	-0.3235	-0.9593	-1.0256	-0.9925	-0.3272
3L12	0:00:30	0.0135	0.0147	0.0141	0.8907	-1.8032	-1.8042	-1.8037	-0.9271	-0.7721	-1.7640	-1.2681	-0.3915	-1.2001	-1.2762	-1.2382	-0.3616
3L12	0:01:00	0.0135	0.0147	0.0141	0.9192	-1.8390	-1.8401	-1.8396	-0.9345	-0.8015	-1.7992	-1.3004	-0.3953	-1.2291	-1.3064	-1.2678	-0.3627
3L12	0:02:00	0.0135	0.0147	0.0141	0.9607	-1.8992	-1.9007	-1.9000	-0.9534	-0.8594	-1.8593	-1.3594	-0.4128	-1.2771	-1.3554	-1.3163	-0.3697

Table L.1 Adjusted Indicator Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Top Mid Cell				Bottom Mid Cell				Top Bottom Cell				Bottom Bottom Cell			
		TT #2 (inches)	TT #7 (inches)	Avg. Rdg (inches)	Avg Mvmt (inches)	TT #1 (inches)	TT #6 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT #4 (inches)	TT #9 (inches)	Avg. Rdg (inches)	Mvmt. (inches)	TT #5 (inches)	TT #10 (inches)	Avg. Rdg (inches)	Mvmt. (inches)
3L12	0:04:00	0.0135	0.0147	0.0141	1.0460	-2.0194	-2.0210	-2.0202	-0.9883	-0.9805	-1.9795	-1.4800	-0.4481	-1.3736	-1.4550	-1.4143	-0.3824
3L13	0:00:30	0.0135	0.0147	0.0141	1.2857	-2.3628	-2.3651	-2.3640	-1.0923	-1.3842	-2.3227	-1.8535	-0.5818	-1.6561	-1.7417	-1.6989	-0.4273
3L13	0:01:00	0.0135	0.0147	0.0141	1.3208	-2.4066	-2.4094	-2.4080	-1.1013	-1.4295	-2.3668	-1.8982	-0.5915	-1.6941	-1.7799	-1.7370	-0.4303
3L13	0:02:00	0.0135	0.0147	0.0141	1.3977	-2.4980	-2.5011	-2.4996	-1.1159	-1.5232	-2.4584	-1.9908	-0.6072	-1.7726	-1.8599	-1.8163	-0.4326
3L13	0:04:00	0.0135	0.0147	0.0141	1.5414	-2.6808	-2.6814	-2.6811	-1.1538	-1.7086	-2.6380	-2.1733	-0.6460	-1.9276	-2.0176	-1.9726	-0.4453
3L14	0:00:30	0.0136	0.0147	0.0142	1.7370	-2.9241	-2.9236	-2.9239	-1.2011	-1.9491	-2.8784	-2.4138	-0.6910	-2.1304	-2.2222	-2.1763	-0.4535
3L14	0:01:00	0.0136	0.0147	0.0142	1.7749	-2.9701	-2.9685	-2.9693	-1.2085	-1.9952	-2.9243	-2.4598	-0.6990	-2.1698	-2.2618	-2.2158	-0.4550
3L14	0:02:00	0.0136	0.0147	0.0142	1.8485	-3.0628	-3.0603	-3.0616	-1.2272	-2.0801	-3.0163	-2.5482	-0.7139	-2.2489	-2.3422	-2.2956	-0.4612
3L14	0:04:00	0.0136	0.0147	0.0142	1.9992	-3.2550	-3.2527	-3.2539	-1.2689	-2.2718	-3.2085	-2.7402	-0.7552	-2.4066	-2.5013	-2.4540	-0.4690
3U1	0:00:30	0.0132	0.0135	0.0134	2.0433	-3.3085	-3.3058	-3.3072	-1.2772	-2.3359	-3.2679	-2.8019	-0.7719	-2.4513	-2.5480	-2.4997	-0.4697
3U1	0:03:00	0.0123	0.0121	0.0122	2.0350	-3.3033	-3.3005	-3.3019	-1.2791	-2.3368	-3.2661	-2.8015	-0.7787	-2.4298	-2.5255	-2.4777	-0.4549
3U2	0:00:30	0.0119	0.0116	0.0118	2.0305	-3.3001	-3.2972	-3.2987	-1.2799	-2.3368	-3.2641	-2.8005	-0.7817	-2.4220	-2.5172	-2.4696	-0.4508
3U2	0:03:00	0.0117	0.0114	0.0116	2.0286	-3.3110	-3.3086	-3.3098	-1.2927	-2.3368	-3.2735	-2.8052	-0.7881	-2.4174	-2.5119	-2.4647	-0.4476
3U3	0:00:30	0.0104	0.0097	0.0101	2.0166	-3.3048	-3.3020	-3.3034	-1.2969	-2.3417	-3.2726	-2.8072	-0.8007	-2.3998	-2.4932	-2.4465	-0.4400
3U3	0:02:43	0.0102	0.0095	0.0099	2.0122	-3.3006	-3.2977	-3.2992	-1.2968	-2.3417	-3.2695	-2.8056	-0.8032	-2.3873	-2.4790	-2.4332	-0.4308
3U4	0:00:30	0.0084	0.0073	0.0079	1.9931	-3.2705	-3.2669	-3.2687	-1.2834	-2.3417	-3.2438	-2.7928	-0.8075	-2.3595	-2.4497	-2.4046	-0.4193
3U4	0:02:57	0.0084	0.0073	0.0079	1.9890	-3.2666	-3.2631	-3.2649	-1.2837	-2.3400	-3.2401	-2.7901	-0.8089	-2.3493	-2.4384	-2.3939	-0.4127
3U5	0:00:30	0.0062	0.0043	0.0053	1.9518	-3.2003	-3.1977	-3.1990	-1.2525	-2.2655	-3.1824	-2.7240	-0.7774	-2.2808	-2.3616	-2.3212	-0.3747
3U5	0:03:00	0.0062	0.0042	0.0052	1.9490	-3.1991	-3.1963	-3.1977	-1.2539	-2.2652	-3.1812	-2.7232	-0.7794	-2.2765	-2.3570	-2.3168	-0.3730
3U6	0:00:30	0.0028	0.0004	0.0016	1.8685	-3.1184	-3.1207	-3.1196	-1.2527	-2.2091	-3.1162	-2.6627	-0.7958	-2.0577	-2.1047	-2.0812	-0.2143
3U6	0:03:00	0.0027	0.0004	0.0016	1.8571	-3.1183	-3.1207	-3.1195	-1.2640	-2.2063	-3.1162	-2.6613	-0.8057	-2.0356	-2.0764	-2.0560	-0.2005
3U6	0:05:59	0.0026	0.0004	0.0015	1.8532	-3.1165	-3.1196	-3.1181	-1.2663	-2.2047	-3.1155	-2.6601	-0.8084	-2.0303	-2.0707	-2.0505	-0.1988

Table L.2 Calculated Strain, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L0	0:00:00	1.31	3.62	2.84	3.03	4.36	0.46	6.77	-5.27	11.17	-11.49	6.14	-9.69	-2.59	0.23	-2.85	-2.05	
L1	0:00:30	1.12	3.25	2.77	3.03	4.29	0.68	6.99	-5.20	11.25	-11.22	6.07	-9.39	-2.01	2.54	0.21	1.17	
L1	0:01:00	1.35	3.21	2.91	3.03	4.70	0.46	6.80	-5.20	11.25	-11.22	6.10	-9.39	-1.82	2.58	0.18	1.25	
L1	0:01:30	1.31	3.29	2.88	3.25	4.70	0.46	6.88	-5.20	11.32	-11.38	6.10	-9.39	-2.12	2.58	0.18	1.54	
L1	0:02:00	1.16	3.69	2.88	3.03	4.44	0.46	6.99	-5.20	11.32	-11.38	6.10	-9.39	-2.01	2.58	0.14	1.25	
L1	0:02:30	1.31	3.62	2.91	3.29	4.29	0.64	6.99	-5.20	11.29	-11.38	6.10	-9.43	-1.82	2.58	0.18	1.50	
L1	0:03:00	1.31	3.62	2.91	3.29	4.29	0.46	6.62	-5.31	11.25	-11.22	6.10	-9.39	-2.12	2.73	0.18	1.28	
L1	0:03:30	1.31	3.25	2.88	3.21	4.70	0.43	6.88	-5.20	11.32	-11.38	6.10	-9.39	-2.33	2.61	-0.07	1.25	
L1	0:04:00	1.12	3.18	2.91	3.25	4.70	0.43	6.88	-5.20	11.25	-11.22	6.10	-9.43	-2.01	2.58	0.14	1.54	
L1	0:04:30	1.31	3.14	2.95	3.25	4.74	0.39	6.88	-5.20	11.25	-11.38	6.10	-9.43	-2.33	2.58	0.07	1.25	
L2	0:00:30	1.12	3.36	2.98	3.03	4.40	0.64	7.10	-5.13	11.44	-11.42	6.50	-9.02	2.12	6.75	8.56	7.92	
L2	0:01:00	1.31	3.47	3.02	3.25	4.40	0.43	7.02	-5.09	11.48	-11.15	6.50	-9.13	2.08	6.75	8.81	8.36	
L2	0:01:30	1.31	3.14	2.98	3.25	4.81	0.43	6.95	-5.17	11.48	-11.03	6.65	-9.17	2.23	6.63	8.53	7.78	
L2	0:02:00	1.31	3.36	3.02	3.21	4.81	0.43	6.99	-5.09	11.48	-11.19	6.50	-9.13	2.08	6.60	8.70	8.25	
L2	0:02:30	1.31	3.47	3.02	3.03	4.55	0.43	6.95	-5.09	11.44	-11.19	6.50	-9.17	2.26	6.56	8.67	7.81	
L2	0:03:00	1.31	3.14	3.02	3.25	4.81	0.54	6.91	-5.09	11.48	-11.15	6.47	-9.31	2.12	6.48	8.56	7.74	
L2	0:03:30	1.31	3.44	3.02	3.25	4.07	0.39	6.99	-5.09	11.48	-11.03	6.50	-9.17	2.19	6.56	8.56	8.22	
L2	0:04:00	1.16	3.10	2.98	3.21	4.40	0.39	6.99	-5.13	11.48	-11.19	6.50	-9.06	2.37	6.87	8.88	8.33	
L2	0:04:30	1.31	3.21	2.98	2.99	4.81	0.57	6.95	-5.09	11.48	-11.22	6.65	-9.31	2.23	6.52	8.70	7.85	
L3	0:00:30	1.16	3.36	2.98	2.99	4.55	0.39	7.24	-4.98	11.60	-10.77	6.28	-7.68	6.89	5.82	13.35	7.78	
L3	0:01:00	1.39	3.03	3.12	3.21	4.44	0.39	7.10	-4.98	11.56	-10.80	6.17	-7.46	7.04	5.46	12.72	6.90	
L3	0:01:30	1.16	3.03	3.09	2.95	4.51	0.36	7.13	-4.98	11.48	-10.73	6.07	-7.61	6.09	4.76	11.59	6.05	
L3	0:02:00	1.35	3.03	3.09	2.95	4.62	0.32	7.21	-5.02	11.44	-10.73	5.99	-7.72	5.91	4.57	11.31	5.69	
L3	0:02:30	1.39	3.29	3.09	3.10	4.92	0.29	7.10	-5.06	11.40	-10.77	5.96	-7.76	5.84	4.45	11.13	5.69	
L3	0:03:00	1.39	3.25	3.09	3.18	4.92	0.29	7.13	-5.02	11.40	-10.61	5.96	-7.76	5.69	4.33	11.03	5.58	
L3	0:03:30	1.16	3.21	3.09	3.18	4.51	0.21	7.10	-5.02	11.44	-10.77	5.92	-7.79	5.73	4.25	10.92	5.54	
L3	0:04:00	1.35	2.96	3.09	2.88	4.51	0.18	7.17	-5.02	11.40	-10.80	5.92	-7.83	5.69	4.21	10.82	5.50	
L3	0:04:30	1.35	2.88	3.09	3.14	4.92	0.36	7.02	-5.02	11.44	-10.80	5.92	-7.83	5.65	4.18	10.82	5.43	
L3	0:05:00	1.35	3.14	3.09	3.03	4.48	0.11	7.06	-5.06	11.40	-10.69	5.88	-7.83	5.62	4.14	10.78	5.39	
L3	0:05:30	1.35	3.10	3.09	3.06	4.48	0.07	7.06	-5.09	11.40	-10.80	5.88	-7.87	5.62	4.10	10.75	5.32	
L3	0:06:00	1.16	2.77	3.05	2.80	4.48	0.25	6.99	-5.06	11.36	-10.80	5.88	-8.05	5.58	4.06	10.71	5.32	
L3	0:06:30	1.35	3.03	3.05	3.03	4.48	0.04	7.06	-5.06	11.36	-10.69	5.85	-7.87	5.54	4.02	10.64	5.25	
L3	0:07:00	1.35	2.99	3.02	3.03	4.36	0.04	7.06	-5.09	11.40	-10.88	5.85	-7.90	5.54	3.98	10.68	5.25	
L3	0:07:30	1.35	2.66	3.05	2.84	4.89	0.00	6.99	-5.09	11.40	-10.80	5.85	-7.90	4.89	3.94	10.57	5.21	
L3	0:08:00	1.35	2.70	3.05	2.73	4.44	0.00	6.99	-5.09	11.32	-10.92	5.85	-7.90	5.51	3.90	10.54	5.14	
L3	0:08:30	1.35	2.96	3.05	2.80	4.89	0.00	7.13	-5.09	11.32	-10.92	5.85	-7.90	4.85	3.90	10.54	5.10	
L4	0:00:30	1.35	2.92	2.95	2.65	4.92	0.04	7.10	-5.09	11.36	-10.73	5.70	-7.39	4.96	4.49	11.35	5.03	
L4	0:01:00	1.20	2.70	2.95	2.62	4.48	0.04	7.17	-5.13	11.29	-10.80	5.48	-7.39	4.49	4.33	10.71	4.66	
L4	0:01:30	1.35	2.92	3.05	2.95	4.89	0.21	6.99	-5.13	11.29	-10.80	5.30	-7.35	4.92	4.10	10.36	4.26	
L4	0:02:00	1.35	2.92	3.05	2.95	4.92	0.00	7.13	-5.13	11.29	-10.84	5.23	-7.50	4.09	3.79	10.11	3.89	
L4	0:02:30	1.35	2.92	3.05	2.95	4.89	0.00	7.02	-5.13	11.29	-10.69	5.23	-7.57	4.78	3.36	9.83	3.48	
L4	0:03:00	1.20	2.66	2.91	2.91	4.44	-0.04	7.13	-5.17	11.21	-10.69	5.23	-7.68	3.94	3.20	9.62	3.23	

Table L.2 Calculated Strain, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
L4	0:03:30		1.16	2.85	3.05	2.91	4.44	0.14	7.02	-5.17	11.21	-10.69	5.19	-7.76	4.71	2.93	9.41	3.04
L4	0:04:00		1.35	2.85	3.02	2.91	4.85	-0.11	7.02	-5.20	11.25	-10.88	5.16	-7.87	4.60	3.01	9.37	3.30
L4	0:04:30		1.35	2.81	3.02	2.88	4.44	-0.14	6.99	-5.20	11.25	-10.96	5.12	-7.79	4.71	2.54	9.34	2.82
L4	0:05:00		1.20	2.55	2.91	2.58	4.44	-0.18	7.10	-5.24	11.17	-10.88	5.12	-7.94	4.74	2.61	9.51	3.01
L4	0:05:30		1.35	2.55	3.05	2.58	4.89	-0.04	6.88	-5.24	11.17	-10.96	5.34	-7.87	4.09	2.58	9.62	2.68
L4	0:06:00		1.35	2.66	3.05	2.84	4.89	-0.29	7.02	-5.20	11.25	-10.92	5.09	-7.76	4.92	2.42	9.69	2.49
L4	0:06:30		1.35	2.62	3.05	2.80	4.85	-0.32	7.10	-5.20	11.17	-10.77	5.05	-7.94	4.30	2.26	9.69	2.71
L4	0:07:00		1.20	2.55	2.91	2.62	4.44	-0.14	7.10	-5.20	11.17	-10.73	5.05	-7.90	4.52	1.83	9.97	2.24
L4	0:07:30		1.35	2.36	3.02	2.54	4.89	-0.29	7.10	-5.24	11.29	-10.96	5.01	-7.72	5.36	1.87	10.01	2.13
L4	0:08:00		1.35	2.44	3.05	2.65	4.85	-0.46	6.95	-5.24	11.21	-10.96	5.19	-7.79	4.71	1.56	9.76	1.83
L4	0:08:30		1.39	2.40	3.02	2.69	4.85	-0.54	6.91	-5.27	11.17	-10.80	4.90	-8.09	5.00	1.29	9.23	1.50
L4	0:09:00		1.16	2.33	2.88	2.32	4.85	-0.61	6.91	-5.35	11.09	-10.84	4.87	-7.98	4.12	1.37	9.02	1.32
U1	0:00:30		1.16	1.85	2.88	2.09	4.40	-0.79	7.02	-5.38	11.17	-11.11	4.72	-8.09	3.90	0.90	8.60	0.99
U1	0:01:00		1.31	1.96	2.98	2.06	4.36	-0.86	7.02	-5.45	11.01	-11.19	4.54	-8.13	4.52	0.08	7.58	-0.88
U1	0:01:30		1.39	1.85	2.98	2.09	4.40	-0.86	6.91	-5.42	11.05	-11.03	4.54	-8.28	3.43	0.08	7.51	-0.84
U1	0:02:00		1.16	1.81	2.98	2.28	4.81	-0.86	6.99	-5.45	10.97	-11.03	4.50	-8.16	4.05	0.04	7.51	-0.88
U1	0:02:30		1.42	1.88	2.98	2.09	4.81	-0.89	6.91	-5.45	10.97	-11.07	4.50	-8.16	4.05	0.04	7.54	-0.88
U1	0:03:00		1.35	1.74	2.95	1.98	4.85	-0.89	6.88	-5.49	11.01	-11.19	4.54	-8.31	3.43	0.00	7.61	-0.88
U1	0:03:30		1.35	1.88	2.95	1.94	4.36	-0.89	6.99	-5.49	11.01	-11.07	4.50	-8.28	3.43	0.00	7.51	-0.92
U1	0:04:00		1.16	1.74	2.84	1.94	4.36	-0.89	6.88	-5.53	11.01	-11.07	4.50	-8.16	3.43	0.00	7.19	-0.92
U1	0:04:30		1.35	1.88	2.95	2.28	4.40	-0.86	6.95	-5.53	11.01	-11.30	4.50	-8.16	3.43	-0.04	7.61	-0.92
U1	0:05:00		1.39	1.88	2.98	1.91	4.81	-0.89	6.84	-5.53	11.01	-11.30	4.50	-8.35	3.43	-0.04	7.51	-0.95
U2	0:00:30		1.35	1.81	2.91	1.87	4.70	-0.89	6.91	-5.64	10.86	-11.30	4.18	-8.57	1.13	-2.73	1.44	-3.78
U2	0:01:00		1.12	1.74	2.77	1.87	4.70	-0.86	6.88	-5.67	10.74	-11.30	4.03	-8.57	1.09	-2.69	1.80	-3.74
U2	0:01:30		1.42	1.88	2.91	1.83	4.29	-0.86	6.88	-5.67	10.82	-11.30	4.03	-8.61	1.09	-2.69	1.76	-3.78
U2	0:02:00		1.12	1.85	2.91	1.87	4.29	-0.86	6.77	-5.67	10.86	-11.30	4.03	-8.57	1.09	-2.81	1.80	-3.74
U2	0:02:30		1.31	1.92	2.91	1.87	4.29	-0.82	6.73	-5.67	10.82	-11.49	4.03	-8.57	1.35	-2.69	1.41	-3.74
U2	0:03:00		1.12	1.92	2.88	2.17	4.29	-0.82	6.88	-5.67	10.74	-11.30	4.03	-8.46	1.13	-1.72	1.80	-3.74
U2	0:03:30		1.35	1.96	2.77	1.87	4.70	-0.75	6.88	-5.67	10.74	-11.49	4.03	-8.54	1.09	-2.77	1.59	-3.78
U2	0:04:00		1.39	1.96	2.91	1.87	4.29	-0.79	6.88	-5.71	10.78	-11.30	4.03	-8.50	1.09	-2.54	1.80	-3.67
U2	0:04:30		1.35	1.96	2.91	2.17	4.70	-0.75	6.88	-5.71	10.82	-11.34	4.07	-8.50	1.09	-2.77	1.76	-3.74
2L0	0:05:00		1.39	1.88	2.77	2.20	4.29	-0.72	6.84	-5.71	10.74	-11.49	4.07	-8.46	1.09	-2.73	1.76	-3.78
2L1	0:00:30		1.12	2.07	2.88	2.35	4.40	-0.32	6.95	-5.53	11.17	-11.03	5.12	-7.83	5.00	1.25	9.87	1.91
2L1	0:01:00		1.39	2.07	3.02	2.06	4.44	-0.43	7.10	-5.49	11.29	-10.96	5.19	-7.90	5.11	1.68	10.29	2.20
2L1	0:01:30		1.35	2.22	3.05	2.43	4.44	-0.18	7.10	-5.49	11.25	-11.15	5.19	-7.90	5.25	1.52	10.46	2.27
2L1	0:02:00		1.31	2.07	2.91	2.09	4.44	-0.43	6.95	-5.45	11.25	-10.96	5.16	-7.90	5.73	1.52	10.61	2.42
2L1	0:02:30		1.39	2.22	3.05	2.32	4.44	-0.29	7.06	-5.49	11.29	-10.92	5.19	-7.90	5.65	1.48	10.92	2.82
2L1	0:03:00		1.31	2.07	3.05	2.09	4.48	-0.43	6.95	-5.45	11.25	-10.92	5.23	-7.90	5.73	1.80	11.10	2.75
2L1	0:03:30		1.12	2.22	3.05	2.43	4.48	-0.43	7.13	-5.45	11.29	-11.11	5.27	-7.83	5.76	1.72	11.17	3.01
2L1	0:04:00		1.65	2.11	2.91	2.43	4.89	-0.46	6.99	-5.45	11.29	-11.30	5.27	-7.76	5.76	1.76	11.42	3.23
2L1	0:04:30		1.42	2.18	3.05	2.09	4.48	-0.46	7.17	-5.45	11.32	-10.92	5.30	-7.98	5.95	2.11	11.49	3.48
2L1	0:05:00		1.35	2.03	3.05	2.43	4.92	0.11	6.99	-5.45	11.32	-10.92	5.30	-7.76	6.09	1.95	11.94	3.78

Table L.2 Calculated Strain, Shaft 7 - 2002

425

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
2L1	0:05:30	1.39	2.14	2.95	2.09	4.92	-0.25	7.17	-5.42	11.36	-10.92	5.38	-7.72	6.38	2.15	12.09	4.11	
2L1	0:06:00	1.39	2.00	2.95	2.39	4.48	-0.54	7.02	-5.45	11.36	-10.92	5.41	-7.72	6.60	2.11	12.65	4.51	
2L1	0:06:30	1.35	2.03	3.09	2.13	4.92	-0.43	7.02	-5.45	11.36	-10.84	5.34	-7.79	7.77	2.38	12.90	4.81	
2L1	0:07:00	1.35	2.00	3.09	2.39	4.92	-0.32	7.17	-5.38	11.25	-10.84	5.19	-7.57	7.55	2.11	13.57	5.17	
2L1	0:07:30	1.20	1.96	3.09	2.24	4.51	-0.36	7.02	-5.38	11.29	-10.96	5.05	-7.24	8.10	2.11	14.31	5.50	
2L1	0:08:00	1.39	2.00	3.09	2.06	4.51	-0.64	7.02	-5.38	11.21	-10.69	4.83	-7.20	8.57	2.50	14.87	5.83	
2L1	0:08:30	1.20	1.96	3.12	2.35	4.55	-0.68	7.21	-5.38	11.25	-10.65	4.61	-6.83	9.16	2.15	15.50	6.24	
2L1	0:09:00	1.39	1.92	3.09	2.02	4.55	-0.07	7.21	-5.38	11.21	-10.58	4.36	-6.75	9.67	2.61	16.07	6.60	
2L1	0:09:30	1.16	1.92	3.12	1.98	4.59	-0.21	7.06	-5.35	11.17	-10.69	4.10	-6.31	10.18	2.65	16.77	7.04	
2L1	0:10:00	1.20	1.85	3.12	2.28	4.55	-0.43	7.02	-5.35	11.09	-10.42	3.74	-6.12	10.94	2.69	17.44	7.92	
2L1	0:10:30	1.35	2.00	3.16	1.98	5.00	-0.61	7.06	-5.31	11.05	-10.35	3.41	-5.83	11.13	3.08	18.22	8.07	
2L1	0:11:00	1.16	1.88	3.16	2.28	5.00	-0.43	7.21	-5.31	10.94	-10.23	3.05	-5.38	11.56	3.86	18.99	9.02	
2L1	0:11:30	1.27	1.92	3.12	2.24	5.04	-0.64	7.21	-5.31	10.94	-10.19	2.62	-5.08	11.89	4.10	19.52	9.39	
2L1	0:12:00	1.42	1.96	3.05	2.20	4.59	-0.46	7.21	-5.31	10.78	-10.31	2.18	-4.90	12.04	4.57	20.22	10.12	
2L1	0:12:30	1.68	1.88	3.16	2.20	4.59	-0.72	7.02	-5.31	10.74	-10.04	1.67	-4.60	12.33	4.72	20.89	10.82	
2L1	0:13:00	1.24	1.88	3.19	1.91	4.59	-0.75	6.99	-5.31	10.58	-10.19	1.31	-4.45	12.66	4.49	21.63	11.48	
2L1	0:13:30	1.16	1.92	3.19	1.87	5.04	-0.32	6.99	-5.31	10.51	-9.93	0.98	-4.23	12.91	4.92	22.44	12.55	
2L1	0:14:00	1.42	1.85	3.19	2.13	4.62	-0.50	6.99	-5.31	10.55	-9.89	0.69	-4.01	13.31	5.31	23.33	13.43	
2L1	0:14:30	1.20	1.88	3.19	1.83	5.04	-0.75	7.17	-5.31	10.51	-9.81	0.51	-3.82	14.15	5.58	24.14	14.34	
2L1	0:15:00	1.16	1.88	3.23	2.09	5.07	-0.50	7.13	-5.27	10.35	-9.77	0.33	-3.45	13.90	6.05	24.95	14.93	
2L1	0:15:30	1.16	1.81	3.23	1.83	5.07	-0.54	7.17	-5.27	10.43	-9.81	0.18	-3.30	14.08	6.63	25.72	15.37	
2L1	0:16:00	1.42	1.88	3.09	2.09	4.62	-0.54	6.99	-5.31	10.27	-9.70	0.00	-3.23	14.26	6.71	26.29	15.70	
2L1	0:16:30	1.24	1.81	3.26	1.79	4.66	-0.79	7.10	-5.27	10.35	-9.66	-0.07	-3.27	14.52	7.22	26.78	16.29	
2L1	0:17:00	1.24	1.85	3.23	2.09	4.66	-0.54	7.17	-5.24	10.27	-9.62	-0.18	-2.97	14.74	7.38	27.48	16.91	
2L1	0:17:30	1.20	1.85	3.26	1.79	4.66	-0.21	7.17	-5.24	10.35	-9.74	-0.29	-2.97	15.06	7.81	27.98	17.53	
2L1	0:18:00	1.42	1.85	3.12	1.76	4.66	-0.25	7.13	-5.31	10.23	-9.62	-0.47	-3.04	14.30	6.79	26.64	16.36	
2L1	0:18:30	1.42	1.81	3.23	2.02	5.07	-0.97	7.10	-5.35	10.08	-9.74	-0.73	-3.23	13.90	6.48	25.90	15.70	
2U1	0:00:30	1.42	1.85	3.16	1.72	5.00	-0.61	6.99	-5.49	9.88	-9.96	-0.94	-3.93	11.42	4.06	20.96	10.16	
2U1	0:01:00	1.16	1.77	3.05	1.72	4.48	-0.64	6.88	-5.64	9.77	-10.19	-1.09	-4.42	9.37	2.93	17.86	7.70	
2U1	0:01:30	1.39	1.77	2.95	1.64	4.44	-0.68	6.88	-5.64	9.77	-10.38	-1.09	-4.49	9.30	2.85	17.83	8.03	
2U1	0:02:00	1.20	1.77	3.05	1.61	4.48	-1.14	6.84	-5.64	9.85	-10.27	-1.09	-4.60	9.26	2.73	17.72	7.92	
2U1	0:02:30	1.12	1.77	3.05	1.87	4.44	-0.68	6.65	-5.64	9.73	-10.27	-0.98	-4.56	9.19	2.73	17.62	7.45	
2U1	0:03:00	1.16	1.74	3.02	1.61	4.44	-0.50	6.65	-5.78	9.69	-10.27	-0.98	-4.64	9.12	2.54	17.51	7.37	
2U1	0:03:30	1.39	1.77	3.05	1.87	4.44	-1.00	6.65	-5.67	9.69	-10.31	-1.05	-4.60	9.08	2.65	17.44	7.30	
2U1	0:04:00	1.39	1.70	3.05	1.61	4.40	-0.46	6.65	-5.67	9.69	-10.31	-1.05	-4.68	9.12	2.58	17.34	7.63	
2U1	0:04:30	1.16	1.77	3.05	1.61	4.44	-0.64	6.65	-5.67	9.81	-10.35	-0.98	-4.71	8.97	2.58	17.27	7.19	
2U2	0:00:30	1.12	1.66	2.91	1.76	4.25	-1.22	6.40	-6.00	9.46	-10.96	-1.71	-5.86	1.53	-3.28	3.21	-4.04	
2U2	0:01:00	1.31	1.70	2.70	1.72	4.21	-1.14	6.36	-6.00	9.34	-11.03	-1.67	-6.09	0.07	-3.24	1.13	-5.28	
2U2	0:01:30	1.12	1.70	2.84	1.72	4.18	-1.22	6.54	-6.00	9.34	-11.03	-1.49	-6.09	-0.04	-3.24	0.56	-4.84	
2U2	0:02:00	1.09	1.70	2.88	1.72	4.59	-1.00	6.36	-6.03	9.46	-11.03	-1.53	-6.09	-0.07	-3.71	0.92	-5.03	
2U2	0:02:30	1.31	1.74	2.91	1.49	4.18	-1.22	6.54	-6.07	9.42	-11.03	-1.56	-6.09	-0.07	-3.98	0.85	-4.84	
2U2	0:03:00	1.09	1.70	2.81	1.49	4.18	-0.43	6.54	-6.00	9.34	-11.03	-1.56	-5.94	0.33	-3.71	0.81	-4.84	

Table L.2 Calculated Strain, Shaft 7 - 2002

Load Interval	Elapsed Time hh:mm:ss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
2U2	0:03:47		1.31	1.70	2.81	1.76	4.18	-1.14	6.54	-6.03	9.46	-11.03	-1.60	-5.94	-0.11	-3.71	0.78	-4.84
2U2	0:04:17		1.09	1.74	2.84	1.72	4.59	-1.14	6.54	-6.07	9.30	-11.03	-1.53	-6.05	-0.11	-3.75	0.35	-5.50
2U2	0:04:47		1.09	1.74	2.81	1.76	3.92	-1.11	6.36	-6.07	9.34	-11.07	-1.42	-5.94	-0.11	-3.71	0.74	-4.88
2U2	0:05:17		1.31	1.74	2.88	1.76	4.18	-0.93	6.54	-6.00	9.34	-11.07	-1.34	-5.94	-0.11	-3.32	0.74	-4.88
2U2	0:16:49		1.05	2.00	2.81	1.72	4.18	-0.75	6.36	-6.00	9.26	-11.00	-1.27	-6.05	-0.22	-3.71	0.14	-4.88
3L0	0:00:00		1.24	2.11	2.84	1.76	4.18	-0.68	6.54	-6.00	9.34	-11.00	-1.27	-6.05	0.22	-2.93	0.18	-4.92
3L1	0:00:30		1.46	2.18	3.37	2.32	4.92	0.14	7.54	-4.91	11.44	-9.12	6.32	-1.08	9.01	6.75	10.43	2.75
3L1	0:01:00		1.31	2.18	3.40	2.58	4.96	0.14	7.57	-4.88	11.48	-8.97	6.47	-0.93	9.26	7.06	10.64	2.97
3L1	0:01:30		1.31	2.11	3.33	2.65	4.96	0.14	7.61	-4.80	11.52	-9.12	6.57	-0.82	9.67	7.22	10.89	3.34
3L1	0:02:00		1.50	2.11	3.40	2.35	5.37	0.14	7.57	-4.84	11.48	-8.93	6.47	-0.96	9.30	7.10	10.78	3.04
3L1	0:02:30		1.31	2.07	3.33	2.35	4.96	0.00	7.57	-4.84	11.56	-8.97	6.36	-0.93	9.34	6.91	10.75	3.01
3L1	0:03:00		1.80	2.03	3.40	2.32	4.96	-0.18	7.72	-4.98	11.52	-8.97	6.32	-0.96	9.30	7.02	10.75	3.34
3L1	0:03:30		1.54	2.00	3.37	2.58	4.96	0.11	7.57	-4.84	11.48	-8.97	6.47	-0.96	9.26	6.87	10.68	3.01
3L1	0:04:00		1.50	1.92	3.37	2.62	4.85	0.11	7.57	-4.80	11.48	-8.97	6.28	-1.00	9.34	6.99	10.68	3.04
3L1	0:04:30		1.57	1.92	3.37	2.54	4.96	0.07	7.57	-4.80	11.29	-8.97	6.28	-1.00	9.23	6.99	10.68	2.97
3L1	0:05:00		1.42	1.92	3.40	2.28	4.96	-0.21	7.72	-4.98	11.44	-8.97	6.28	-1.00	9.19	6.91	10.64	3.08
3L1	0:05:30		1.31	1.92	3.37	2.62	5.37	-0.11	7.57	-4.80	11.52	-9.05	6.28	-1.00	9.23	6.99	10.61	3.01
3L1	0:06:00		1.31	1.92	3.37	2.28	4.96	-0.11	7.57	-4.80	11.44	-8.97	6.43	-1.04	9.19	6.75	10.61	2.93
3L1	0:06:30		1.31	1.92	3.37	2.24	5.41	0.07	7.57	-4.84	11.44	-8.97	6.28	-1.04	9.30	6.95	10.61	2.90
3L1	0:07:00		1.50	1.92	3.26	2.24	4.85	0.04	7.57	-4.84	11.48	-8.97	6.28	-1.04	9.16	6.95	10.57	2.90
3L1	0:07:30		1.31	1.96	3.44	2.50	5.37	0.07	7.57	-4.84	11.52	-8.97	6.25	-1.26	9.16	6.95	10.57	3.23
3L1	0:08:00		1.31	1.96	3.40	2.24	4.96	-0.14	7.57	-4.88	11.52	-8.97	6.39	-1.26	9.16	6.87	10.57	2.90
3L1	0:08:30		1.54	1.96	3.37	2.24	4.96	0.04	7.54	-4.88	11.52	-9.09	6.39	-1.04	9.48	6.83	10.57	3.23
3L1	0:09:00		1.50	2.00	3.37	2.24	4.96	0.04	7.72	-4.84	11.44	-8.97	6.39	-1.04	9.23	6.91	10.54	2.90
3L1	0:09:30		1.50	2.00	3.37	2.24	4.96	-0.14	7.54	-5.02	11.44	-8.97	6.39	-1.04	9.26	6.91	10.54	3.19
3L1	0:10:00		1.31	2.03	3.37	2.58	4.96	0.04	7.54	-5.09	11.44	-8.97	6.21	-1.04	9.12	6.91	10.57	3.23
3L1	0:10:30		1.31	2.03	3.40	2.58	4.96	0.07	7.54	-4.84	11.52	-8.97	6.17	-1.04	9.23	6.83	10.54	2.93
3L1	0:11:00		1.50	2.03	3.37	2.24	5.37	-0.11	7.57	-5.02	11.44	-9.01	6.25	-1.04	9.45	6.83	10.54	3.12
3L1	0:11:30		1.50	2.07	3.37	2.28	4.96	-0.11	7.54	-4.88	11.44	-8.97	6.21	-1.04	9.08	6.87	10.50	2.86
3L1	0:12:00		1.31	2.07	3.37	2.58	4.85	-0.11	7.54	-4.84	11.44	-8.97	6.21	-1.08	9.23	6.83	10.50	3.15
3L1	0:12:30		1.42	2.11	3.37	2.54	5.37	-0.11	7.57	-5.20	11.48	-8.97	6.36	-1.08	9.45	6.83	10.50	3.19
3L1	0:13:00		1.50	2.14	3.40	2.54	4.96	0.07	7.72	-5.02	11.44	-9.01	6.21	-1.08	9.19	6.83	10.50	3.19
3L1	0:13:30		1.50	2.25	3.40	2.58	5.37	-0.11	7.54	-5.02	11.44	-9.01	6.36	-1.08	9.19	6.87	10.50	3.19
3L1	0:14:00		1.31	2.29	3.40	2.62	4.96	0.14	7.54	-4.88	11.44	-8.97	6.17	-1.08	9.16	6.79	10.50	3.19
3L1	0:14:30		1.50	2.14	3.37	2.62	4.85	0.29	7.54	-5.20	11.48	-9.12	6.39	-1.04	9.08	6.83	10.50	2.86
3L1	0:15:00		1.31	2.18	3.37	2.28	4.96	0.14	7.54	-5.02	11.48	-9.01	6.36	-1.30	9.05	6.79	10.46	2.82
3L1	0:15:30		1.31	2.33	3.37	2.62	4.92	0.14	7.54	-4.88	11.44	-9.01	6.36	-1.08	9.23	6.87	10.46	3.15
3L1	0:16:00		1.39	2.22	3.37	2.62	5.11	0.14	7.54	-4.91	11.44	-9.01	6.36	-1.08	9.05	6.83	10.46	3.15
3L1	0:16:30		1.50	2.25	3.37	2.62	5.37	0.14	7.54	-4.98	11.44	-9.01	6.21	-1.08	9.16	6.79	10.46	2.86
3L1	0:17:00		1.35	2.25	3.40	2.32	4.96	0.18	7.54	-5.13	11.48	-9.01	6.36	-1.30	9.16	6.79	10.46	3.15
3L1	0:17:30		1.54	2.25	3.40	2.32	4.96	0.14	7.54	-4.88	11.52	-8.97	6.32	-1.30	9.05	6.79	10.46	2.90
3L1	0:18:00		1.54	2.25	3.40	2.32	5.37	0.50	7.72	-4.88	11.44	-8.97	6.17	-1.11	9.01	6.75	10.46	2.90

Table L.2 Calculated Strain, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
3L1	0:18:30		1.54	2.44	3.40	2.32	5.37	0.00	7.72	-4.88	11.44	-8.97	6.36	-1.30	9.01	6.79	10.46	2.79
3L1	0:29:54		1.27	2.48	3.33	2.69	4.92	0.29	7.54	-4.88	11.40	-8.97	6.32	-1.30	8.90	6.71	10.36	2.79
3L1	0:30:24		1.27	2.48	3.23	2.80	4.92	0.29	7.68	-4.84	11.48	-8.97	6.14	-1.11	8.94	6.79	10.36	2.79
3L1	0:30:54		1.35	2.51	3.40	2.80	5.41	0.07	7.61	-4.77	11.56	-8.82	6.76	-0.74	10.03	7.73	11.31	3.56
3L1	0:31:24		1.42	2.66	3.54	2.73	5.30	0.50	8.31	-4.30	12.45	-7.98	9.52	1.67	14.23	11.83	15.89	7.45
3L1	0:31:54		1.76	2.85	3.75	3.03	5.78	0.82	8.90	-3.61	13.66	-6.87	12.89	4.64	19.55	15.49	20.82	12.00
3L2	0:00:30		1.98	2.96	4.31	3.40	6.42	1.32	10.07	-2.85	15.29	-5.46	16.67	7.50	23.45	19.12	25.26	15.22
3L2	0:01:00		1.76	2.96	4.42	3.40	6.45	1.29	9.96	-2.85	15.22	-5.50	16.56	7.24	23.16	18.93	25.02	15.15
3L2	0:01:30		1.91	2.88	4.38	3.40	6.45	1.29	10.00	-2.78	15.25	-5.61	16.60	7.42	23.34	19.01	25.16	15.11
3L2	0:02:00		1.72	2.85	4.38	3.40	6.83	1.25	10.00	-2.82	15.29	-5.46	16.56	7.24	23.20	18.89	25.02	15.15
3L2	0:02:30		1.98	2.81	4.42	3.40	6.49	1.29	10.04	-2.75	15.37	-5.38	16.67	7.46	23.49	19.12	25.30	15.70
3L2	0:03:00		1.91	2.77	4.42	3.40	6.86	1.32	10.04	-2.75	15.37	-5.38	16.85	7.53	23.24	19.12	25.30	15.22
3L2	0:03:30		1.98	2.73	4.42	3.48	6.49	1.22	10.04	-2.78	15.33	-5.38	16.82	7.39	23.38	19.08	25.19	15.66
3L2	0:04:00		1.98	2.70	4.42	3.48	6.86	1.22	10.04	-2.78	15.29	-5.38	16.74	7.46	23.45	19.28	25.26	15.59
3L2	0:04:30		2.02	2.70	4.52	3.59	6.97	1.18	10.29	-2.53	15.68	-4.96	17.47	8.68	25.17	20.80	27.31	16.18
3L3	0:00:30		3.03	3.69	6.49	5.16	9.59	3.47	14.82	0.87	23.12	1.03	27.79	17.74	36.33	30.36	38.65	25.72
3L3	0:01:00		3.03	3.66	6.38	5.23	10.18	3.40	15.07	1.19	23.50	1.07	28.01	17.89	36.48	30.52	38.83	25.83
3L3	0:01:30		2.73	3.66	6.31	5.19	9.73	3.36	15.00	0.94	23.23	1.18	28.66	18.11	36.69	30.71	39.08	26.93
3L3	0:02:00		3.00	3.58	6.28	5.19	9.66	3.40	15.15	0.87	23.54	1.11	28.51	18.11	36.44	30.44	38.79	26.38
3L3	0:02:30		2.85	3.51	6.56	5.16	9.62	3.33	15.11	1.12	23.43	1.03	28.91	17.74	36.26	30.25	38.55	26.63
3L3	0:03:00		3.00	3.47	6.24	5.08	10.18	3.29	15.07	1.08	23.08	0.95	27.79	17.81	36.04	30.09	38.34	25.46
3L3	0:03:30		2.96	3.44	6.21	5.04	10.14	3.33	15.04	1.01	22.84	0.92	28.62	17.52	35.86	29.93	38.12	25.31
3L3	0:04:00		2.77	3.40	6.17	5.08	9.55	3.29	14.74	0.65	22.77	0.84	27.39	17.37	35.67	29.66	37.91	25.13
3L3	0:04:30		2.73	3.40	6.17	4.97	9.55	3.18	14.96	0.94	22.65	0.80	27.57	17.26	35.27	29.62	37.74	25.09
3L4	0:00:30		3.71	4.54	8.14	6.35	12.49	4.90	18.86	3.76	28.06	5.65	34.51	24.86	43.37	36.41	45.70	32.76
3L4	0:01:00		3.67	4.18	8.17	6.35	12.57	4.90	18.97	3.83	28.21	5.80	34.80	25.05	43.77	36.72	46.16	33.16
3L4	0:01:30		3.41	4.18	7.50	6.39	12.46	4.97	19.08	4.15	28.37	5.96	34.87	24.53	43.95	36.96	46.33	33.27
3L4	0:02:00		3.67	4.18	7.54	6.39	12.53	4.97	19.16	3.90	28.41	6.26	34.94	25.35	43.84	36.80	46.23	33.42
3L4	0:02:30		3.59	4.10	7.43	6.32	12.61	4.90	19.05	3.90	28.25	5.80	35.09	24.16	43.41	36.45	45.77	32.94
3L4	0:03:00		3.63	4.36	8.07	6.28	12.57	4.83	19.08	3.79	28.10	5.69	35.05	23.94	43.08	36.14	45.42	31.58
3L4	0:03:30		3.56	4.03	8.07	6.24	12.53	4.79	19.08	3.61	28.17	5.65	34.36	24.83	43.26	36.30	45.63	32.83
3L4	0:04:00		3.56	3.99	7.33	6.17	12.49	4.76	18.86	3.65	27.98	5.61	35.05	24.94	43.44	36.53	45.95	32.76
3L5	0:00:30		4.16	4.62	9.29	7.32	14.02	6.47	22.50	6.68	33.27	10.35	41.52	30.36	50.63	43.12	53.70	39.14
3L5	0:01:00		4.04	4.58	8.45	7.21	13.99	6.62	22.46	6.83	33.04	10.23	40.35	29.65	50.48	44.37	53.35	38.08
3L5	0:01:30		3.97	4.47	9.08	7.10	14.47	6.47	22.13	6.57	32.88	9.96	40.10	30.21	50.41	42.66	53.28	38.63
3L5	0:02:00		4.01	4.51	8.42	7.17	13.95	6.19	22.39	6.79	33.27	10.65	41.55	31.02	51.39	43.16	53.87	38.63
3L5	0:02:30		4.01	4.47	9.22	7.21	14.62	6.40	22.54	6.83	33.47	10.50	41.77	30.47	50.81	43.32	54.02	39.47
3L5	0:03:00		3.93	4.73	8.52	7.06	14.51	6.51	22.32	6.68	33.12	10.23	41.30	30.54	50.81	42.73	53.31	38.30
3L5	0:03:30		3.89	4.36	9.08	7.06	14.51	6.47	22.32	6.65	33.00	10.23	40.39	30.06	50.59	43.24	53.73	38.85
3L5	0:04:00		3.89	4.32	8.31	7.06	13.91	6.22	22.32	6.65	33.16	10.23	40.39	30.80	50.56	43.01	53.66	38.70
3L5	0:04:30		3.86	4.29	9.01	6.99	14.47	6.19	22.24	6.32	33.00	10.16	41.19	30.51	50.45	43.91	53.17	37.93
3L6	0:00:30		4.01	4.91	9.61	7.70	15.33	7.62	24.67	9.32	36.89	14.36	45.98	35.33	56.76	49.21	60.60	44.28

Table L.2 Calculated Strain, Shaft 7 - 2002

428

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
3L6	0:01:00		4.42	4.84	9.71	7.59	15.63	7.40	24.49	9.14	36.58	14.16	45.40	34.92	56.98	48.82	60.43	44.57
3L6	0:01:30		4.23	4.51	9.05	7.62	15.25	7.44	24.60	9.10	36.81	14.36	46.31	35.40	57.27	49.49	60.67	43.47
3L6	0:02:00		4.19	4.43	9.82	7.62	15.66	7.44	24.60	9.17	36.74	14.43	46.24	35.14	57.05	48.94	60.43	43.36
3L6	0:02:30		4.12	4.43	9.75	7.55	15.63	7.51	24.56	9.10	36.74	14.47	46.38	35.40	57.60	49.41	60.82	44.61
3L6	0:03:00		4.12	4.36	8.98	7.51	15.59	7.44	24.49	9.03	36.74	14.39	45.40	35.11	56.98	48.82	60.43	44.90
3L6	0:03:30		4.08	4.29	9.64	7.51	15.59	7.44	24.49	9.03	36.74	14.39	46.38	35.48	56.61	49.33	60.64	45.41
3L6	0:04:00		4.04	4.29	9.64	7.47	15.55	7.40	24.45	8.99	36.62	14.39	45.91	35.26	56.50	49.41	60.50	43.98
3L6	0:04:30		4.01	4.21	8.87	7.32	15.44	7.30	24.27	8.71	36.39	14.09	45.26	34.59	56.43	48.20	59.97	43.29
3L7	0:00:30		4.49	4.43	9.64	7.96	16.75	8.37	26.14	11.52	38.88	17.83	50.67	40.67	63.03	54.79	67.93	51.17
3L7	0:01:00		4.42	4.36	10.20	7.92	16.78	8.30	26.07	11.41	38.76	17.79	50.89	40.49	62.78	54.64	67.58	50.92
3L7	0:01:30		4.31	4.66	9.50	7.85	16.78	8.26	26.03	11.09	38.76	17.87	50.45	40.86	63.25	54.99	68.25	51.50
3L7	0:02:00		4.23	4.21	9.54	7.77	16.26	8.19	25.85	10.98	38.88	17.72	50.85	40.27	63.03	54.95	68.11	51.36
3L7	0:02:30		4.27	4.14	9.36	7.74	16.15	8.12	25.74	11.20	38.68	17.60	49.36	40.30	62.63	54.40	67.37	51.32
3L7	0:03:00		4.12	4.06	9.22	7.62	15.96	7.94	25.55	10.62	38.21	17.41	49.69	40.27	62.78	54.87	67.79	51.06
3L7	0:03:30		4.19	4.47	9.33	7.66	16.56	8.12	25.81	11.27	38.53	17.83	50.31	40.86	63.29	55.07	68.29	51.69
3L7	0:04:00		4.23	4.06	9.33	7.70	16.52	8.12	25.81	11.05	38.56	17.87	51.03	41.04	63.58	55.26	68.46	52.02
3L7	0:04:30		4.16	4.03	9.92	7.66	16.37	8.01	25.70	11.27	38.72	17.79	50.74	40.67	63.03	55.30	68.00	52.02
3L8	0:00:30		4.76	4.32	10.03	8.37	17.27	8.91	27.10	12.43	40.63	20.04	53.76	43.79	69.34	60.34	72.83	56.53
3L8	0:01:00		4.61	4.29	10.20	8.22	17.60	8.87	27.13	13.44	40.59	20.62	54.52	44.42	70.11	61.74	74.70	57.81
3L8	0:01:45		4.53	4.18	10.38	8.07	17.38	8.91	26.91	12.86	40.24	20.62	53.61	44.50	71.09	61.70	75.51	58.29
3L8	0:02:15		4.34	4.06	9.68	7.96	16.90	8.73	26.55	12.75	40.04	20.23	53.18	44.09	70.29	60.80	74.10	57.59
3L8	0:02:45		4.42	4.06	10.24	7.92	17.08	8.73	26.55	12.93	39.89	20.39	54.08	44.35	70.22	61.43	74.91	58.14
3L8	0:03:15		4.27	3.99	9.54	7.81	16.90	8.66	26.36	12.61	39.65	20.27	53.54	44.61	70.91	61.51	75.16	57.85
3L8	0:03:45		4.27	3.99	10.17	7.88	16.93	8.66	26.44	12.93	39.77	20.43	53.79	44.57	69.92	61.97	75.83	58.29
3L8	0:04:15		4.19	3.88	10.06	7.77	16.75	8.58	26.21	12.43	39.46	20.16	53.10	44.24	70.69	61.35	75.19	57.78
3L8	0:04:45		4.19	3.84	9.61	7.81	16.52	8.55	26.29	12.50	39.85	20.35	53.76	44.57	71.35	62.05	75.93	58.47
3L8	0:05:15		4.27	3.84	10.06	7.74	16.78	8.51	26.18	12.50	39.50	20.31	53.50	44.38	71.06	62.44	75.40	58.14
3L8	0:05:45		4.16	3.73	9.92	7.62	16.15	8.33	25.85	12.39	39.30	19.85	52.70	43.90	69.67	61.08	73.78	56.97
3L9	0:00:30		4.38	3.88	10.34	8.07	17.31	9.19	26.84	14.85	40.71	22.79	56.77	49.73	77.22	68.84	82.20	64.60
3L9	0:01:00		4.38	3.88	9.75	8.00	16.93	9.16	26.73	14.52	40.51	22.79	56.95	49.32	78.68	70.68	82.34	64.64
3L9	0:01:30		4.34	3.81	10.27	8.00	16.82	9.12	26.62	14.67	40.59	22.75	56.81	49.84	78.79	69.43	82.80	64.97
3L9	0:02:00		4.31	3.73	9.57	7.88	16.22	8.94	26.33	14.59	40.20	22.72	56.37	49.62	75.25	69.12	82.27	64.89
3L9	0:02:30		4.27	3.69	10.13	7.81	16.67	8.94	26.21	14.56	40.08	22.45	56.59	49.65	78.64	69.23	82.45	64.78
3L9	0:03:00		4.34	3.66	9.71	7.81	16.34	8.91	26.14	14.09	40.00	22.45	56.59	49.69	78.72	69.39	82.63	65.19
3L9	0:03:30		4.46	3.62	10.06	7.81	16.26	8.83	26.07	14.52	39.93	22.49	56.05	49.73	78.82	69.59	82.84	65.15
3L9	0:04:00		4.27	3.58	9.47	7.77	16.19	8.80	25.99	14.48	39.77	22.33	56.08	49.58	75.43	70.79	82.38	64.89
3L9	0:04:30		4.08	3.88	9.89	7.55	16.15	8.55	25.59	13.98	38.95	21.72	55.03	48.58	78.84	67.56	80.58	63.72
3L10	0:00:30		4.53	3.66	9.85	8.03	16.97	9.33	26.51	16.07	40.32	24.51	59.39	51.40	82.25	71.20	89.81	73.33
3L10	0:01:00		4.53	3.62	9.99	8.03	16.86	9.44	26.33	16.44	40.04	24.51	59.24	51.51	82.58	71.56	89.74	71.24
3L10	0:01:30		4.38	3.55	9.71	7.88	16.63	9.30	25.96	16.11	39.54	24.24	58.59	51.14	82.22	71.17	89.46	70.95
3L10	0:02:00		4.31	3.51	10.20	7.85	16.15	9.16	25.77	16.22	39.30	24.05	58.33	51.06	82.47	75.36	90.10	71.17
3L10	0:02:30		4.01	3.44	10.13	7.77	16.30	9.08	25.52	15.17	39.30	23.90	57.97	51.96	82.58	75.36	89.88	70.95

Table L.2 Calculated Strain, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μstrain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
3L10	0:03:00		4.34	3.36	10.13	7.74	15.89	9.05	25.41	15.86	38.88	23.86	57.90	50.92	82.40	75.28	89.57	71.13
3L10	0:03:30		4.27	3.36	10.20	7.74	16.30	9.01	25.37	15.71	39.07	23.86	57.90	50.92	82.47	75.36	90.27	71.86
3L10	0:04:00		4.23	3.33	10.10	7.70	15.59	9.01	25.22	15.64	38.72	23.86	57.86	52.07	82.69	75.56	90.55	72.16
3L10	0:04:30		4.16	3.21	9.96	7.55	15.48	8.80	24.85	14.95	38.49	23.29	56.77	50.10	14.85	73.76	88.72	70.03
3L11	0:00:30		4.64	3.47	10.24	7.96	16.37	9.73	25.22	17.37	38.45	25.77	60.30	54.40	21.52	80.90	96.16	76.38
3L11	0:01:00		4.68	3.33	10.52	7.96	16.26	9.76	24.96	17.56	38.14	25.96	59.72	54.70	22.03	81.45	96.79	77.04
3L11	0:01:30		4.64	3.25	10.38	7.88	16.34	9.66	24.67	17.19	38.10	25.89	59.42	54.66	23.45	82.97	96.97	77.22
3L11	0:02:00		4.53	3.21	9.85	7.81	15.96	9.66	24.49	17.34	37.55	25.96	59.53	54.70	22.29	81.72	97.00	77.11
3L11	0:02:30		4.76	3.14	10.34	7.74	15.81	9.59	24.23	17.30	37.28	25.89	59.64	54.78	90.35	81.92	97.95	77.37
3L11	0:03:00		4.49	3.10	9.92	7.74	15.37	9.59	24.05	17.23	37.09	25.92	59.39	55.30	90.35	81.92	97.21	76.60
3L11	0:03:30		4.53	3.03	10.03	7.66	15.63	9.51	23.79	17.09	36.97	25.77	58.55	54.66	91.52	83.17	97.14	77.40
3L11	0:04:00		4.42	2.99	10.24	7.59	15.55	9.44	23.71	17.01	36.70	25.81	58.59	54.70	90.39	81.96	97.32	77.55
3L11	0:04:30		4.42	2.96	9.64	7.55	15.52	9.44	23.60	17.09	36.58	25.85	58.77	54.81	91.81	83.48	97.53	77.77
3L12	0:00:30		4.90	2.73	10.55	7.44	15.52	9.91	22.35	18.35	34.05	28.25	58.95	57.60	95.06	86.95	103.45	82.65
3L12	0:01:00		4.79	2.66	10.13	7.44	15.44	9.91	22.13	18.42	33.78	28.41	58.88	57.86	95.31	87.23	103.13	82.32
3L12	0:01:30		5.02	2.55	10.45	7.25	15.03	9.69	21.58	17.52	32.81	27.99	57.97	58.26	95.60	30.09	103.10	82.28
3L12	0:02:00		4.76	2.81	10.06	7.32	15.37	9.84	21.73	18.39	33.04	28.86	58.88	58.19	95.60	87.54	103.41	83.16
3L12	0:02:30		4.90	2.51	10.55	7.29	14.51	9.84	21.58	18.49	32.84	28.75	58.55	59.30	96.37	88.20	103.73	83.49
3L12	0:03:00		4.83	2.73	10.17	7.29	14.55	9.87	21.51	18.64	32.69	28.98	58.44	58.60	96.00	87.81	103.56	83.46
3L12	0:03:30		4.76	2.59	10.48	7.10	14.88	9.66	21.25	18.10	32.10	28.67	58.04	58.34	95.90	87.69	104.05	83.97
3L12	0:04:00		4.72	2.36	10.20	7.06	14.28	9.55	20.99	18.17	31.95	28.75	57.86	59.15	96.15	87.97	102.89	82.76
3L12	0:04:30		4.49	2.25	10.13	6.91	14.81	9.48	20.92	18.31	30.90	29.09	57.57	58.04	96.15	87.97	103.56	83.05
3L12	0:05:00		4.83	2.22	10.17	6.88	14.77	9.51	20.77	18.42	30.55	29.25	57.61	59.08	95.53	87.30	103.06	82.54
3L12	0:05:30		4.79	2.18	10.24	6.80	14.14	9.37	20.59	18.13	30.43	29.59	57.54	59.19	95.97	87.77	103.13	82.61
3L12	0:06:00		4.61	2.33	10.17	6.80	14.73	9.48	20.55	18.57	30.35	29.47	57.68	59.41	96.26	88.08	103.77	83.60
3L12	0:06:30		4.57	2.22	10.34	6.91	14.32	9.69	20.59	18.93	30.70	30.01	57.86	58.82	96.62	88.47	103.70	83.97
3L13	0:00:30		4.94	2.00	10.66	6.58	14.62	9.76	19.27	18.93	28.52	31.04	56.81	61.68	97.87	89.80	104.58	84.89
3L13	0:01:00		5.02	1.96	10.70	6.50	14.55	9.76	19.34	19.11	28.37	31.61	57.57	61.75	97.61	89.80	106.13	86.50
3L13	0:01:30		4.98	1.96	10.66	6.43	14.51	9.73	18.94	19.18	28.41	31.80	57.43	61.90	97.61	91.13	106.23	86.61
3L13	0:02:00		5.05	1.85	10.70	6.35	14.43	9.66	18.75	19.18	27.55	31.92	57.32	61.79	97.61	91.05	106.13	86.50
3L13	0:02:30		5.28	1.81	10.77	6.28	14.40	9.69	18.53	19.65	27.40	32.07	57.50	62.31	97.61	91.48	105.71	87.16
3L13	0:03:00		5.13	1.77	10.77	6.20	14.32	9.66	18.35	19.69	27.12	32.18	57.21	62.27	97.61	91.48	106.37	87.31
3L13	0:03:30		5.13	1.66	10.84	6.09	13.69	9.59	18.09	19.29	26.62	31.99	56.55	42.01	96.62	91.48	104.89	86.21
3L13	0:04:00		5.20	1.55	10.62	5.90	14.06	9.37	17.68	19.43	26.31	31.92	56.55	61.83	96.33	91.17	105.35	86.54
3L13	0:04:30		5.02	1.55	10.66	5.87	13.46	9.37	17.65	19.51	26.70	32.03	56.59	62.09	96.31	91.15	105.07	86.98
3L13	0:05:00		5.24	1.48	10.77	5.83	14.02	9.37	17.68	19.61	25.92	32.07	56.34	61.83	96.30	91.13	104.82	86.43
3L14	0:00:30		5.32	1.40	10.98	5.57	13.39	9.19	17.21	19.58	25.49	32.76	56.66	62.79	9.67	-1.56	105.53	87.16
3L14	0:01:00		5.20	1.37	11.01	5.49	13.39	9.30	17.06	20.01	25.33	32.83	56.66	62.87	97.90	92.85	105.56	88.08
3L14	0:01:30		5.13	1.29	11.05	5.42	13.35	9.26	16.88	20.05	24.75	32.91	56.52	62.72	44.94	36.18	105.35	88.30
3L14	0:02:00		5.24	1.26	11.05	5.27	13.84	9.19	16.62	19.98	24.24	32.95	56.41	62.79	97.94	92.88	105.63	88.23
3L14	0:02:30		5.24	1.26	11.08	5.19	13.80	9.12	16.55	19.72	24.21	33.06	56.37	62.75	98.05	93.00	105.11	88.34
3L14	0:03:00		5.28	1.18	11.15	5.12	13.76	9.08	16.40	20.12	24.32	33.18	56.30	62.87	98.16	93.12	105.39	88.63

Table L.3 Calculated Strain, 4 Minute Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain																
		Gage #	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
		Elev. ft	+25.10	+25.10	+15.10	+15.10	+5.10	+5.10	-4.90	-4.90	-14.90	-14.90	-24.90	-24.90	-36.40	-36.40	-42.90	-42.90
3L0	0:00:00		1.24	2.11	2.84	1.76	4.18	-0.68	6.54	-6.00	9.34	-11.00	-1.27	-6.05	0.22	-2.93	0.18	-4.92
3L1	0:04:00		1.50	1.92	3.37	2.62	4.85	0.11	7.57	-4.80	11.48	-8.97	6.28	-1.00	9.34	6.99	10.68	3.04
3L1	0:08:00		1.31	1.96	3.40	2.24	4.96	-0.14	7.57	-4.88	11.52	-8.97	6.39	-1.26	9.16	6.87	10.57	2.90
3L1	0:29:54		1.27	2.48	3.33	2.69	4.92	0.29	7.54	-4.88	11.40	-8.97	6.32	-1.30	8.90	6.71	10.36	2.79
3L2	0:04:00		1.98	2.70	4.42	3.48	6.86	1.22	10.04	-2.78	15.29	-5.38	16.74	7.46	23.45	19.28	25.26	15.59
3L3	0:04:00		2.77	3.40	6.17	5.08	9.55	3.29	14.74	0.65	22.77	0.84	27.39	17.37	35.67	29.66	37.91	25.13
3L4	0:04:00		3.56	3.99	7.33	6.17	12.49	4.76	18.86	3.65	27.98	5.61	35.05	24.94	43.44	36.53	45.95	32.76
3L5	0:04:00		3.89	4.32	8.31	7.06	13.91	6.22	22.32	6.65	33.16	10.23	40.39	30.80	50.56	43.01	53.66	38.70
3L6	0:04:00		4.04	4.29	9.64	7.47	15.55	7.40	24.45	8.99	36.62	14.39	45.91	35.26	56.50	49.41	60.50	43.98
3L7	0:04:00		4.23	4.06	9.33	7.70	16.52	8.12	25.81	11.05	38.56	17.87	51.03	41.04	63.58	55.26	68.46	52.02
3L8	0:03:45		4.27	3.99	10.17	7.88	16.93	8.66	26.44	12.93	39.77	20.43	53.79	44.57	69.92	61.97	75.83	58.29
3L9	0:04:00		4.27	3.58	9.47	7.77	16.19	8.80	25.99	14.48	39.77	22.33	56.08	49.58	75.43	70.79	82.38	64.89
3L10	0:04:00		4.23	3.33	10.10	7.70	15.59	9.01	25.22	15.64	38.72	23.86	57.86	52.07	82.69	75.56	90.55	72.16
3L11	0:04:00		4.42	2.99	10.24	7.59	15.55	9.44	23.71	17.01	36.70	25.81	58.59	54.70	90.39	81.96	97.32	77.55
3L12	0:04:00		4.72	2.36	10.20	7.06	14.28	9.55	20.99	18.17	31.95	28.75	57.86	59.15	96.15	87.97	102.9	82.76
3L13	0:04:00		5.20	1.55	10.62	5.90	14.06	9.37	17.68	19.43	26.31	31.92	56.55	61.83	96.33	91.17	105.4	86.54
3L14	0:04:00		5.13	1.03	11.12	4.82	13.58	8.80	15.92	20.01	23.04	32.99	56.01	62.64	96.33	93.08	104.5	88.30
3U1	0:03:00		4.16	0.44	8.70	3.33	10.52	6.83	12.21	16.87	17.36	26.61	42.39	48.58	70.47	67.09	77.16	64.12
3U2	0:03:00		3.78	0.63	8.77	3.10	9.77	6.51	11.84	16.11	16.54	25.05	39.56	45.02	62.59	59.71	69.55	57.63
3U3	0:02:43		3.18	0.70	7.54	2.73	8.32	5.90	9.71	13.26	13.43	21.00	30.73	35.37	47.53	46.91	54.05	44.72
3U4	0:02:57		2.51	0.44	5.72	2.02	6.94	4.69	7.35	11.23	10.31	16.99	22.05	26.76	32.39	33.21	37.28	32.87
3U6	0:05:59		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table L.4 Average Calculated Strain, 4 Minute Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Strain Difference ($\Delta\epsilon$) μ strain								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+43.65	+25.10	+15.10	+5.10	-4.90	-14.90	-24.90	-28.40
3L0	0:00:00	0.00	0.00	1.67	2.30	1.75	0.27	-0.83	-3.66	0.00
3L1	0:04:00	0.00	0.00	1.71	2.99	2.48	1.38	1.25	2.64	13.21
3L1	0:08:00	0.00	0.00	1.63	2.82	2.41	1.35	1.27	2.57	12.97
3L1	0:29:54	0.00	0.00	1.87	3.01	2.60	1.33	1.22	2.51	12.58
3L2	0:04:00	0.00	0.00	2.34	3.95	4.04	3.63	4.96	12.10	31.42
3L3	0:04:00	0.00	0.00	3.09	5.63	6.42	7.70	11.80	22.38	47.52
3L4	0:04:00	0.00	0.00	3.77	6.75	8.63	11.25	16.80	30.00	58.40
3L5	0:04:00	0.00	0.00	4.11	7.69	10.07	14.48	21.69	35.60	67.25
3L6	0:04:00	0.00	0.00	4.16	8.56	11.48	16.72	25.51	40.58	75.30
3L7	0:04:00	0.00	0.00	4.15	8.51	12.32	18.43	28.22	46.04	85.35
3L8	0:03:45	0.00	0.00	4.13	9.03	12.79	19.68	30.10	49.18	94.20
3L9	0:04:00	0.00	0.00	3.93	8.62	12.49	20.24	31.05	52.83	102.38
3L10	0:04:00	0.00	0.00	3.78	8.90	12.30	20.43	31.29	54.96	112.05
3L11	0:04:00	0.00	0.00	3.71	8.91	12.50	20.36	31.25	56.65	120.47
3L12	0:04:00	0.00	0.00	3.54	8.63	11.92	19.58	30.35	58.51	127.56
3L13	0:04:00	0.00	0.00	3.38	8.26	11.72	18.56	29.11	59.19	131.06
3L14	0:04:00	0.00	0.00	3.08	7.97	11.19	17.97	28.01	59.33	132.36
3U1	0:03:00	0.00	0.00	2.30	6.01	8.67	14.54	21.98	45.48	91.24
3U2	0:03:00	0.00	0.00	2.20	5.93	8.14	13.97	20.79	42.29	84.65
3U3	0:02:43	0.00	0.00	1.94	5.13	7.11	11.48	17.21	33.05	60.98
3U4	0:02:57	0.00	0.00	1.48	3.87	5.81	9.29	13.65	24.40	40.25
3U6	0:05:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Top of Shaft Ground Surface

Top of Mid Cell

Table L.5 Shaft Load, 4 Minute Readings, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Shaft Load, tons								
		Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.	Elev.
		+47.00	+43.65	+25.10	+15.10	+5.10	-4.90	-14.90	-24.90	-28.40
3L0	0:00:00	0.00	0.00	10.88	14.96	11.38	1.78	-5.38	-23.79	0.00
3L1	0:04:00	0.00	0.00	11.13	19.47	16.13	9.01	8.15	17.17	91.05
3L1	0:08:00	0.00	0.00	10.64	18.37	15.68	8.78	8.28	16.68	89.41
3L1	0:29:54	0.00	0.00	12.20	19.60	16.95	8.66	7.90	16.32	86.73
3L2	0:04:00	0.00	0.00	15.24	25.69	26.29	23.62	32.21	78.68	216.52
3L3	0:04:00	0.00	0.00	20.08	36.63	41.78	50.10	76.73	145.48	327.52
3L4	0:04:00	0.00	0.00	24.56	43.92	56.15	73.26	109.19	195.00	402.52
3L5	0:04:00	0.00	0.00	26.74	50.03	65.53	94.27	141.03	231.41	463.46
3L6	0:04:00	0.00	0.00	27.11	55.71	74.71	108.85	165.82	263.84	518.93
3L7	0:04:00	0.00	0.00	27.00	55.41	80.20	119.98	183.43	299.30	588.22
3L8	0:03:45	0.00	0.00	26.88	58.76	83.28	128.13	195.67	319.73	649.25
3L9	0:04:00	0.00	0.00	25.56	56.11	81.32	131.75	201.87	343.46	705.58
3L10	0:04:00	0.00	0.00	24.59	57.92	80.07	132.99	203.42	357.32	772.23
3L11	0:04:00	0.00	0.00	24.12	58.01	81.35	132.56	203.17	368.25	830.26
3L12	0:04:00	0.00	0.00	23.05	56.20	77.57	127.46	197.30	380.36	879.13
3L13	0:04:00	0.00	0.00	21.99	53.80	76.26	120.81	189.26	384.80	903.27
3L14	0:04:00	0.00	0.00	20.06	51.87	72.82	116.94	182.11	385.68	912.19
3U1	0:03:00	0.00	0.00	14.97	39.13	56.46	94.63	142.91	295.69	628.84
3U2	0:03:00	0.00	0.00	14.35	38.63	52.99	90.97	135.17	274.90	583.40
3U3	0:02:43	0.00	0.00	12.64	33.42	46.28	74.74	111.90	214.84	420.24
3U4	0:02:57	0.00	0.00	9.61	25.17	37.83	60.50	88.75	158.64	277.38
3U6	0:05:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Modulus, ksi		4312	4312	4312	4312	4312	4312	4307	4307	4285
Diameter, in		62.00	62.00	62.00	62.00	62.00	62.00	62.00	62.00	64.00
		Top of Shaft	Ground Surface						Top of Mid Cell	

Table L.6 Average Segment Side Shear, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Average Segment Side Shear, tsf								
		CL Elev., ft	+45.33	+34.38	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65
		Length, ft	3.35	18.55	10.00	10.00	10.00	10.00	10.00	3.50
3L0	0:00:00		0.00	-0.04	-0.03	-0.08	-0.12	-0.10	-0.17	0.35
3L1	0:04:00		0.00	-0.04	-0.01	-0.08	-0.10	-0.06	0.00	1.22
3L1	0:08:00		0.00	-0.04	-0.01	-0.07	-0.10	-0.06	0.00	1.20
3L1	0:29:54		0.00	-0.03	-0.01	-0.07	-0.11	-0.06	0.00	1.16
3L2	0:04:00		0.00	-0.02	0.01	-0.05	-0.07	0.00	0.23	2.33
3L3	0:04:00		0.00	-0.01	0.05	-0.02	-0.01	0.11	0.37	3.10
3L4	0:04:00		0.00	0.01	0.06	0.02	0.05	0.16	0.47	3.54
3L5	0:04:00		0.00	0.01	0.09	0.04	0.12	0.23	0.50	3.96
3L6	0:04:00		0.00	0.02	0.12	0.06	0.15	0.29	0.55	4.36
3L7	0:04:00		0.00	0.02	0.12	0.10	0.19	0.33	0.66	4.95
3L8	0:03:45		0.00	0.02	0.14	0.09	0.22	0.36	0.71	5.65
3L9	0:04:00		0.00	0.01	0.13	0.10	0.25	0.38	0.82	6.22
3L10	0:04:00		0.00	0.01	0.15	0.08	0.27	0.38	0.89	7.13
3L11	0:04:00		0.00	0.01	0.15	0.09	0.26	0.38	0.96	7.95
3L12	0:04:00		0.00	0.00	0.15	0.08	0.25	0.37	1.07	8.58
3L13	0:04:00		0.00	0.00	0.14	0.08	0.22	0.37	1.15	8.92
3L14	0:04:00		0.00	-0.01	0.14	0.07	0.22	0.34	1.20	9.06
3U1	0:03:00		0.00	-0.02	0.09	0.05	0.18	0.24	0.88	5.71
3U2	0:03:00		0.00	-0.03	0.09	0.03	0.18	0.22	0.80	5.29
3U3	0:02:43		0.00	-0.03	0.07	0.02	0.12	0.17	0.58	3.50
3U4	0:02:57		0.00	-0.04	0.04	0.02	0.08	0.12	0.37	2.00
3U6	0:05:59		0.00	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
Segment Wt., tons			5.27	17.03	9.18	9.18	9.18	9.18	9.18	3.32
Maximum Shear, tsf			0.000	0.016	0.152	0.099	0.269	0.378	1.198	9.063

Table L.7 Average Segment Compression and Comparison with Telltale Measurement, Shaft 7 -2002

Load Interval	Elapsed Time hhmmss	Average Segment Compression μ strain									Shaft Compression				
		CL Elev., ft	+45.33	+34.38	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65	Strain Gage		TT in	Error in	Error %
		Length, ft	3.35	18.55	10.00	10.00	10.00	10.00	10.00	3.50	Net, in	Change, in			
3L0	0:00:00	0.00	0.84	1.98	2.02	1.01	-0.28	-2.24	-1.83	0.0004	0.0000	0.0000	0.0000		
3L1	0:04:00	0.00	0.85	2.35	2.73	1.93	1.32	1.95	7.93	0.0018	0.0013	0.0001	0.0013	2596.4%	
3L1	0:08:00	0.00	0.82	2.23	2.62	1.88	1.31	1.92	7.77	0.0017	0.0013	0.0001	0.0012	2487.2%	
3L1	0:29:54	0.00	0.94	2.44	2.81	1.97	1.27	1.86	7.55	0.0018	0.0014	0.0001	0.0013	2618.1%	
3L2	0:04:00	0.00	1.17	3.14	3.99	3.83	4.29	8.53	21.76	0.0040	0.0036	0.0016	0.0020	126.3%	
3L3	0:04:00	0.00	1.54	4.36	6.02	7.06	9.75	17.09	34.95	0.0071	0.0067	0.0048	0.0019	39.9%	
3L4	0:04:00	0.00	1.89	5.26	7.69	9.94	14.03	23.40	44.20	0.0095	0.0091	0.0069	0.0022	31.9%	
3L5	0:04:00	0.00	2.05	5.90	8.88	12.27	18.09	28.65	51.42	0.0115	0.0111	0.0090	0.0021	22.9%	
3L6	0:04:00	0.00	2.08	6.36	10.02	14.10	21.11	33.05	57.94	0.0131	0.0126	0.0106	0.0021	19.9%	
3L7	0:04:00	0.00	2.07	6.33	10.42	15.38	23.32	37.13	65.69	0.0143	0.0139	0.0118	0.0022	18.5%	
3L8	0:03:45	0.00	2.06	6.58	10.91	16.24	24.89	39.64	71.69	0.0153	0.0149	0.0128	0.0021	16.5%	
3L9	0:04:00	0.00	1.96	6.27	10.56	16.37	25.65	41.94	77.60	0.0158	0.0154	0.0135	0.0019	14.4%	
3L10	0:04:00	0.00	1.89	6.34	10.60	16.37	25.86	43.13	83.51	0.0162	0.0158	0.0139	0.0019	13.6%	
3L11	0:04:00	0.00	1.85	6.31	10.71	16.43	25.81	43.95	88.56	0.0165	0.0161	0.0141	0.0021	14.6%	
3L12	0:04:00	0.00	1.77	6.09	10.28	15.75	24.97	44.43	93.03	0.0165	0.0161	0.0141	0.0020	14.0%	
3L13	0:04:00	0.00	1.69	5.82	9.99	15.14	23.84	44.15	95.13	0.0162	0.0158	0.0141	0.0017	12.3%	
3L14	0:04:00	0.00	1.54	5.53	9.58	14.58	22.99	43.67	95.84	0.0159	0.0155	0.0142	0.0014	9.7%	
3U1	0:03:00	0.00	1.15	4.16	7.34	11.61	18.26	33.73	68.36	0.0121	0.0117	0.0122	-0.0005	-3.9%	
3U2	0:03:00	0.00	1.10	4.07	7.04	11.06	17.38	31.54	63.47	0.0114	0.0110	0.0116	-0.0005	-4.5%	
3U3	0:02:43	0.00	0.97	3.54	6.12	9.30	14.35	25.13	47.01	0.0092	0.0088	0.0099	-0.0011	-10.7%	
3U4	0:02:57	0.00	0.74	2.67	4.84	7.55	11.47	19.03	32.32	0.0070	0.0066	0.0079	-0.0013	-16.2%	
3U6	0:05:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	-0.0004	0.0015	-0.0019	-127.3%	

Table L.8 Movement at Segment Centerline, Shaft 7 - 2002

Load Interval	Elapsed Time hhmmss	Segment Movement, in									Mid Cell
		CL Elev., ft	+45.33	+34.38	+20.10	+10.10	+0.10	-9.90	-19.90	-26.65	-28.40
		Length, ft	3.35	18.55	10.00	10.00	10.00	10.00	10.00	3.50	-
3L0	0:00:00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3L1	0:04:00	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009
3L1	0:08:00	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.008
3L1	0:29:54	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.008	0.008	0.008
3L2	0:04:00	0.014	0.014	0.014	0.015	0.015	0.016	0.017	0.018	0.018	0.018
3L3	0:04:00	0.040	0.040	0.040	0.041	0.042	0.043	0.044	0.046	0.047	0.047
3L4	0:04:00	0.073	0.073	0.073	0.074	0.075	0.077	0.079	0.081	0.082	0.082
3L5	0:04:00	0.124	0.124	0.125	0.125	0.127	0.128	0.131	0.134	0.135	0.135
3L6	0:04:00	0.182	0.182	0.183	0.184	0.185	0.187	0.191	0.194	0.195	0.195
3L7	0:04:00	0.246	0.246	0.247	0.248	0.250	0.252	0.255	0.259	0.260	0.260
3L8	0:03:45	0.311	0.311	0.312	0.313	0.314	0.317	0.321	0.325	0.326	0.326
3L9	0:04:00	0.397	0.398	0.398	0.399	0.401	0.403	0.407	0.412	0.413	0.413
3L10	0:04:00	0.493	0.494	0.494	0.495	0.497	0.499	0.503	0.508	0.510	0.510
3L11	0:04:00	0.663	0.663	0.664	0.665	0.666	0.669	0.673	0.677	0.679	0.679
3L12	0:04:00	1.029	1.030	1.030	1.031	1.033	1.035	1.039	1.044	1.046	1.046
3L13	0:04:00	1.525	1.525	1.526	1.527	1.528	1.531	1.535	1.539	1.541	1.541
3L14	0:04:00	1.983	1.983	1.984	1.985	1.986	1.989	1.993	1.997	1.999	1.999
3U1	0:03:00	2.023	2.023	2.023	2.024	2.025	2.027	2.030	2.034	2.035	2.035
3U2	0:03:00	2.017	2.017	2.018	2.018	2.019	2.021	2.024	2.027	2.029	2.029
3U3	0:02:43	2.003	2.003	2.003	2.004	2.005	2.006	2.009	2.011	2.012	2.012
3U4	0:02:57	1.982	1.982	1.982	1.983	1.984	1.985	1.987	1.988	1.989	1.989
3U6	0:05:59	1.853	1.853	1.853	1.853	1.853	1.853	1.853	1.853	1.853	1.853

Table L.9 Section Properties, Shaft 7 - 2002

Area of Steel Composition:

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 11 Rebar	16	1.561	24.983
3/4" Galvanized Steel Telltale Pipe	10	0.333	3.33
No. 5 Spiral Stiffeners	2	0.307	0.614
Permanent Casing (1/2" thick)	0	168.86	0
Area of Steel =			28.927

PVC and Hose

Element	Quantity	X-Sectional Area (in2)	Total Area (in2)
No. 6 (0.69 O.D.) Hydraulic Hose	4	0.442	1.768
2.049" I.D. 2.375"O.D. Schedule 40 PVC Pipes	4	4.431	17.724
Area of Pipe =			19.492

437

Concrete Modulus 4100 ksi
 Steel Modulus 29000 ksi

Elevation (ft)	Diameter (inches)	Gross X-Sectional Area (in2)	Area of Steel (in2)	Area Pipe (in2)	Area of Concrete (in2)	Shaft Modulus (ksi)	Notes
46.5	62	3019.07	28.93	19.49	2970.65	4312.11	4PVC pipe, 4hose
-11.9	62	3019.07	28.26	19.49	2971.32	4306.62	4PVC pipe, 4hose
-26	64	3216.99	26.93	18.61	3171.45	4284.72	4PVC pipe, 2hose

Figure L.1 Shaft Top VW Strain, Shaft 7 - 2002

438

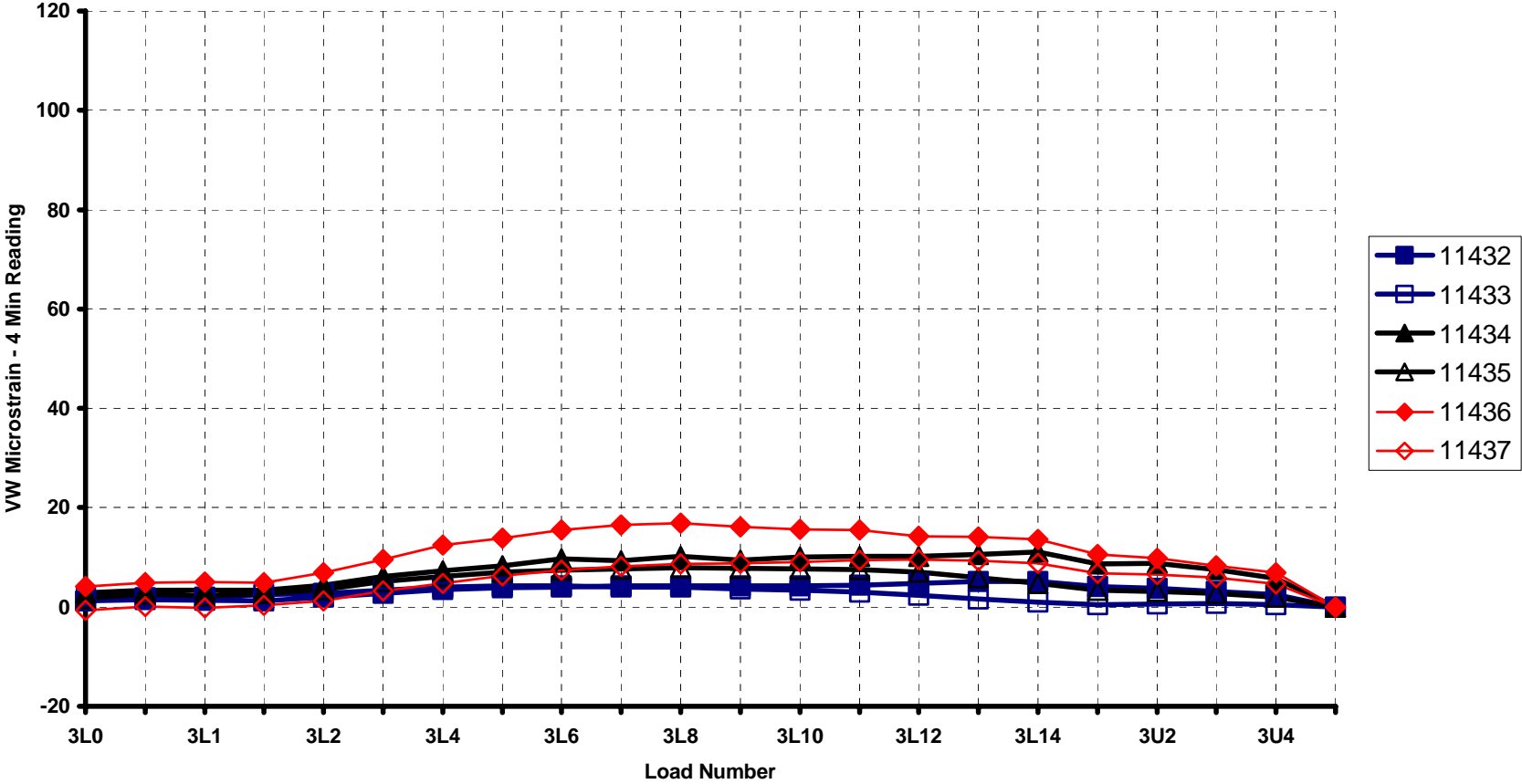


Figure L.2 Shaft Middle VW Strain, Shaft 7 - 2002

439

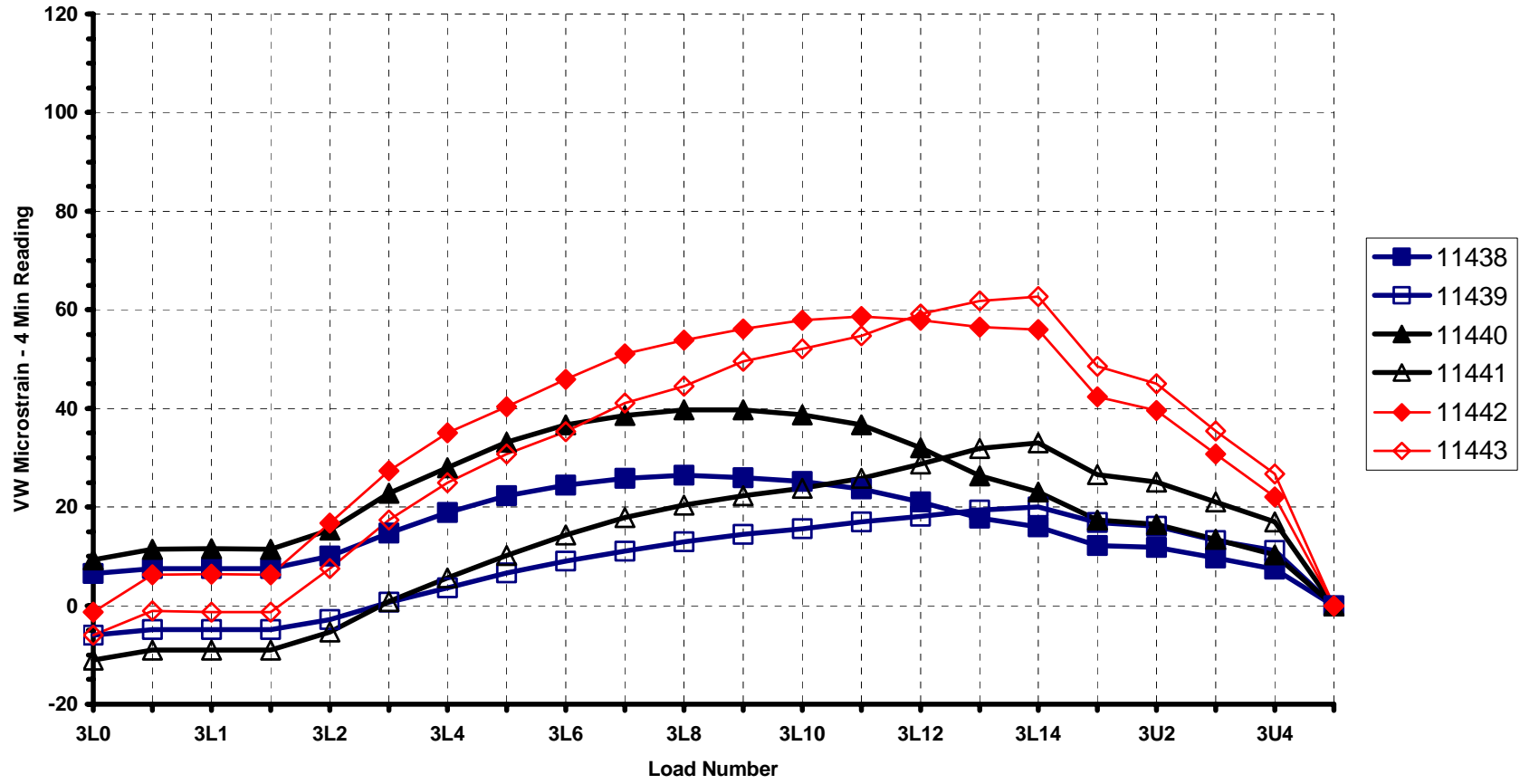
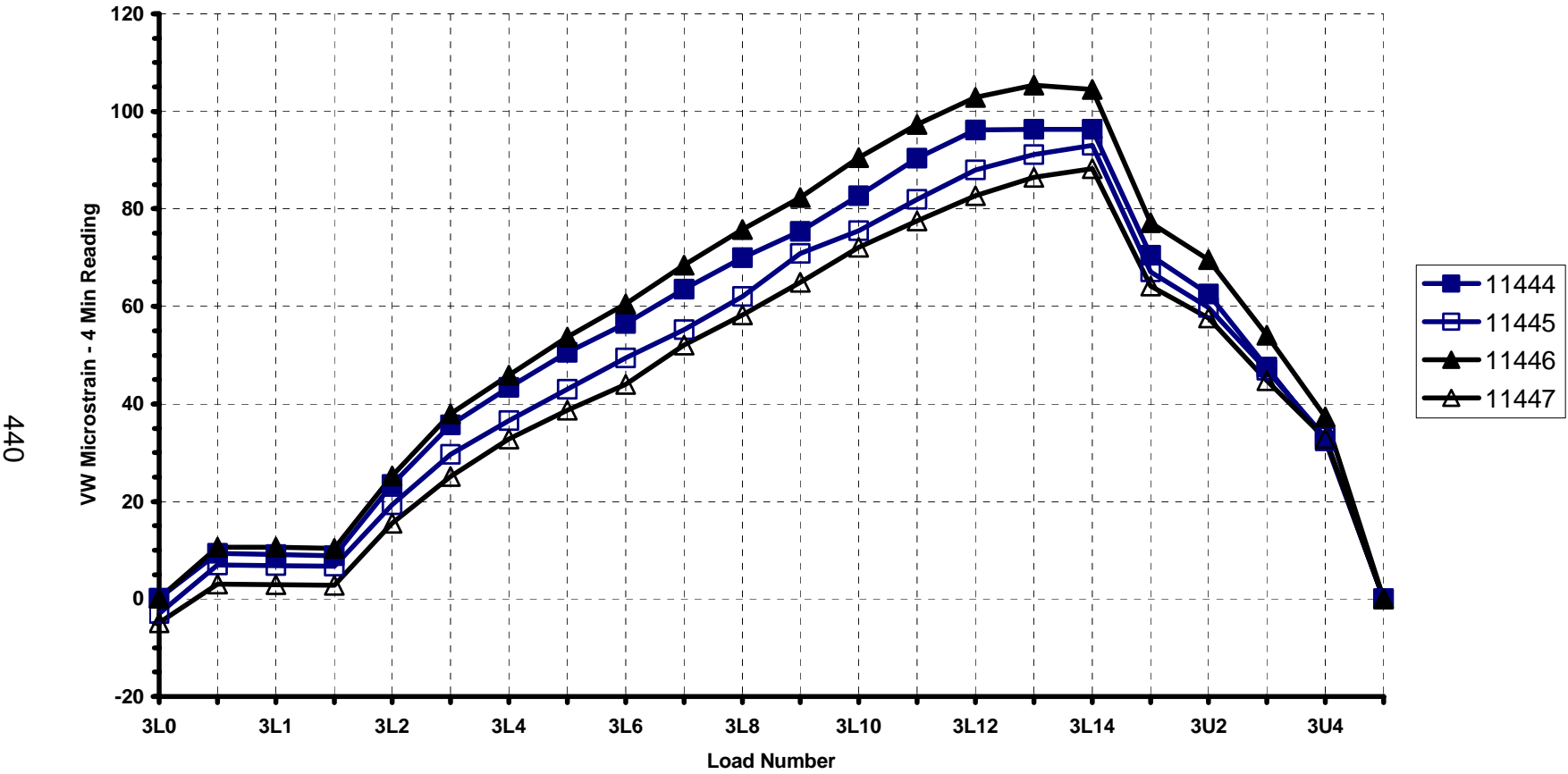


Figure L.3 Shaft Bottom VW Strain, Shaft 7 - 2002



440

Figure L.4 Shaft Top Shear Stress vs. Movement, Shaft 7 - 2002

441

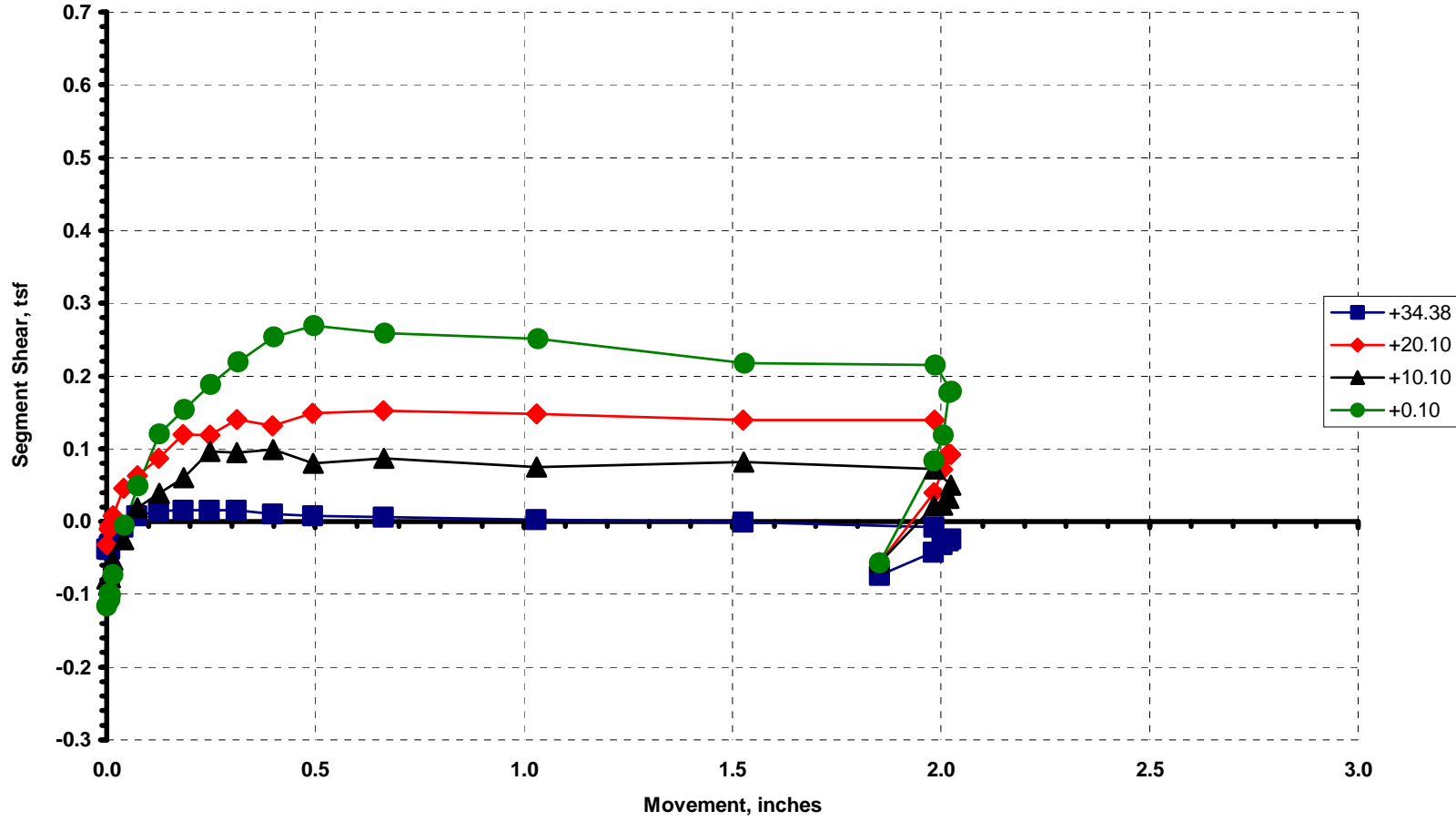


Figure L.5 Shaft Middle Shear Stress vs. Movement, Shaft 7 - 2002

442

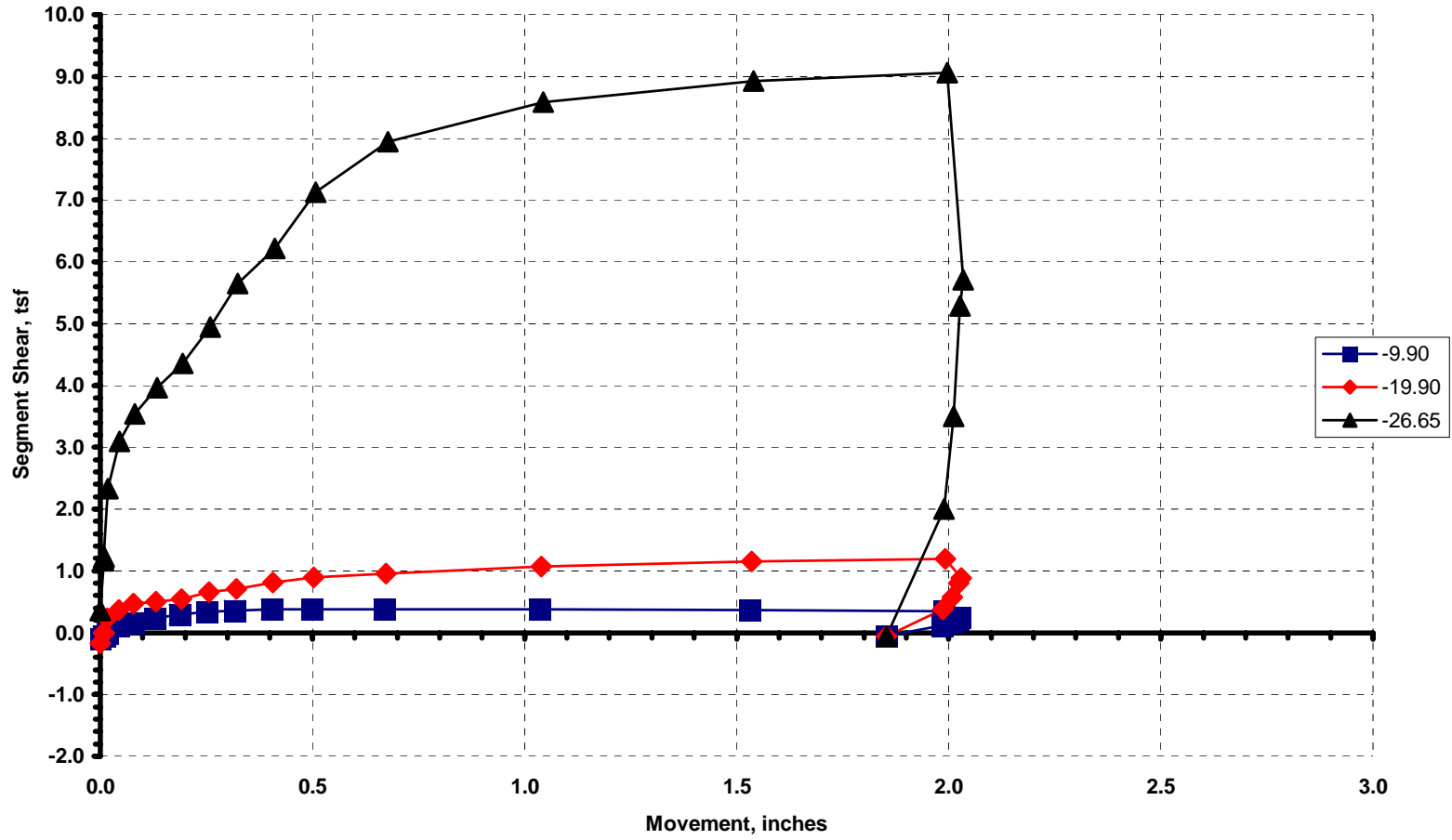


Figure L.6 Strain Distribution, Shaft 7 - 2002

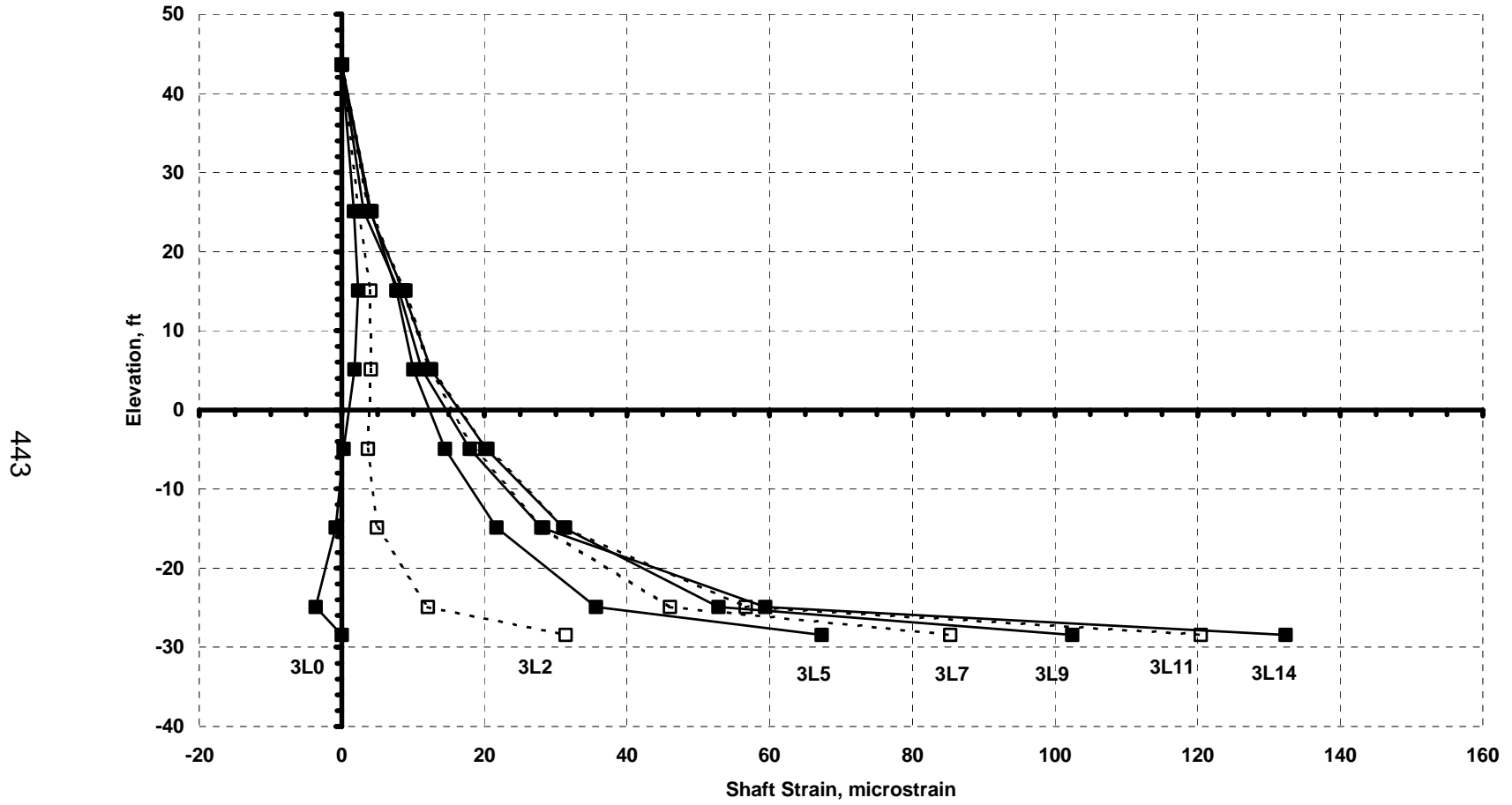
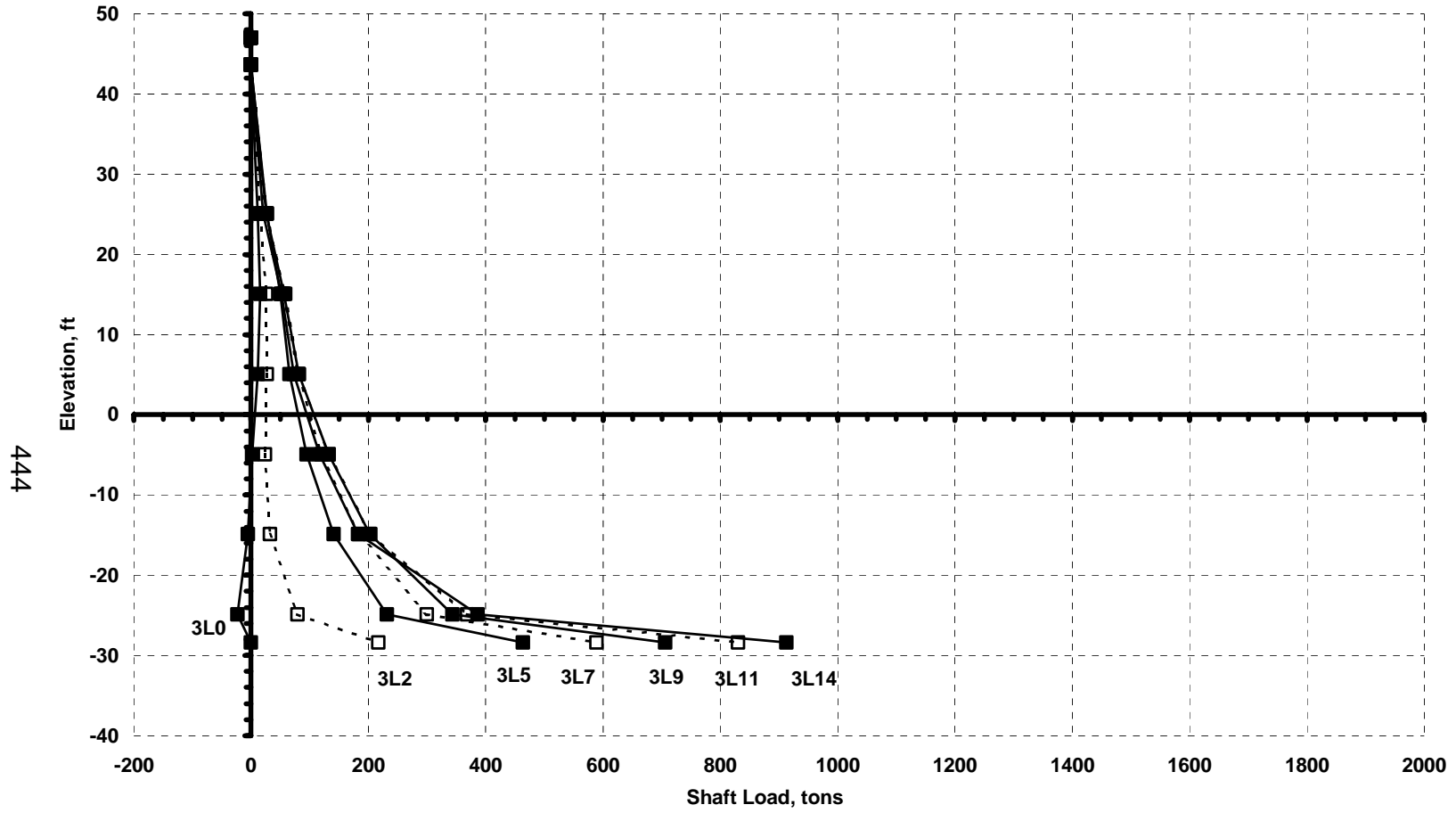


Figure L.7 Load Distribution, Shaft 7 - 2002



444

Figure L.8 Shear Stress Distribution, Shaft 7 - 2002

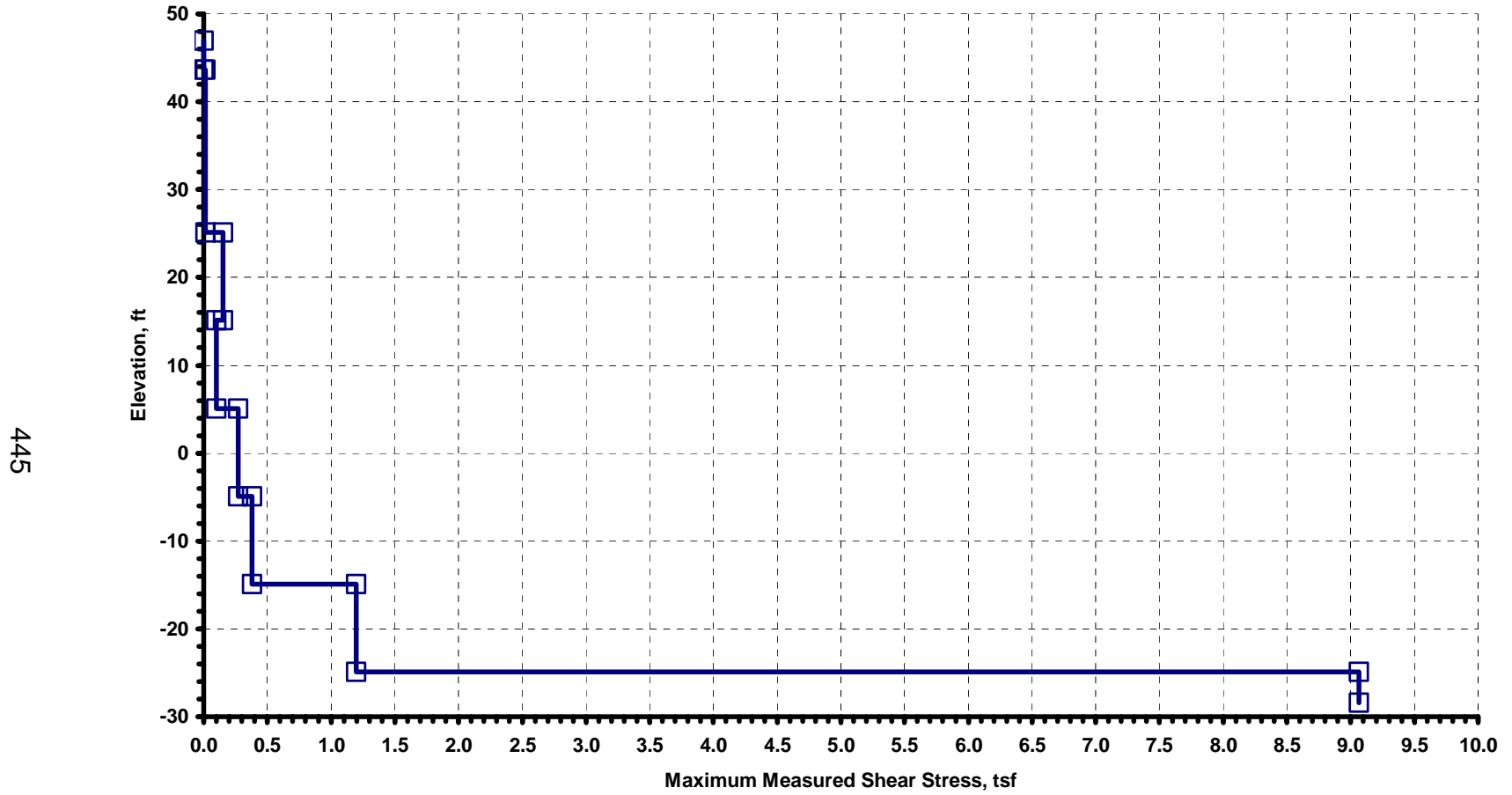


Figure L.9 Top of Shaft indicators vs Survey Level, Stage 3 - Shaft 7 - 2002

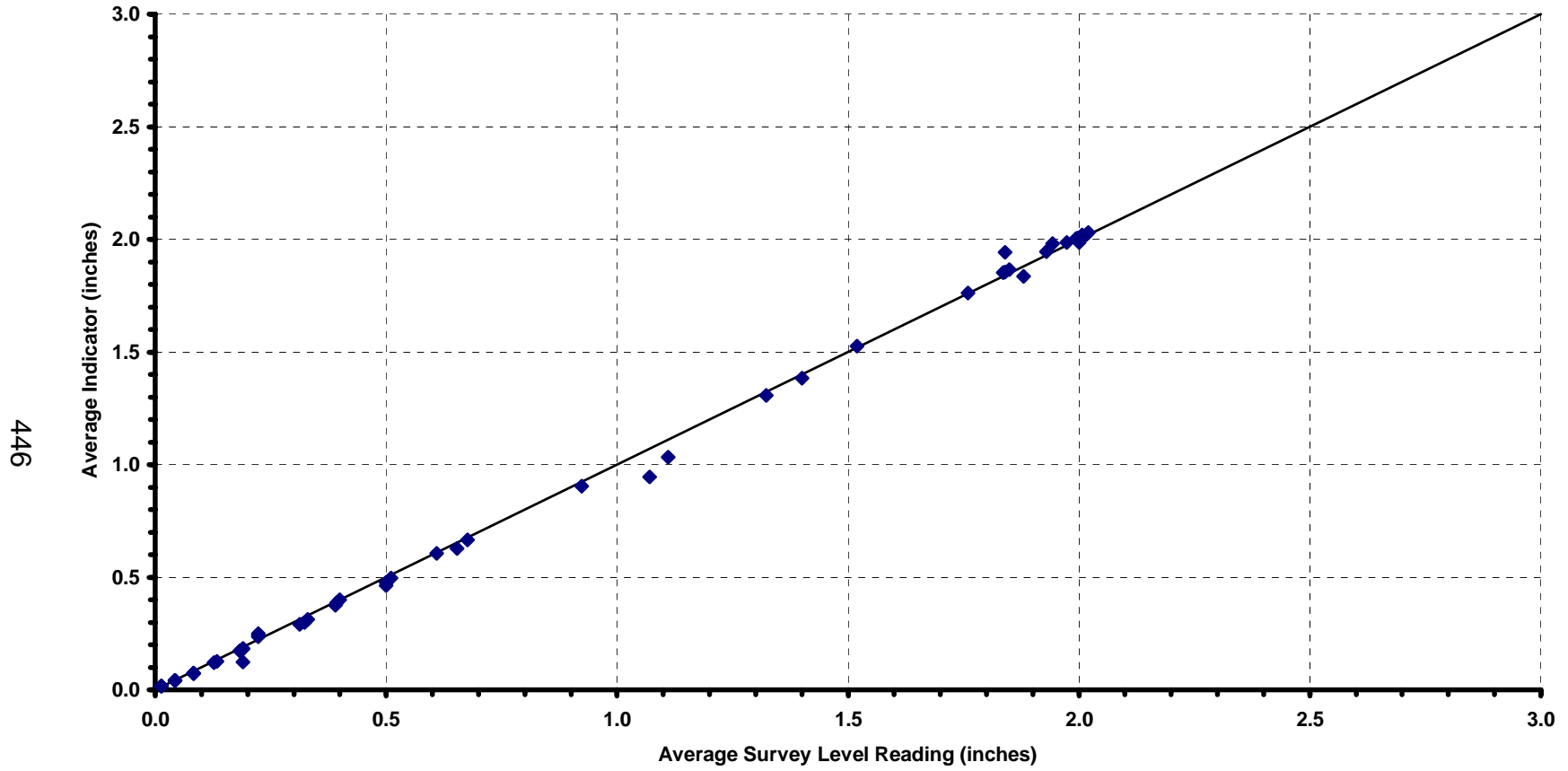


Figure L.10 Average Compression vs Load, Stage 3 - Shaft 7 - 2002

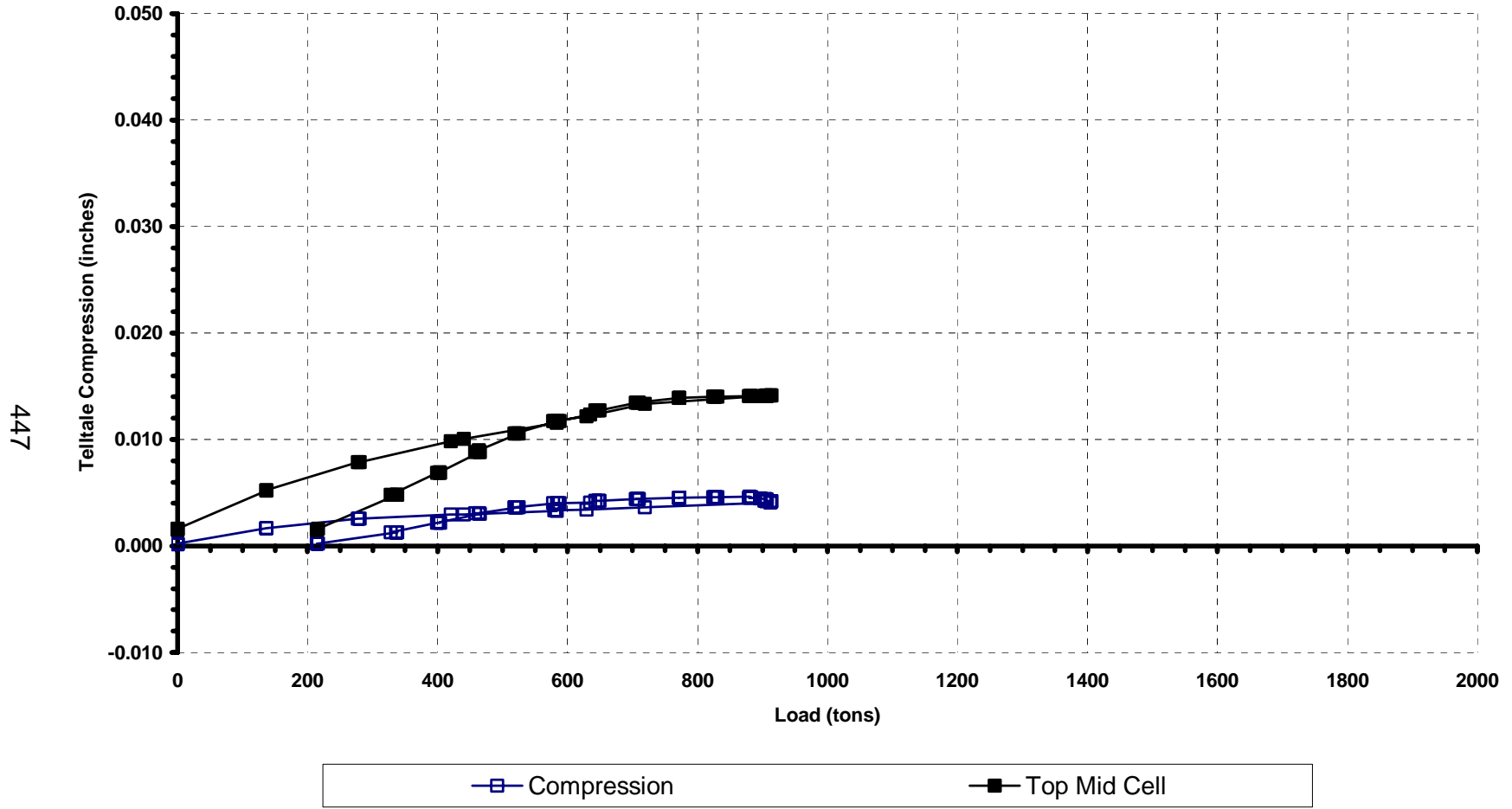


Figure L.11 Bottom Cell Movement, Stage 1 - Shaft 7 - 2002

448

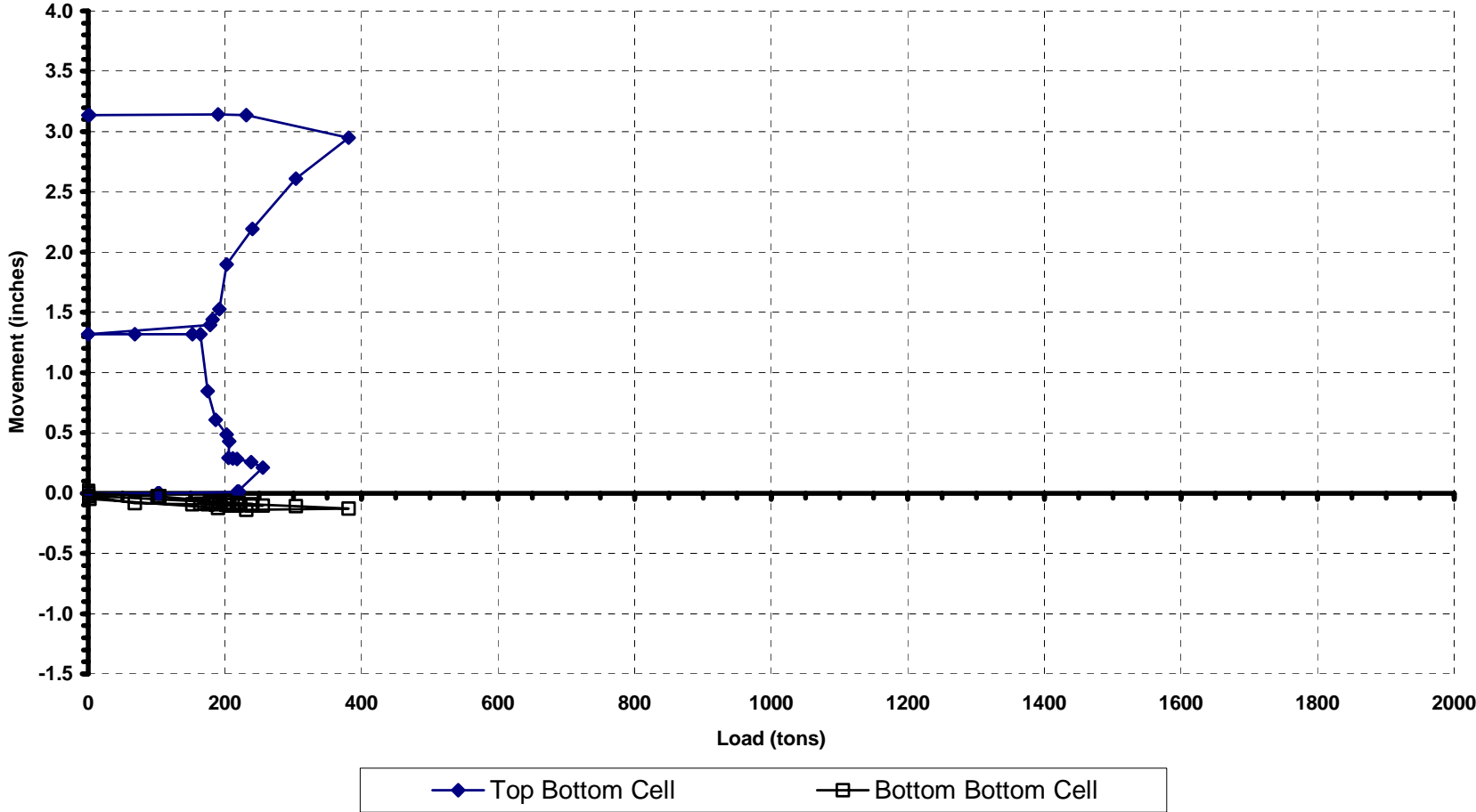
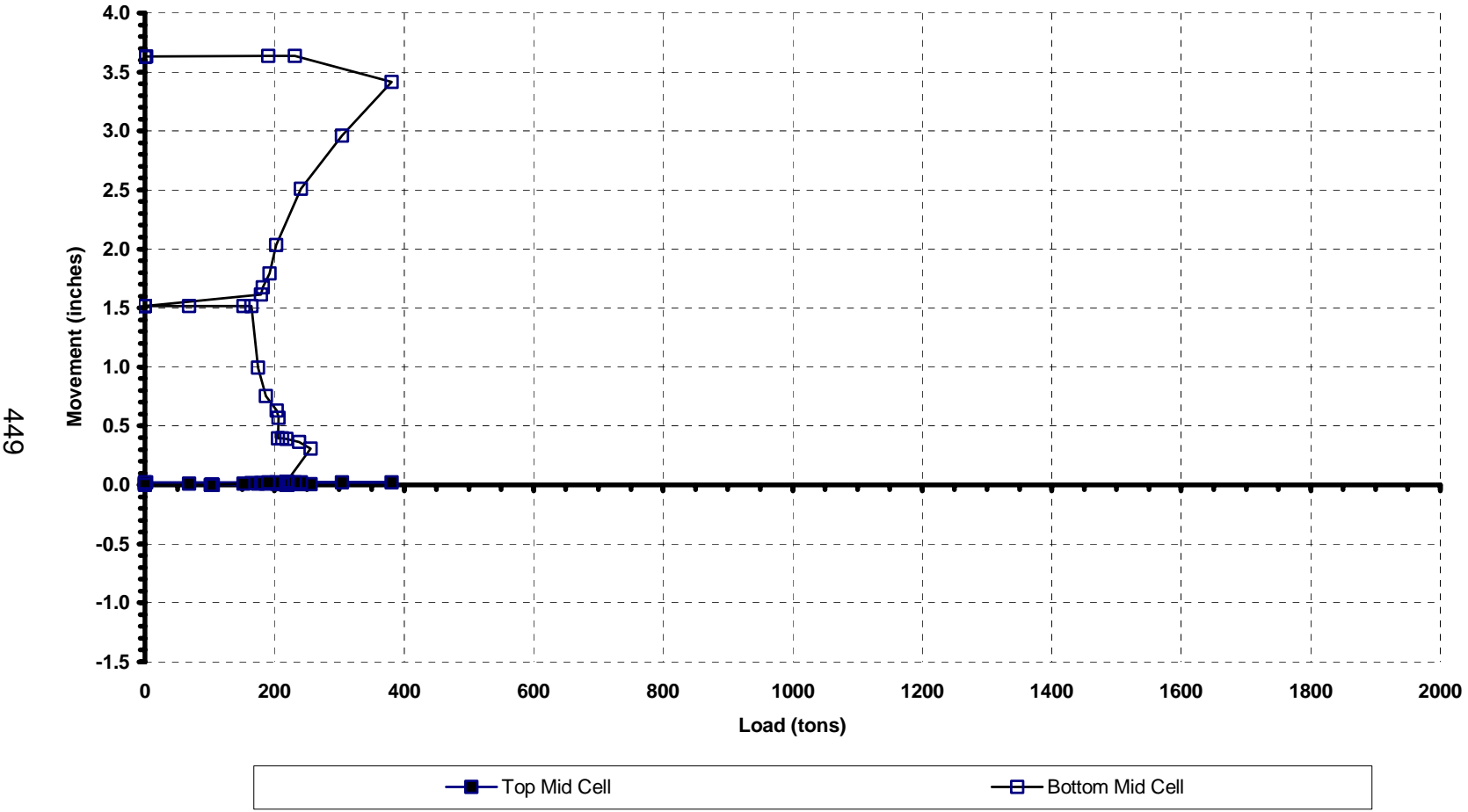


Figure L.12 Mid Cell Movement, Stage 1 - Shaft 7 - 2002



449

Figure L.13 Bottom Cell Movement, Stage 3 - Shaft 7 - 2002

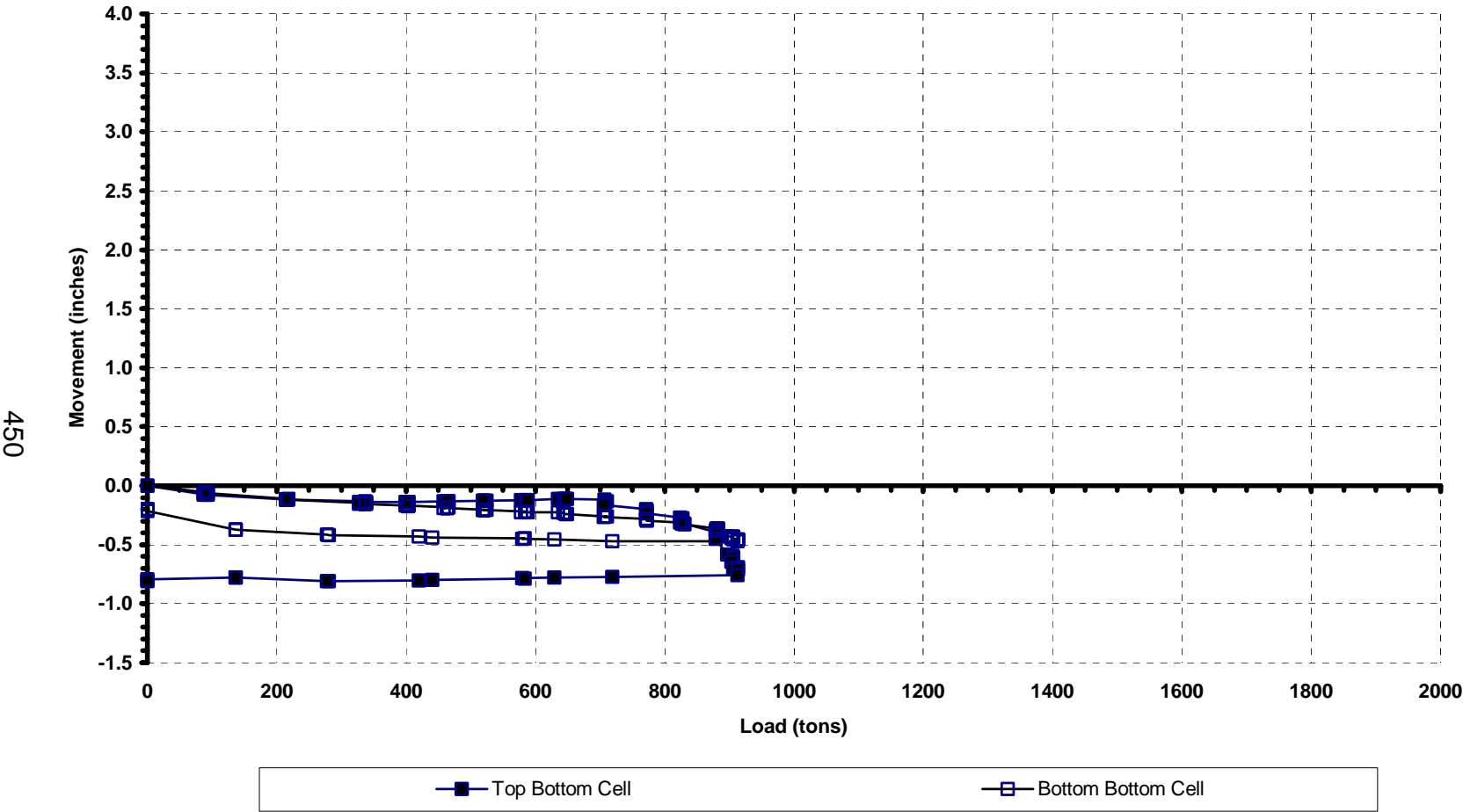


Figure L.14 Mid Cell Movement, Stage 3 - Shaft 7 - 2002

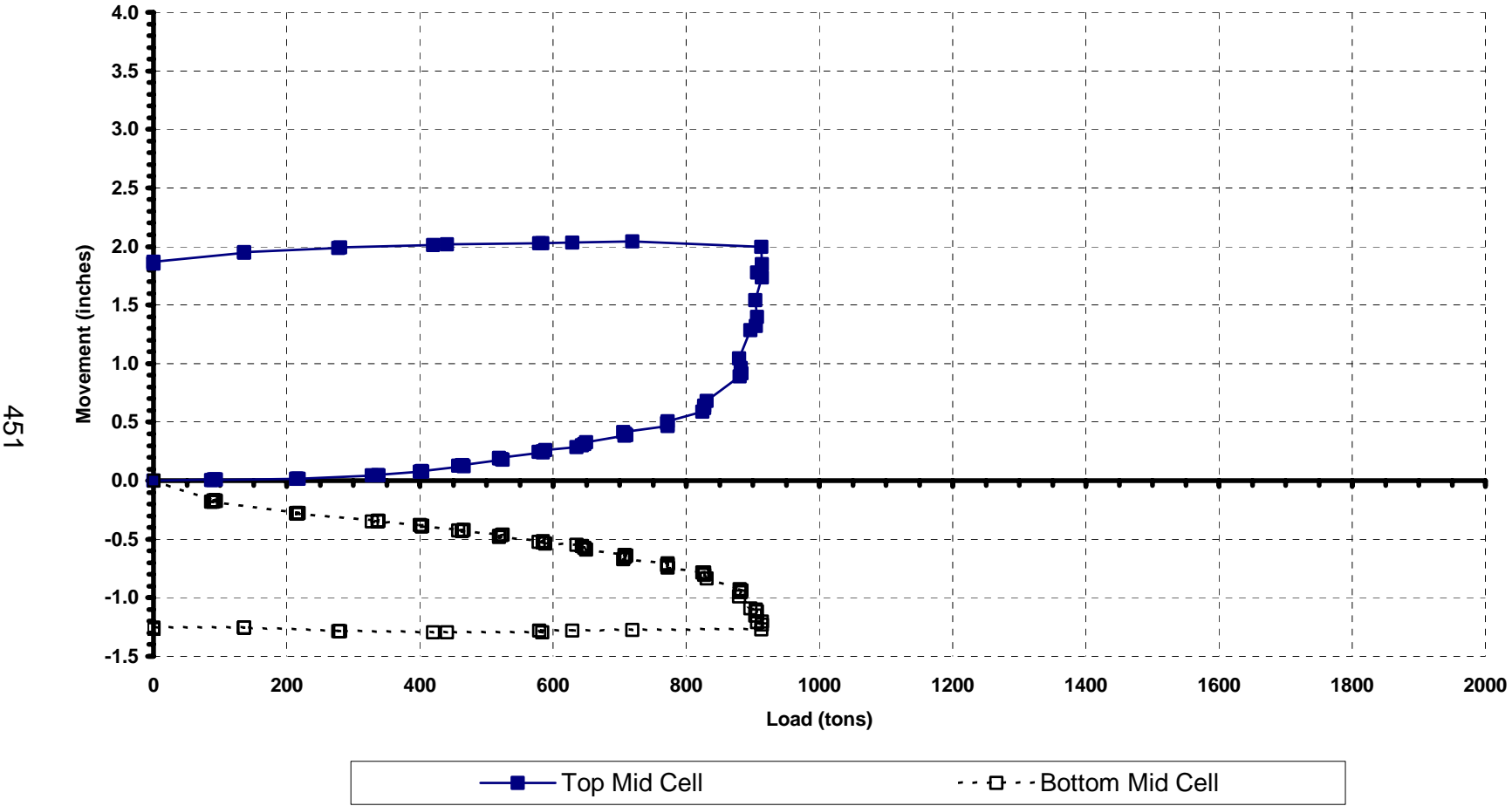
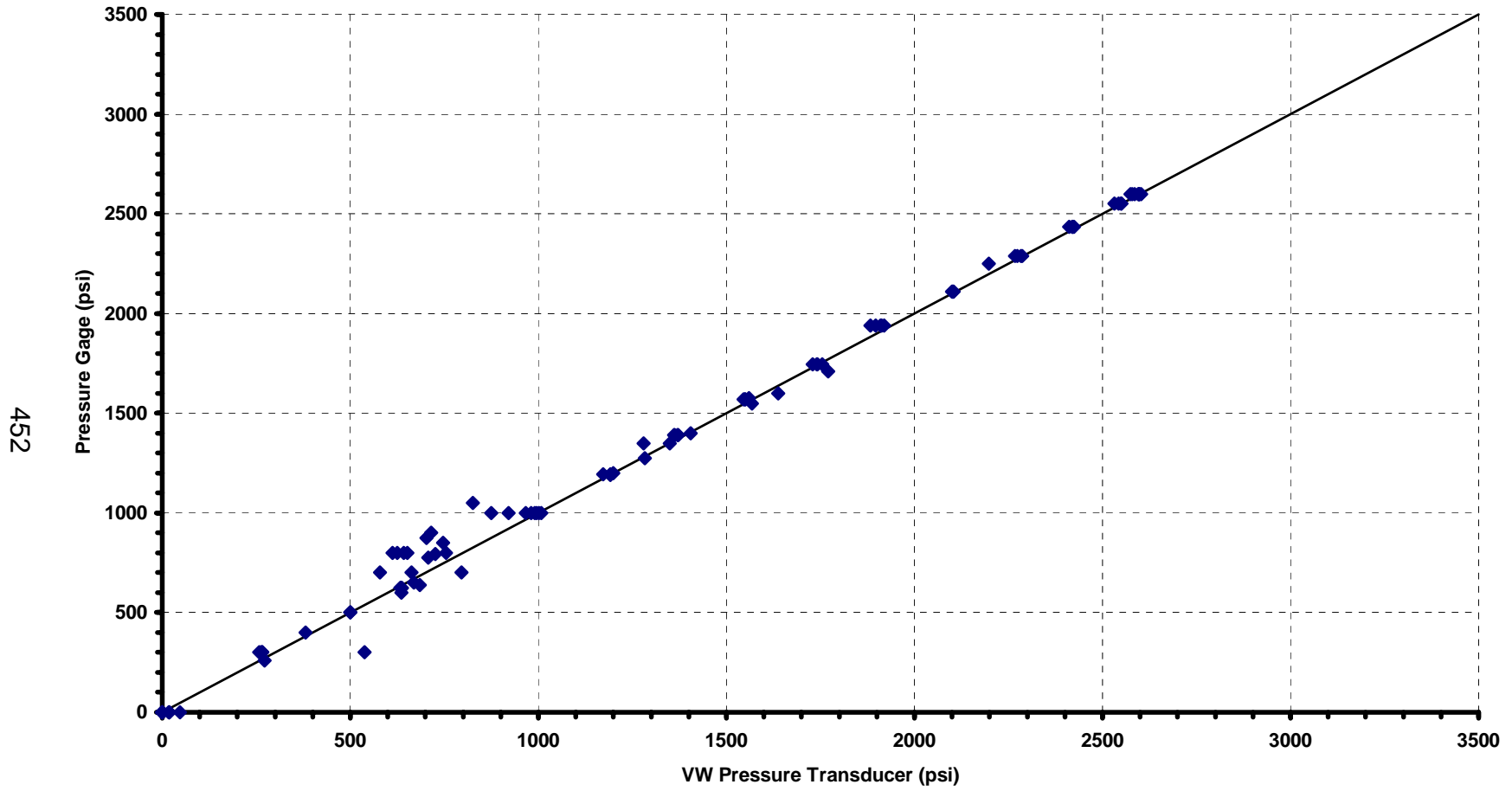
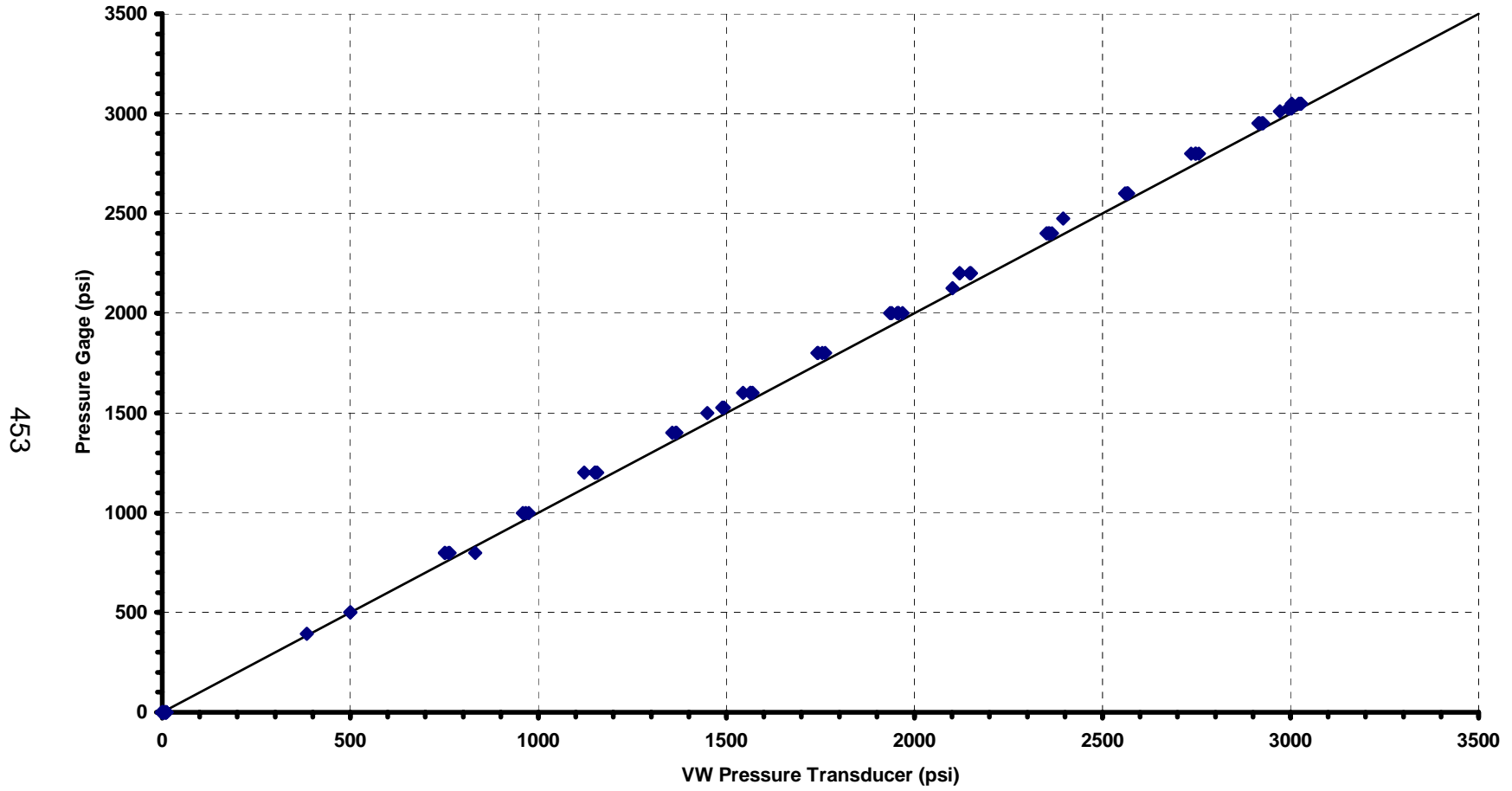


Figure L.15 VW Pressure Transducer vs Pressure Gage, Bottom Cell - Stage 1 - Shaft 7 - 2002



452

Figure L.16 VW Pressure Transducer vs Pressure Gage, Mid Cell - Shaft 7 - 2002



453