



## Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

---

### AC303 Post-Tension Anchorage Testing

712 W. Simonds Road., Suite A  
Seagoville, Texas 75159



---

### FINAL REPORT

June 18, 2020  
WJE No. 2019.6324

### PREPARED FOR:

P.T. Atlas  
712 W. Simonds Road., Suite A  
Seagoville, Texas 75159

### PREPARED BY:

Wiss, Janney, Elstner Associates, Inc.  
330 Pfingsten Road  
Northbrook, Illinois 60062  
847.272.7400 tel



## Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

---

### AC303 Post-Tension Anchorage Testing

712 W. Simonds Road., Suite A  
Seagoville, Texas 75159

A handwritten signature in black ink, appearing to read 'John Pearson'.

---

John Pearson SE, PE (IL)  
Principal and Laboratory Manager

---

#### **FINAL REPORT**

June 18, 2020  
WJE No. 2019.6324

#### **PREPARED FOR:**

P.T. Atlas  
712 W. Simonds Road., Suite A  
Seagoville, Texas 75159

#### **PREPARED BY:**

Wiss, Janney, Elstner Associates, Inc.  
330 Pfingsten Road  
Northbrook, Illinois 60062  
847.272.7400 tel



---

**CONTENTS**

**Introduction** ..... 1

**Scope of Work** ..... 1

**Basic Product Information** ..... 1

Product Description..... 1

Product Sampling..... 1

**Test Methods and Requirements** ..... 3

Strand Control Tests..... 3

Static Load Tests ..... 4

Fatigue Load Tests ..... 6

**Test Data and Results**..... 9

**Summary** ..... 11

**APPENDIX A. Product Drawings**

**APPENDIX B. Test Machine Calibrations**

**APPENDIX C. Strand Mill Certificate and Test Results**

**APPENDIX D. Anchorage Test Results**

## INTRODUCTION

At the request of P.T. Atlas (PTA), Wiss, Janney, Elstner Associates, Inc. (WJE) conducted testing services following procedures outlined in the International Code Council-Evaluation Services (ICC-ES) Acceptance Criteria AC303, *Acceptance Criteria for Post-Tensioning Anchorages and Couplers of Prestressed Concrete*. Testing summarized in this report was performed using a PTA AN5S (0.5S) post tension anchor with a 1.2-in two-piece wedge, AN5M (0.5M) post tension anchor with a 1.2-in two-piece wedge, and a splice chuck assembly (SC500TU).

## SCOPE OF WORK

The scope of work consisted of performing static and fatigue tests by WJE in accordance with AC303 for the PTA 0.5S post tension anchor with a 1.2-in two-piece wedge, 0.5M post tension anchor with a 1.2-in two-piece wedge, and SC500TU splice chuck assembly. All testing utilized Grade 270 low relaxation 7-wire strand. The following tasks were performed as part of the scope of work:

1. Random sampling of the strand anchorages splice chucks to be tested from the manufacturer's supply (*AC303 Section 2.4*)
2. Performing dimensional measurements to verify the anchorage generally conforms to the design drawings (*AC303 Section 2.3*)
3. Performing static tensile tests to determine the breaking strength of the strand (*AC303 Section 3.1*)
4. Performing static tensile tests of strand with the use of anchorages and splice chucks to determine the effect the anchorages have on the breaking strength of the strand (*AC303 Sections 3.2 and 4.1*)
5. Performing fatigue load tests of strand with the use of anchorages and splice chucks to determine the fatigue characteristics of the stand and anchorage system (*AC303 Sections 3.3 and 4.2*)

## BASIC PRODUCT INFORMATION

### Product Description

The PTA 0.5S (Figure 1) and 0.5M (Figure 2) post-tension anchor consists of a ductile iron anchor and two-piece wedge that grips the strand and used for end anchorages (stressing-end, fixed-end, or intermediate) depending upon the anchorage configuration utilized. The SC500TU splice chuck consists of a machined steel tube internally threaded at both ends, two-piece wedges and threaded cap ends (Figure 3). Appendix A contains drawings for the wedges and anchorages used for the anchorage test assembly.

### Product Sampling

All products for the testing program were sampled by WJE from a production sampling sent to WJE by PTA. The test sample dimensions were measured and compared to available production drawings. The measured dimensions generally agreed with the drawings (Appendix A).





Figure 1. P.T. Atlas AN5S (0.5S) post tension anchor with a 1.2-in two-piece wedge

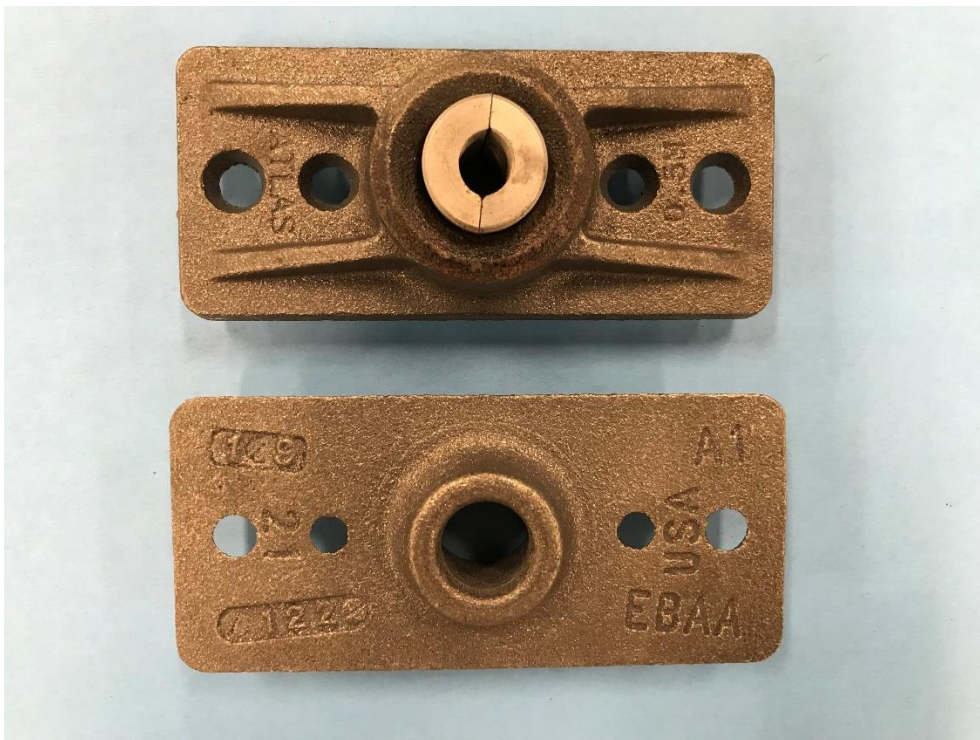


Figure 2. P.T. Atlas AN5M (0.5M) post tension anchor with a 1.2-in two-piece wedge



Figure 3. P.T. Atlas SC500TU splice chuck assembly

## TEST METHODS AND REQUIREMENTS

All static and fatigue testing of the strand and anchorages were conducted by WJE personnel at our structural laboratory in Northbrook, Illinois. Strand and anchorage static testing were performed in our Riehle universal test machine. Fatigue testing was performed using our Tinius Olsen fatigue-rated test machine. Test machine calibration records are included in Appendix B. All testing protocols followed WJE's Quality Manual. All test samples were assembled by WJE personnel from production components shipped to WJE prior to testing.

### Strand Control Tests

Representative strands were chosen from the samples provided to determine the actual breaking strength of the strand used for the static and fatigue tests. These tests were conducted in accordance with ASTM A1061, *Standard Test Methods for Testing Multi-Wire Steel Strand*, and results were compared to the requirement of ASTM A416, *Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete*.

Data were recorded and are included in Appendix C along with mill certificates and manufacturer reports for the strand used for testing. A total of three samples were tested and the results were averaged to determine the actual breaking strength to be used as a baseline for comparison to the anchorage test specimen static tests in general accordance with AC303, Section 3.1.

#### Static Load Tests

Three static load tests were performed using PTA 0.5S post tension anchor with two-piece wedge and three static tests were performed using strand on either side of SC50OTU splice chuck. Two static load tests were performed using PTA 0.5M post tension anchor with two-piece wedge at either end of a strand length, which in essence is testing two anchors for each test. The static load tests were performed in accordance with AC303 Section 4.1.

The strands used for the tests had a length of at least 42 in. between the end anchorages. The strand was at least 42-in on either end of the SC50OTU splice chuck. The actual distance between the end anchorages and splice chuck was measured prior to loading the samples. A baseline gage length, a minimum of 3 in. from each anchorage, was marked, measured and recorded prior to loading. Extensometers were used to measure strand elongation up to 1.2 percent elongation then removed to prevent damage at failure. Test machine head travel was used after the extensometers were removed for determining the total elongation of strand at maximum load. Load and elongation data were recorded for each test.

During the test, the end anchorage was bearing on the outward-facing side of the top head of the test machine (Figure 4). For the 0.5S anchors, strand was inserted into the end anchorage and passed through the top head of the test machine and gripped in the test machine bottom head. For the 0.5M anchors, anchors were bearing on the top and bottom head of the test machine (Figure 5). Testing of the SC50OTU splice chuck consisted of strand inserted into either end of the splice chuck and the opposite ends gripped by the test machine top and bottom crossheads.

In accordance with AC303 Section 3.2.2, each test assembly was considered to pass when 1) the failure load of the strand exceeded 95 percent of the actual breaking strength of the strand and 2) the strand elongations at failure were at least 2 percent.





Figure 4. PTA 0.5S end anchorage at test machine top head



Figure 5. PTA 0.5M end anchorage at test machine top head

#### Fatigue Load Tests

Fatigue load tests were performed using either PTA 0.5S end anchorages on either end with a SC500TU splice chuck at mid-length, or with PTA 0.5M end anchorages on either end. Tests were performed in general accordance with AC303 Section 4.2.

The test configuration for the 0.5S end anchorage with SC500TU splice chuck consisted of an anchorage on both ends and an approximate total strand length of 70-in. One end of the test sample was connected to a reinforced steel reaction fixture that was gripped by the test machine (Figure 6) and the opposite end was supported by the outward-facing side of the test machine upper crosshead (Figure 7). The SC500TU was at mid-length of the test assembly (Figure 8).

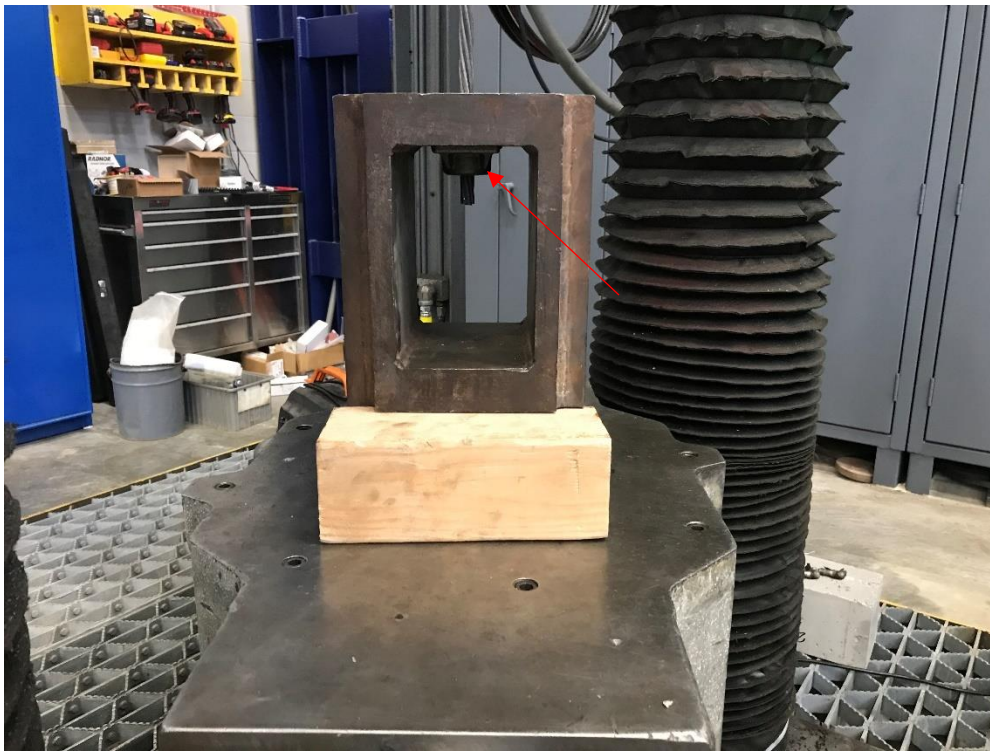


Figure 6. PTA 0.5S end anchorage in reinforced reaction fixture in test machine bottom grip





Figure 7. PTA 0.5S end anchorage bearing on test machine upper crosshead



Figure 8. PTA SC500TU splice chuck at mid-length of test assembly

The test setup for the 0.5M end anchorage consisted of an anchorage on both ends and an approximate total strand length of 70-in. One end of the test sample was connected to a reinforced steel reaction fixture that was gripped by the test machine (Figure 9) and the opposite end was supported by the outward-facing side of the test machine upper crosshead (Figure 10).



Figure 9. PTA 0.5M end anchorage in reinforced reaction fixture in test machine bottom grip



Figure 10. PTA 0.5M end anchorage bearing on test machine upper crosshead

The first fatigue load test consisted of 500,000 cycles with a cycle frequency of 1.5 Hz. The load range of cycling was specified to be between 60 and 66 percent of the strand’s minimum specified breaking strength of 41,300 lbf (24,780 lbf to 27,260 lbf). The hydraulic actuator limits were programmed between 24,700 lbf and 27,400 lbf to ensure the specified load range was achieved. Data for the 500,000-cycle fatigue test was recorded on a per cycle basis. Recorded data included maximum force and minimum force per cycle.

At the completion of the 500,000 cycles, 50 cycles with a cycle frequency of 1 Hz was performed with a load range of cycling between 40 and 85 percent of the strand’s minimum specified breaking strength of 41,300 lbf (16,520 lbf to 35,105 lbf). The hydraulic actuator limits were programmed between 16,400 lbf and 35,200 lbf to ensure the specified load range was achieved. Recorded data included applied maximum and minimum force for each cycle.

At the conclusion of the testing, the anchorage configuration was deemed to pass if neither the strand nor an anchorage failed during any part of the fatigue tests.

**TEST DATA AND RESULTS**

The results from the strand control tests are tabulated in Table 1. The strand used for testing the anchorage assemblies met the minimum ultimate tensile capacity requirements listed in ASTM A416.



Table 1. Summary of 0.5-in, 270ksi, 7-Wire Strand Control Tests

Test Number	Weight (g)	Length (in.)	Area (in <sup>2</sup> )	Load at 1% Elongation (lbf)	Ultimate Load (lbf)	Elongation at Failure Load (%)
05-1	232.8	12.020	0.150	37,510	41,520	6.64
05-2	232.8	12.020	0.150	37,600	41,640	6.78
05-3	232.8	12.020	0.150	37,740	41,690	6.55
Average				37,615	41,615	6.66

The results from the static load tests and fatigue load tests are tabulated in Table 2 and Table 3, respectively. Included in each table is a summary for each test. The load-elongation plots for the static testing and the load-cycle plots for the fatigue testing are included in Appendix D. All samples passed the requirements outlined in AC303 Sections 3.2.2 and 3.3.2.

Table 2. Summary of Static Load Tests - PTA 0.5S End Anchorage, 0.5M End Anchorage, and SC50OTU Splice Chuck

Test Number	Material Type	Total Elongation <sup>1, 2</sup> (%)	Ultimate Load (lbf)	95% of Control Strand Ultimate Load (lbf)	Pass/Fail
05S-A1	PTA 0.5S end Anchorage	4.29	40,220	39,535	Pass
05S-A2	PTA 0.5S end Anchorage	4.89	40,920	39,535	Pass
05S-A3	PTA 0.5S end Anchorage	4.73	40,620	39,535	Pass
05M-A1	PTA 0.5M end Anchorage	3.85	40,690	39,535	Pass
05M-A2	PTA 0.5M end Anchorage	3.85	40,690	39,535	Pass
05M-A3	PTA 0.5M end Anchorage	3.88	41,010	39,535	Pass
05M-A4	PTA 0.5M end Anchorage	3.88	41,010	39,535	Pass
05-C1	PTA SC50OTU	3.55/3.55	40,430	39,535	Pass
05-C2	PTA SC50OTU	4.41/4.41	41,110	39,535	Pass
05-C3	PTA SC50OTU	2.88/2.93	39,720	39,535	Pass

Note 1: Total elongation to be greater than 2 percent

Note 2: top strand / bottom strand elongation

Table 3. Summary of Fatigue Load Tests - PTA 0.5S Anchorage and SC500TU Splice Chuck, and 0.5M Anchorage

Test Number	Test Configuration	Load Test (Cycles)	Load Range		Pass/Fail
			Min (lbf)	Max (lbf)	
051220-1	PTA 0.5S End Anchorage and SC500TU Splice Chuck	500,000	24,700	27,400	Pass
051620-1	PTA 0.5S End Anchorage and SC500TU Splice Chuck	50	16,400	35,200	Pass
052120-2	PTA 0.5S End Anchorage and SC500TU Splice Chuck	500,000	24,700	27,400	Pass
052520-2	PTA 0.5S End Anchorage and SC500TU Splice Chuck	50	16,400	35,200	Pass
060920-1	PTA 0.5M End Anchorage	500,000	24,700	27,400	Pass
060920-2	PTA 0.5M End Anchorage	500,000	24,700	27,400	Pass
061420-1	PTA 0.5M End Anchorage	50	16,400	35,200	Pass
061420-2	PTA 0.5M End Anchorage	50	16,400	35,200	Pass

**SUMMARY**

The anchorage assembly static test results consisting of PTA 0.5S end anchorage and PTA SC500TU splice chuck exceeded 95 percent of the actual strand tensile strength and achieved a total strand elongation greater than 2 percent. The anchorage assembly consisting of PTA 0.5M end anchorage exceeded 95 percent of the actual strand tensile strength and achieved a total strand elongation greater than 2 percent. The anchorage assembly consisting of PTA 0.5S end anchorage and PTA SC500TU splice chuck successfully completed the fatigue test requirements. The anchorage assembly consisting of PTA 0.5M end anchorage successfully completed the fatigue test requirements. All of the anchorage configurations listed in Table 2 and Table 3 passed the requirements outlined in AC303 Sections 3.2.2 and 3.3.2.



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## APPENDIX A. PRODUCT DRAWINGS



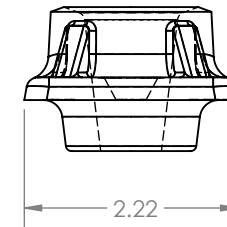
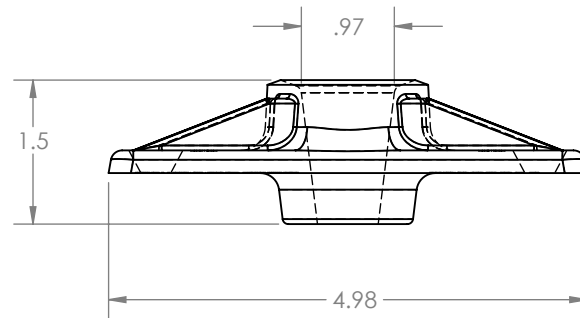
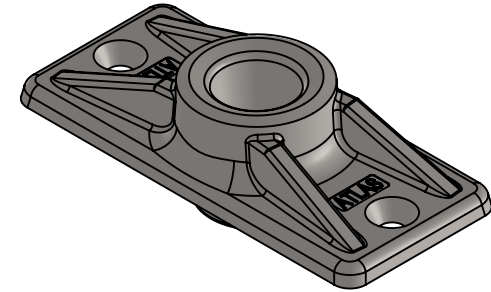
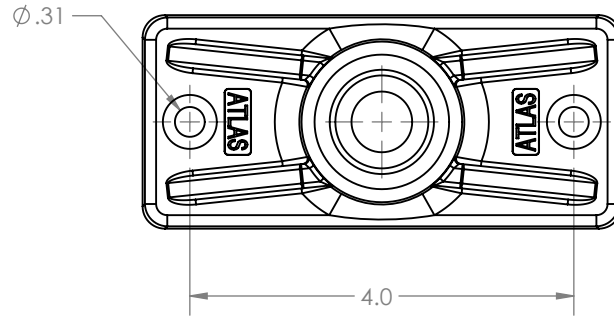
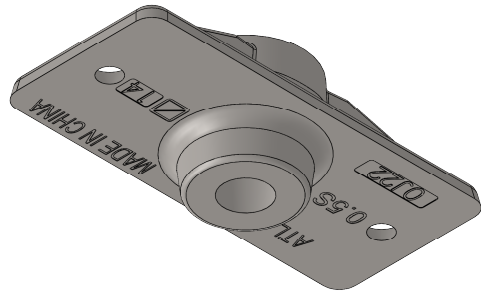
# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## AN5S Anchorage

REV	CHANGED BY	CHKD	REVISION	DATE
A	NM	NM	NEW RELEASE	4/10/2020



TOLERANCES EXCEPT AS NOTED:  
 DECIMAL:           ANGULAR: ±2°  
 X.X = ±.032       FRACTIONAL: ±1/32  
 X.XX = ±.025  
 X.XXX = ±.010

**P.T. ATLAS**  
**MANUFACTURING**

712A W SIMONDS RD SEAGOVILLE, TX 75159

MATERIAL: SEE NOTES  
 DRAWN ON: 4/10/2020  
 DRAWN BY: NM  
 SCALE: 1:2 | SHEET SIZE: A | SHEET: 1 OF 1

DESCRIPTION:  
 P.T. ATLAS, ANCHOR, BARE,  
 0.5S

PART NO: **AN5S**      REV **A**

PREVIOUS PART NUMBER: ATLAS0.5S



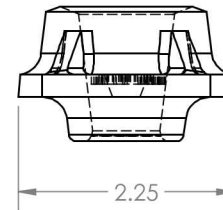
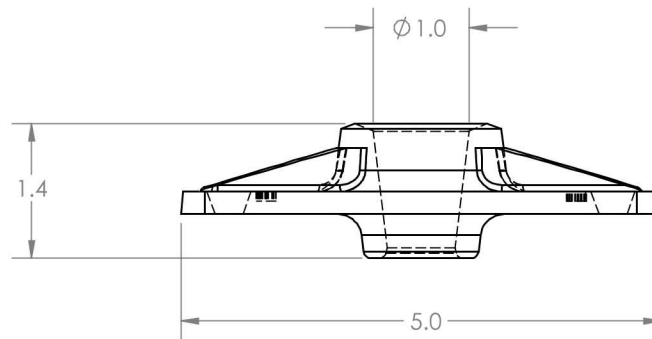
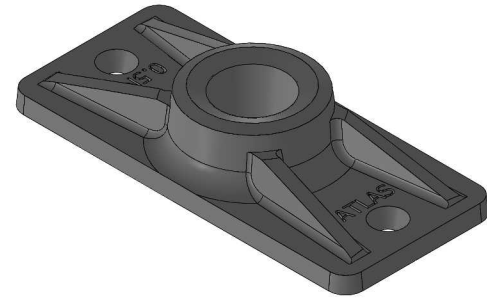
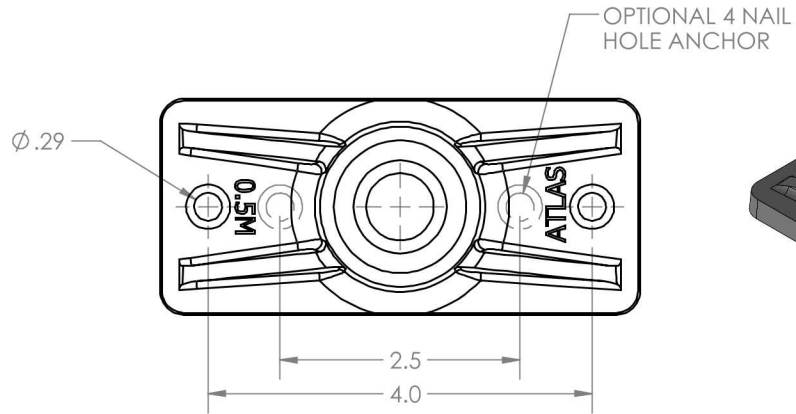
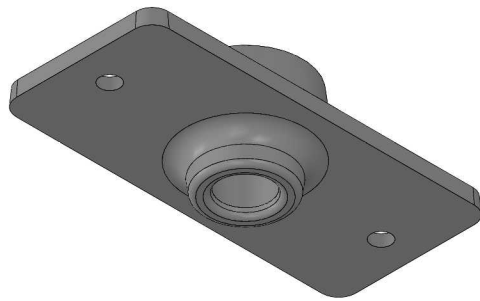
# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## AN5M Anchorage

REV	CHANGED BY	CHKD	REVISION	DATE
A	NM	NM	NEW RELEASE	4/20/2020



ORDERED AS AN5M

TOLERANCES EXCEPT AS NOTED:  
 DECIMAL:           ANGULAR: REF. ONLY  
 X.X = REF. ONLY   FRACTIONAL: REF. ONLY  
 X.XX = REF. ONLY  
 X.XXX = REF. ONLY

**P.T. ATLAS**  
**MANUFACTURING**  
 712A W SIMONDS RD SEAGOVILLE, TX 75159

MATERIAL: 80-55-06 DUCTILE IRON  
 DRAWN ON: 4/20/2020  
 DRAWN BY: NM  
 SCALE: 1:2    SHEET SIZE: A    SHEET: 1 OF 1

DESCRIPTION:  
 P.T. ATLAS, ANCHOR, BARE,  
 0.5M, DIMENSIONAL DRAWING  
 PART NO:  
**AN5MSD**  
 REV  
**A**

PREVIOUS PART NUMBER: ATLAS0.5M



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

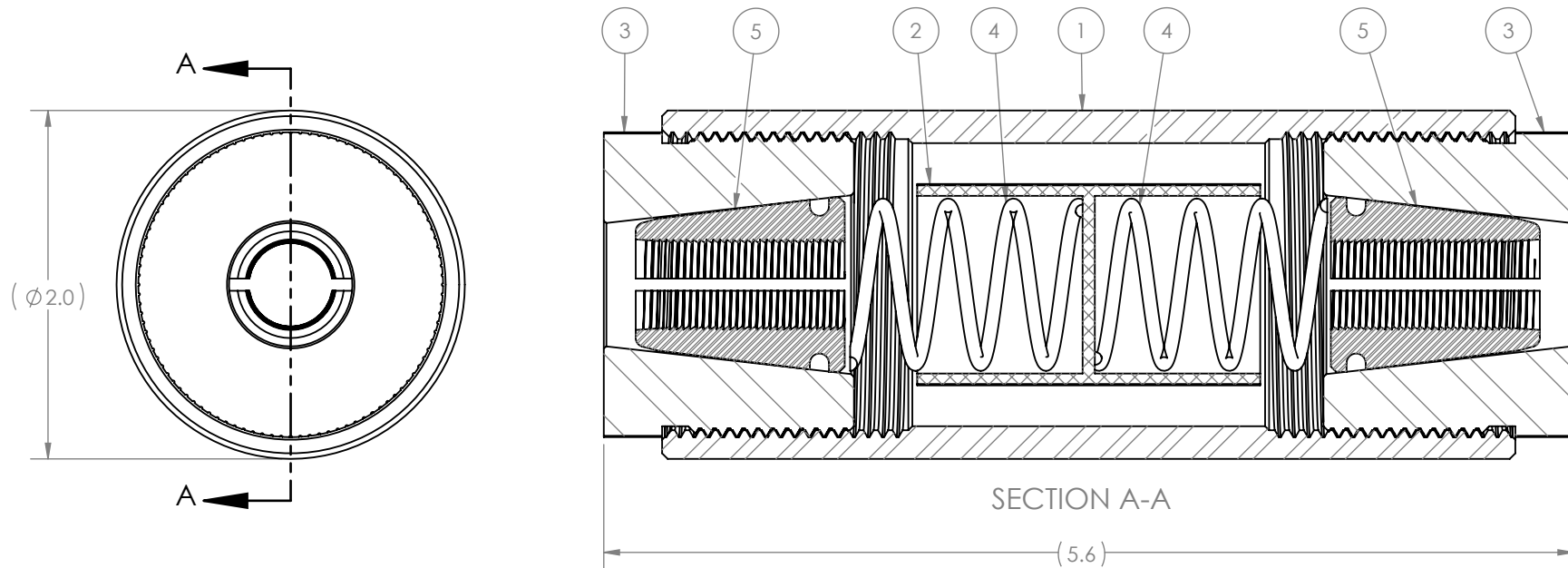
---

## SC500TU Splice Chuck



REV	CHANGED BY	CHKD	REVISION	DATE
A	NM	NM	NEW RELEASE	3/1/2020

PREVIOUS PART NUMBER: 400105



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	SC001	SPLICE CHUCK TUBE	1
2	SC002	PLASTIC BUSHING	1
3	SC003	CHUCK END	2
4	SC004	SPLICE CHUCK SPRING	2
5	WG50122RM	P.T. ATLAS 2PC WEDGE W/RING	2

TOLERANCES EXCEPT AS NOTED:  
 DECIMAL: ANGULAR:  $\pm 2^\circ$   
 X.X =  $\pm 0.032$  FRACTIONAL:  $\pm 1/32$   
 X.XX =  $\pm 0.010$   
 X.XXX =  $\pm 0.005$



MATERIAL: N/A - ASSEMBLY  
 DRAWN ON: 3/1/2020  
 DRAWN BY: NM  
 SCALE: 1:1 SHEET SIZE: A SHEET: 1 OF 1

DESCRIPTION:  
**SPLICE CHUCK ASSY (2PC WEDGE)**  
 PART NO: **SC500TU** REV **A**



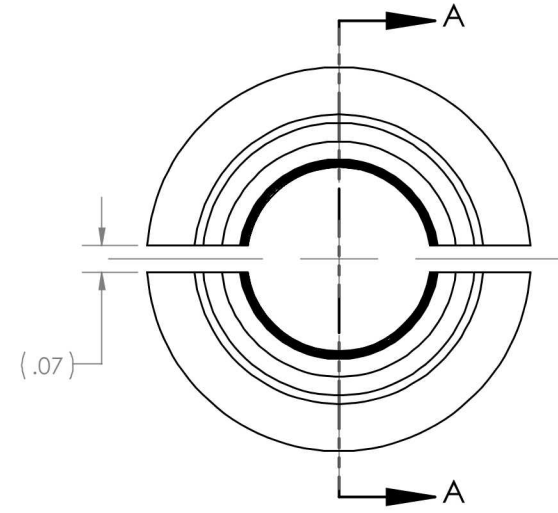
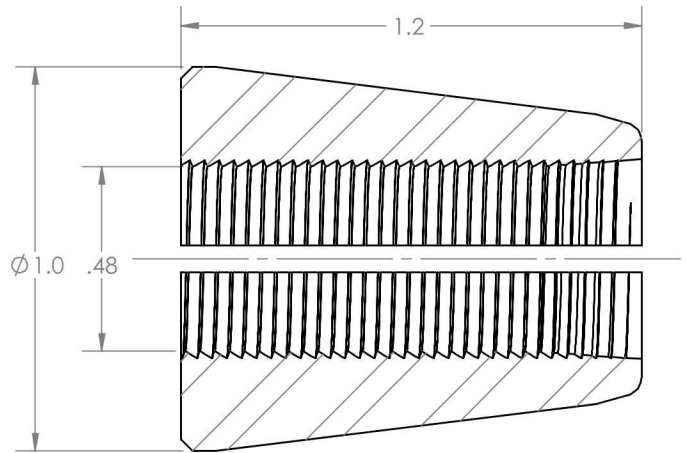
# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

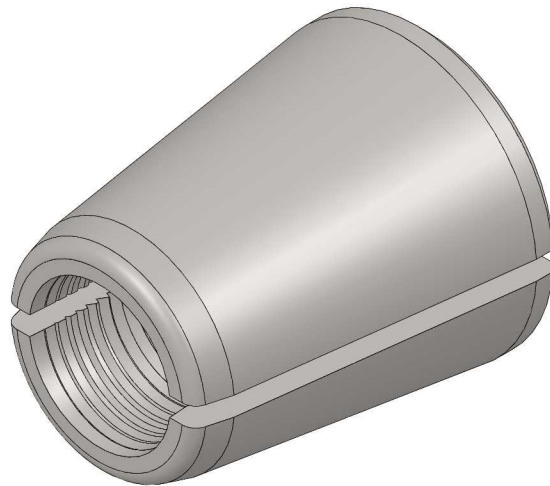
---

## 1.2-in Two-Piece Wedge

REV	CHANGED BY	CHKD	REVISION	DATE
A	NM	NM	NEW RELEASE	4/1/2020



SECTION A-A



ORDERED AS  
WG50122

TOLERANCES EXCEPT AS NOTED:  
 DECIMAL:           ANGULAR: REF. ONLY  
 X.X = REF. ONLY   FRACTIONAL: REF. ONLY  
 X.XX = REF. ONLY  
 X.XXX = REF. ONLY

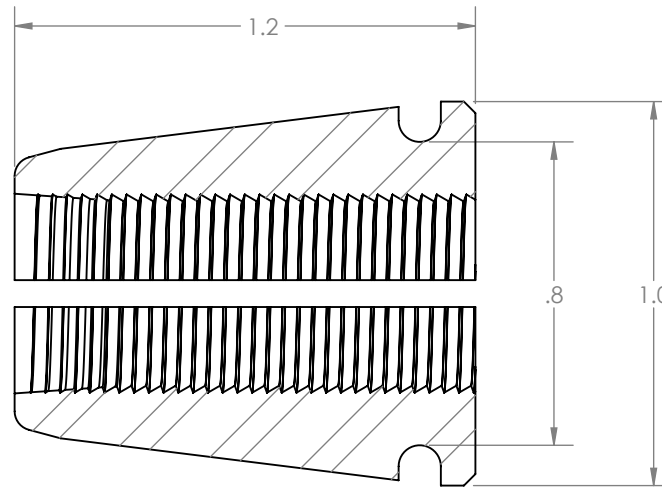
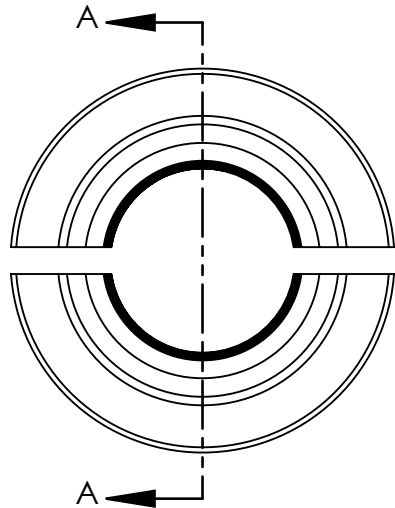
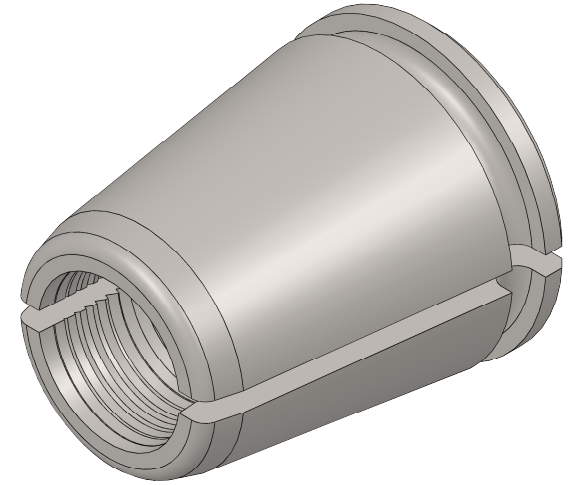
**P.T. ATLAS**  
MANUFACTURING

712A W SIMONDS RD SEAGOVILLE, TX 75159

MATERIAL: 12L14 OR 12L15		DESCRIPTION: P.T. ATLAS 1.2 2PC WEDGE DIMENSIONAL DRAWING	
DRAWN ON: 4/1/2020		PART NO:	
DRAWN BY: NM		WG50122SD	
SCALE: 2:1	SHEET SIZE: A	SHEET: 1 OF 1	REV <b>A</b>

PREVIOUS PART NUMBER: 401012

REV	CHANGED BY	CHKD	REVISION	DATE
A	NM	NM	NEW RELEASE	4/28/2020



SECTION A-A

TOLERANCES EXCEPT AS NOTED:

DECIMAL:            ANGULAR: REF. ONLY  
X.X = REF. ONLY    FRACTIONAL: REF. ONLY  
X.XX = REF. ONLY  
X.XXX = REF. ONLY

**P.T. ATLAS**  
**MANUFACTURING**

712A W SIMONDS RD SEAGOVILLE, TX 75159

MATERIAL: 12L14 OR 12L15

DRAWN ON: 4/28/2020

DRAWN BY: NM

SCALE: 2:1    SHEET SIZE: A    SHEET: 1 OF 1

DESCRIPTION:  
**P.T. ATLAS 2PC WEDGE**  
**W/RING**

PART NO:  
**WG50122RM**    REV  
**A**

PREVIOUS PART NUMBER: 1.2 GROOVE



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## APPENDIX B. TEST MACHINE CALIBRATIONS



1795-A W. Cortland Ct. P: (630)613-9350  
 Addison, IL 60101 [www.GreatLakesCalibration.com](http://www.GreatLakesCalibration.com)  
**Your Guide To Quality Control**



# Calibration Certificate

**Certificate #:** 20173-18

This calibration was performed on-site at the address below for:

**WISS JANNEY ELSTNER ASSOCIATES INC**  
 330 PFINGSTEN ROAD  
 NORTHBROOK, IL 60062

**Date of Calibration:** Friday, March 6, 2020  
**Calibration Interval:** 12 - Months  
**Calibration Due Date:** 3/6/2021  
**Purchase Order:** 00985  
**Condition Received:** Within Tolerance  
**Condition Returned:** Within Tolerance

Equipment Information			
<b>Manufacturer:</b>	RIEHLE	<b>External Cell Mfg:</b>	N/A
<b>Model Number:</b>	500FH	<b>External Cell Model:</b>	N/A
<b>Serial Number:</b>	0258347-458	<b>External Cell Serial:</b>	N/A
<b>Asset ID:</b>	N/A	<b>External Cell Asset ID:</b>	N/A
<b>Work instruction:</b>	MECH-001	<b>Calibration Direction:</b>	COMPRESSION
<b>Revision:</b>	Rev-05	<b>Calibration Device:</b>	E-74 LOAD CELL
<b>Specification:</b>	ASTM E4-16	<b>Calibration Method:</b>	FOLLOW THE FORCE
<b>Description:</b>	500,000-LB Test Frame		
		<b>Display Mfg:</b>	N/A
		<b>Display Model #:</b>	N/A
		<b>Display Serial #:</b>	N/A
		<b>Software Version:</b>	N/A
		<b>Temp / Hum:</b>	70.6°F / 21 %RH
		<b>Technician:</b>	Robert Southern
		<b>Page:</b>	1 of 2

The data contained within this report pertains only to the item(s) as described above and shall not be reproduced or distributed without prior written consent from Great Lakes Calibration, Inc. The calibration was performed in accordance with the most current revision of work instruction MECH-001 (which is based off the requirements of ASTM E-4) and the governing specification listed above and is compliant with ISO/IEC 17025:2005, ANS/NCSL Z540-1-1994, ISO9000, and TS-16949.

The calibration device(s) used is either a Class-A load cell that has been certified by an accredited laboratory in accordance with ASTM E-74 or Class-F certified Dead weights.

Calibration Data											
500,000-LB RANGE - COMPRESSION											
<b>Certified Range:</b> 50000 to 500000 - lbf				<b>Max Error (%):</b> 0.34%				<b>Tolerance (+/-):</b> 1.00%		<b>Load Module SN:</b> N/A	
<b>Range Capacity:</b> 500,000.00				<b>units:</b> lbf				<b>Indicator:</b> DIGITAL			
Reading	Nominal	Resolution	As Found	As Found Error (lbf)	As Found Error (%)	As Left	Max Error As Left (LB)	Max Error As Left (%)	Repeatability (%)	Uncertainty	Pass/Fail
0%	return to zero	100.0	0.00	0.00	0.000%	0.00	0.00	0.000%	0.000%	1.0E+02	PASS
10%	50,000.0	100.0	49,978.00	22.00	0.044%	49,967.10	32.90	0.066%	-0.022%	2.4E+02	PASS
25%	125,000.0	100.0	124,728.00	272.00	0.218%	124,719.60	280.40	0.225%	-0.007%	4.1E+02	PASS
50%	250,000.0	100.0	249,157.40	842.60	0.338%	249,210.90	842.60	0.338%	0.021%	7.5E+02	PASS
75%	375,000.0	100.0	373,953.90	1,046.10	0.280%	374,018.10	1,046.10	0.280%	0.017%	1.1E+03	PASS
100%	500,000.0	100.0	498,914.00	1,086.00	0.218%	499,151.60	1,086.00	0.218%	0.048%	1.5E+03	PASS

Calibration Data											
250,000-LB RANGE - COMPRESSION											
<b>Certified Range:</b> 25000 to 250000 - lbf				<b>Max Error (%):</b> 0.42%				<b>Tolerance (+/-):</b> 1.00%		<b>Load Module SN:</b> N/A	
<b>Range Capacity:</b> 250,000.00				<b>units:</b> lbf				<b>Indicator:</b> DIGITAL			
Reading	UUT Indication	Resolution	As Found	As Found Error (lbf)	As Found Error (%)	As Left	Max Error As Left (LB)	Max Error As Left (%)	Repeatability (%)	Uncertainty	Pass/Fail
0%	return to zero	100.0	0.00	0.00	0.000%	0.00	0.00	0.000%	0.000%	1.0E+02	PASS
10%	25,000.00	100.0	24,928.90	71.10	0.285%	24,927.20	72.80	0.292%	-0.007%	1.5E+02	PASS
25%	62,500.00	100.0	62,277.50	222.50	0.357%	62,274.80	225.20	0.362%	-0.004%	2.2E+02	PASS
50%	125,000.00	100.0	124,478.10	521.90	0.419%	124,473.60	526.40	0.423%	-0.004%	3.7E+02	PASS
75%	187,500.00	100.0	186,745.40	754.60	0.404%	186,732.00	768.00	0.411%	-0.007%	5.4E+02	PASS
100%	250,000.00	100.0	248,987.30	1,012.70	0.407%	249,084.50	1,012.70	0.407%	0.039%	7.1E+02	PASS

Reported uncertainty values have been estimated at the 95% confidence level with a coverage factor of K=2 and are a combination of the reference standard uncertainty, the UUT resolution, and the UUT repeatability. Uncertainties are reported but not combined with the UUT error for the determination of the "PASS/FAIL" status.

\* Denotes that the As Found reading was Out of Tolerance.

**Check any that apply:**

- All applicable clauses of ASTM E4 have been met unless otherwise noted below
- Adjustments Were Made
- 3.1.12 (The Resolution is stated as 1/2 the fluctuation of the indicator)
- 10.1 (Readings taken below 200 times the resolution)
- 10.5 (Does not return to zero within 30-seconds)
- 7.3 (Interchangeability established)
- Annex A1 (Verified outside of testing machine)
- 17.1 (Error or repeatability greater than 1.0%)

**Calibration Standards Used:** All verification devices used are traceable to the National Institute of Standards and Technology (NIST)

Eqpt Used	ID#:	Description:	Cal Date:	Cal Due:	Class-A Ten	Class-A Comp	Calibrated By:
A	M-012	600-KIP Class-A LOAD CELL	2/19/2019	2/19/2021	N/A	17180	MOREHOUSE
B	M-130	120-KIP Class-A LOAD CELL	6/21/2019	6/21/2021	3584	2556	MOREHOUSE
C	M-139A	10-KIP Class-A LOAD CELL	11/19/2019	11/19/2021	210.4	200	MOREHOUSE
D	T-058	Thermohygrometer	8/15/2019	8/15/2020	N/A	N/A	GREAT LAKES CALIBRATION



1795-A W. Cortland Ct. P: (630)613-9350  
 Addison, IL 60101 [www.GreatLakesCalibration.com](http://www.GreatLakesCalibration.com)

**Your Guide To Quality Control**



# Calibration Certificate

**Certificate #:** 20173-18

This calibration was performed on-site at the address below for:

**WISS JANNEY ELSTNER ASSOCIATES INC**  
 330 PFINGSTEN ROAD  
 NORTHBROOK, IL 60062

**Date of Calibration:** Friday, March 6, 2020  
**Calibration Interval:** 12 - Months  
**Calibration Due Date:** 3/6/2021  
**Purchase Order:** 00985  
**Condition Received:** Within Tolerance  
**Condition Returned:** Within Tolerance

**Equipment Information**

<b>Manufacturer:</b>	RIEHLE	<b>External Cell Mfg:</b>	N/A	<b>Display Mfg:</b>	N/A
<b>Model Number:</b>	500FH	<b>External Cell Model:</b>	N/A	<b>Display Model #:</b>	N/A
<b>Serial Number:</b>	0258347-458	<b>External Cell Serial:</b>	N/A	<b>Display Serial #:</b>	N/A
<b>Asset ID:</b>	N/A	<b>External Cell Asset ID:</b>	N/A	<b>Software Version:</b>	N/A
<b>Work instruction:</b>	MECH-001	<b>Calibration Direction:</b>	COMPRESSION	<b>Temp / Hum:</b>	70.6°F / 21 %RH
<b>Revision:</b>	Rev-05	<b>Calibration Device:</b>	E-74 LOAD CELL	<b>Technician:</b>	Robert Southern
<b>Specification:</b>	ASTM E4-16	<b>Calibration Method:</b>	FOLLOW THE FORCE	<b>Page:</b>	2 OF 2
<b>Description:</b>	500,000-LB Test Frame				

The data contained within this report pertains only to the item(s) as described above and shall not be reproduced or distributed without prior written consent from Great Lakes Calibration, Inc. The calibration was performed in accordance with the most current revision of work instruction MECH-001 (which is based off the requirements of ASTM E-4) and the governing specification listed above and is compliant with ISO/IEC 17025:2005, ANS/NCSL Z540-1-1994, ISO9000, and TS-16949.

The calibration device(s) used is either a Class-A load cell that has been certified by an accredited laboratory in accordance with ASTM E-74 or Class-F certified Dead weights.

**Calibration Data**

**100,000-LB RANGE - COMPRESSION**

**Calibrated Range:** 20000 to 100000 - lbf      **Max Error (%):** 0.63%      **Tolerance (+/-):** 1.00%      **Load Module SN:** N/A  
**Range Capacity:** 100,000.00      **units:** lbf      **Indicator:** Digital

Reading	Nominal	Resolution	As Found	As Found Error (lbf)	As Found Error (%)	As Left	Max Error As Left (LB)	Max Error As Left (%)	Repeatability (%)	Uncertainty	Pass/Fail	Eqpt Used
0%	return to zero	100.00	0.00	0.00	0.000%	0.00	0.00	0.000%	0.000%	5.8E+01	PASS	A
20%	20,000.00	100.00	19,875.80	124.20	0.625%	19,877.10	124.20	0.625%	0.006%	1.3E+02	PASS	A
40%	40,000.00	100.00	39,750.90	249.10	0.627%	39,752.00	249.10	0.627%	0.003%	1.7E+02	PASS	A
60%	60,000.00	100.00	59,681.00	319.00	0.535%	59,703.60	319.00	0.535%	0.038%	2.1E+02	PASS	A
80%	80,000.00	100.00	79,562.50	437.50	0.550%	79,565.10	437.50	0.550%	0.003%	2.6E+02	PASS	A
100%	100,000.00	100.00	99,451.60	548.40	0.551%	99,483.70	548.40	0.551%	0.032%	3.1E+02	PASS	A

**20,000-LB RANGE - COMPRESSION**

**Certified Range:** 2000 to 20000 - lbf      **Max Error (%):** 0.62%      **Tolerance (+/-):** 1.00%      **Load Module SN:** N/A  
**Range Capacity:** 20,000.00      **units:** lbf      **Indicator:** Digital

Reading	UUT Indication	Resolution	As Found	As Found Error (lbf)	As Found Error (%)	Adjusted	As Left	Max Error As Left (LB)	Max Error As Left (%)	Repeatability (%)	Uncertainty	Pass/Fail	Eqpt Used
0%	return to zero	10.00	0.00	0.00	0.000%		0.00	0.00	0.000%	0.000%	5.8E+00	PASS	B
10%	2,000.00	10.00	1,987.60	12.40	0.624%		1,987.90	12.40	0.624%	0.015%	1.5E+01	PASS	C
25%	5,000.00	10.00	4,972.00	28.00	0.563%		4,973.40	28.00	0.563%	0.028%	2.0E+01	PASS	B
50%	10,000.00	10.00	9,948.30	51.70	0.520%		9,949.10	51.70	0.520%	0.008%	3.1E+01	PASS	B
75%	15,000.00	10.00	14,923.60	76.40	0.512%		14,925.60	76.40	0.512%	0.013%	4.4E+01	PASS	B
100%	20,000.00	10.00	19,903.80	96.20	0.483%		19,916.70	96.20	0.483%	0.065%	5.8E+01	PASS	B

Reported uncertainty values have been estimated at the 95% confidence level with a coverage factor of K=2 and are a combination of the reference standard uncertainty, the UUT resolution, and the UUT repeatability. Uncertainties are reported but not combined with the UUT error for the determination of the "PASS/FAIL" status.

\* Denotes that the As Found reading was Out of Tolerance.

**Check any that apply:**

<input type="checkbox"/> All applicable clauses of ASTM E4 have been met unless otherwise noted below	<input type="checkbox"/> Adjustments Were Made
<input type="checkbox"/> 3.1.12 (The Resolution is stated as 1/2 the fluctuation of the indicator)	<input type="checkbox"/> 10.1 (Readings taken below 200 times the resolution)
<input type="checkbox"/> 7.3 (Interchangeability established)	<input type="checkbox"/> Annex A1 (Verified outside of testing machine)
<input type="checkbox"/> 17.1 (Error or repeatability greater than 1.0%)	

**Calibration Standards Used:** All verification devices used are traceable to the National Institute of Standards and Technology (NIST)

Eqpt Used	ID#:	Description:	Cal Date:	Cal Due:	Class-A Ten	Class-A Comp	Calibrated By:
A	M-012	600-KIP Class-A LOAD CELL	2/19/2019	2/19/2021	N/A	17180	MOREHOUSE
B	M-130	120-KIP Class-A LOAD CELL	6/21/2019	6/21/2021	3584	2556	MOREHOUSE
C	M-139A	10-KIP Class-A LOAD CELL	11/19/2019	11/19/2021	210.4	200	MOREHOUSE
	T-058	Thermohyrometer	8/15/2019	8/15/2020			GREAT LAKES CALIBRATION

*Marya Black*

Customer Approval

QA Approval - Marya Black (QM)



# MTS Field Service



**Customer Address:**  
330 Pfingsten Road  
Northbrook, | 10643\_SN  
SA

**MTS Systems Corporation**  
14000 Technology Drive  
Eden Prairie, MN 55344-2290

## Certificate of Calibration

Page: 1 of 3

<b>Customer</b>	Name: Wiss, Janney, Elstner Associates, Inc.	Certificate Number: 2394-10654	
	System ID: Tinius Olsen 114585	System: Tinius Olsen 114585	Site: 508308
	Device ID:	Location: Structural Lab	Country Code: SA

### Equipment

Device Type: Force	Model: REVERE_400KIP	Serial No.: 665148
Conditioner Model: 493.21B	Serial No.: 1070201	
Readout Device Model: 493.21B	Serial No.: 1070201	Channel: Force

MTS Field Service is accredited by the American Association for Laboratory Accreditation (A2LA Cert. No. 1145.01). The basis for this accreditation is the international standard for calibration laboratories, ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories". Defined and documented measurement assurance techniques or uncertainty analyses are used to verify the adequacy of the measurement processes.

Calibrations are performed with standards whose values and measurements are traceable to the International System of Units (SI) through a National Metrology Institute (NMI). MTS Reference Force Transducers are calibrated in compliance with ASTM E74. The results of this calibration relate only to the items calibrated.

When parameter(s) are certified to be within specified tolerance(s), the measured value(s) shall fall within the appropriate specification limit and the uncertainty of the measured value(s) shall be stated and provided to the customer for evaluation.

### CALIBRATION INFORMATION

As Found: In Tolerance	Max. Error As Found: -0.49 %	Calibration Date: 31-Jul-19
As Left: In Tolerance	Max. Error As Left: -0.49 %	Calibration Due: 31-Jul-20
Tolerance: +/-1.0% of Applied Force		
Calibration Procedure: FS-CA 2122 Rev. F	ASTM E4-16	
Full Scale Ranges: 400000 lbf		
Note:		

### STANDARDS USED FOR CALIBRATION

MTS Asset Number	Manufacturer	Model Number	Description	Cal. Date	Cal. Due
19695	Interface Inc.	Interface	mV/V Indicator	22-Mar-19	20-Mar-20
17140	Fluke	189	DMM	15-Nov-18	15-Nov-19
23427	Fluke	80T-150U	Temp Probe	26-Sep-18	26-Sep-19
18090	Interface	CX-0330-1	Bridge Simulator	8-Aug-18	8-Aug-19
10656	Interface	500 kip	500kip load cell	5-Nov-18	5-Nov-19

Certified by:

Issued on: 31-Jul-19

ACS Version: 10.43





# Calibration Report



Customer  
10643\_SN

Name: Wiss, Janney, Elstner Associates, Inc.  
System ID: Tinius Olsen 114585 System: Tinius Olsen 114585  
Device ID: Location: Structural Lab

Report Number: 2394-10654  
Site: 508308  
Country Code: SA

**Equipment**

Device Type: Force Model: REVERE\_400KIP Serial No.: 665148  
Conditioner Model: 493.21B Serial No.: 1070201  
Readout Device Model: 493.21B Serial No.: 1070201 Channel: Force

**Procedure**

MTS Procedure: FS-CA 2122 Rev. F ACS Version: 10.43  
Calibration has been performed in accordance with: ASTM E4-16  
Method of Verification: Follow-the-Force Method using Elastic Calibration Devices

**Calibration Equipment Asset No.**

Dead Weight Set: HighLevel Board: LowLevel Board: Standard Asset No.: 10656  
DW Compensation: DMM: 17140 Digital Indicator: 19695 Lower Limit: 13457 lbf  
Temperature Readout: 23427 Additional Equipment: Standardizer: 18090

**Conditions**

Ambient Temperature: 81.30 °F Polarity(+): Tension Bidirectional: Cable Length: 25 Feet

In Tolerance  
Out of Tolerance

X

As Found: 

X
---

  
As Adjusted: 

--

Tolerance: +/-1.0% of Applied Force  
As Found System Condition: Good

**Conditioner Parameters**

Total Gain: 335.93746 Fine zero: 0.0 Shunt Cal (+): -236863.75334 lbf.  
Polarity: Inverted Pre-amp gain: 150.1  
Excitation: 10.0 Volts Post-amp gain: 2.23809

**Calibration Data**

Range: 1 Full Scale: 400000  
Compression Resolution: 8.5 Report Units: lbf

Applied Percent of Full Scale Force	Series 1		Series 1 Errors				Series 2		Series 2 Errors				Repeatability	
	Indicated Reading	Indicated Reading	Units Error	Percent Error	Units Error	Percent Error	Indicated Reading	Indicated Reading	Units Error	Percent Error	Units Error	Percent Error	Percent Error	
	Ascending	Descending	Asc	Asc	Desc	Desc	Ascending	Descending	Asc	Asc	Desc	Desc	Asc	Desc
0	4.0	0.0	4.0	0.00	0.0	0.00	0.0	2.0	0.0	0.00	2.0	0.00	0.00	0.00
-3.4000001	-13609.0		9.0	0.07			-13607.0		7.0	0.05			0.01	
-4	-16000.0		0.0	0.00			-16007.0		7.0	0.04			0.04	
-6	-24010.0		10.0	0.04			-24018.0		18.0	0.08			0.03	
-8	-32011.0		11.0	0.03			-32028.0		28.0	0.09			0.05	
-10	-40023.0		23.0	0.06			-40036.0		36.0	0.09			0.03	
-20	-80089.0		89.0	0.11			-80109.0		109.0	0.14			0.03	
-40	-160260.0		260.0	0.16			-160280.0		280.0	0.18			0.01	
-70	-280480.0		480.0	0.17			-280500.0		500.0	0.18			0.01	
-100	-400530.0		530.0	0.13			-400510.0		510.0	0.13			0.01	

Tension Range: 1  
Report Units: lbf

Applied Percent of Full Scale Force	Series 1		Series 1 Errors				Series 2		Series 2 Errors				Repeatability	
	Indicated Reading	Indicated Reading	Units Error	Percent Error	Units Error	Percent Error	Indicated Reading	Indicated Reading	Units Error	Percent Error	Units Error	Percent Error	Percent Error	
	Ascending	Descending	Asc	Asc	Desc	Desc	Ascending	Descending	Asc	Asc	Desc	Desc	Asc	Desc
0	-1.0	2.0	-1.0	0.00	2.0	0.00	-1.0	3.0	-1.0	0.00	3.0	0.00	0.00	0.00
3.4000001	13550.0		-50.0	-0.37			13534.0		-66.0	-0.49			0.12	
4	15945.0		-55.0	-0.34			15932.0		-68.0	-0.43			0.08	
6	23917.0		-83.0	-0.35			23907.0		-93.0	-0.39			0.04	
8	31898.0		-102.0	-0.32			31894.0		-106.0	-0.33			0.01	
10	39898.0		-102.0	-0.26			39895.0		-105.0	-0.26			0.01	
20	79922.0		-78.0	-0.10			79928.0		-72.0	-0.09			0.01	
40	160210.0		210.0	0.13			160220.0		220.0	0.14			0.01	
70	280910.0		910.0	0.33			280900.0		900.0	0.32			0.00	
100	401840.0		1840.0	0.46			401830.0		1830.0	0.46			0.00	

Errors at Zero are computed in % of Range.  
Uncertainty of the data supplied is equal to or less than ±0.25% of reading for a coverage factor of k=2 and an approximate confidence level of 95%.  
This report shall not be reproduced except in full, without the written approval of the laboratory.

Out of Tolerance in % column

American Association of Laboratory Accreditation Certificate Number: 1145.01

Notes:

Performed By: Jim Rieder Field Service Engineer Date: 31-Jul-19

Signature:

Next Customer Agreed Upon Calibration Date: 31-Jul-20

ACSRepRevBC





# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## APPENDIX C. STRAND MILL CERTIFICATE AND TEST RESULTS



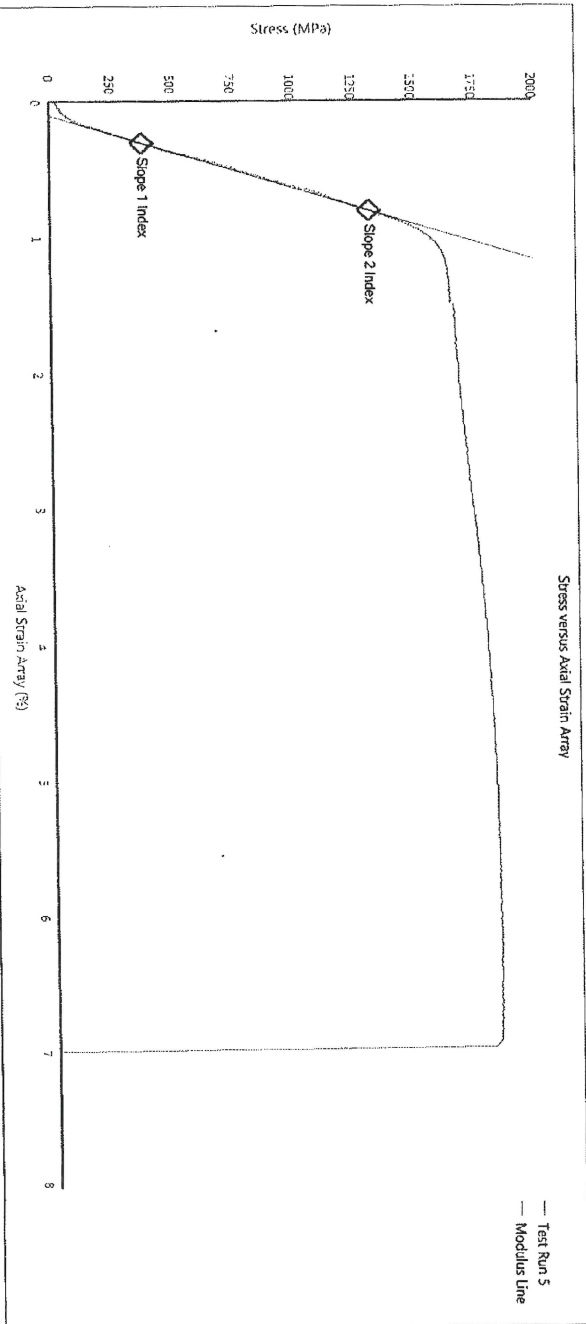
**haggle**  
Wire & Strand

**JCC-EA-XD50-9D**

ASTM A416-05-270K-Low relaxation-left

Test date

Page 4 of 12  
15 December 2019




Test no	Pack #	Buo	Fm	F(1%)	Rp0.1	Rp0.2	E	At	Agt	So	Mass	Cast #	C	Mn	SI	S	P	N
		in	lbf	lbf	lbf	lbf	ksi	%	%	in <sup>2</sup>	lb		%	%	%	%	%	%
5	JCC-EA-XD50-9D	0.50	41635	37251	37543	37453	27859	7.00	6.68	0.15	6213	1909433	0.810	0.640	0.260	0.010	0.014	0.004

Directors: WF Covertzen (Chairperson), D Barnes (Chief Executive Officer), R Barnes, VO Truitt, LI Truitt, MG Gardner, SC Thiele, M P Nixod, N A Maszio  
 Company Secretary: J Thies  
 Registration Number: 2006/029205/07

MEASURAND	(%)
Fm	±1.2
Rp1	±1.2
Rp0.2	±1.3
E	±1.2
At	±2.3
SO	±0.2
CONFORMANCE LEVEL	95%
COVERAGE FACTOR	2

**CONDITIONS OF ISSUE OF TEST CERTIFICATE:**  
 This report shall not be reproduced except if full without the prior written approval of Haggle Wire and Strand. Tests marked "not SANAS accredited" in this report are not included in the SANAS accreditation schedule for this laboratory. All tests carried out at ambient temperature, unless otherwise specified. Materials sampling carried out as per applicable international specification. The above results relate only to the items tested. All information on this certificate is traceable to the original steel cast numbers. Opinions and interpretations expressed here are outside the scope of SANAS accreditation.



10096



# haggie

## Wire & Strand

**Wire & Strand**  
60 Strachan Street  
Industriële Eker  
Germiston, 1401  
South Africa

P.O. Box 52, Germiston  
Gauteng, 1400, South Africa  
Tel: +27 11 876 2900  
Fax: +27 11 876 2700  
Website: www.sqaw.co.za

Mill certificate number ES 253

Page 2 of 12  
11 Feb 2020

Customer	CRP
Customer order number	120039
Our works order number	SMG 908243

Product	0.5mm, 270MPa Strand
Specification	ASTM A416-0.5'-270K-Low/relaxation-Left

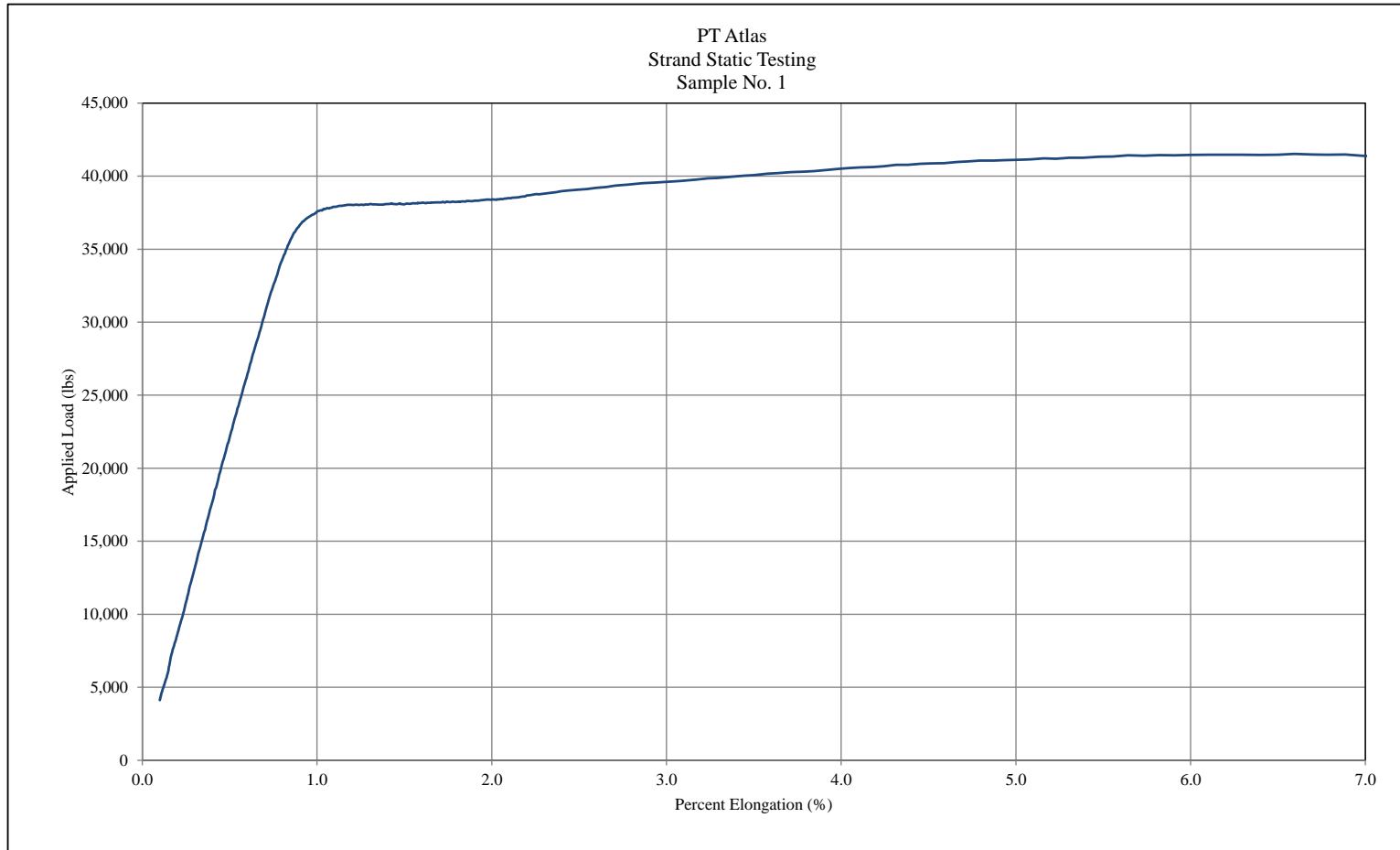
Chemical analysis *						
Cast Number	Carbon (%)	Manganese (%)	Silicon (%)	Sulphur (%)	Phosphorus (%)	Nitrogen (%)
1908433	0.81	0.64	0.26	0.010	0.014	0.004
1908493	0.81	0.64	0.26	0.010	0.014	0.004
1908441	0.81	0.64	0.26	0.010	0.014	0.004

\* Not part of the SANAS accreditation scope



Verified Dimensions	
Strand Diameter	0.500 in
Weight	235.4 grams
Length	11.902 in
Area	0.153 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,510 lbs
Breaking Load	41,520 lbs
Total Elongation	6.64 percent
Modulus of Elasticity	28,786 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

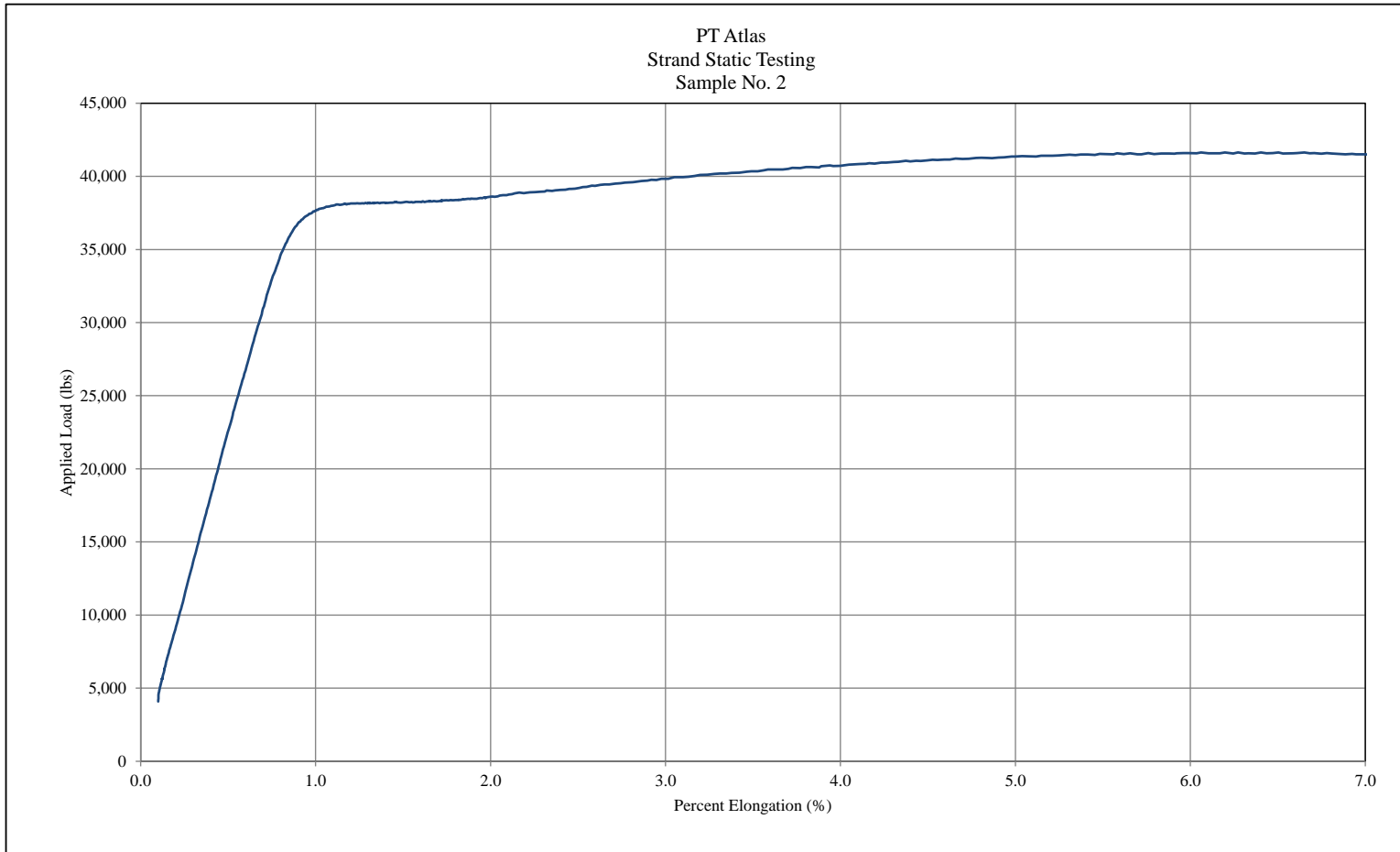
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	235.4 grams
Length	11.902 in
Area	0.153 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,600 lbs
Breaking Load	41,640 lbs
Total Elongation	6.31 percent
Modulus of Elasticity	28,659 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

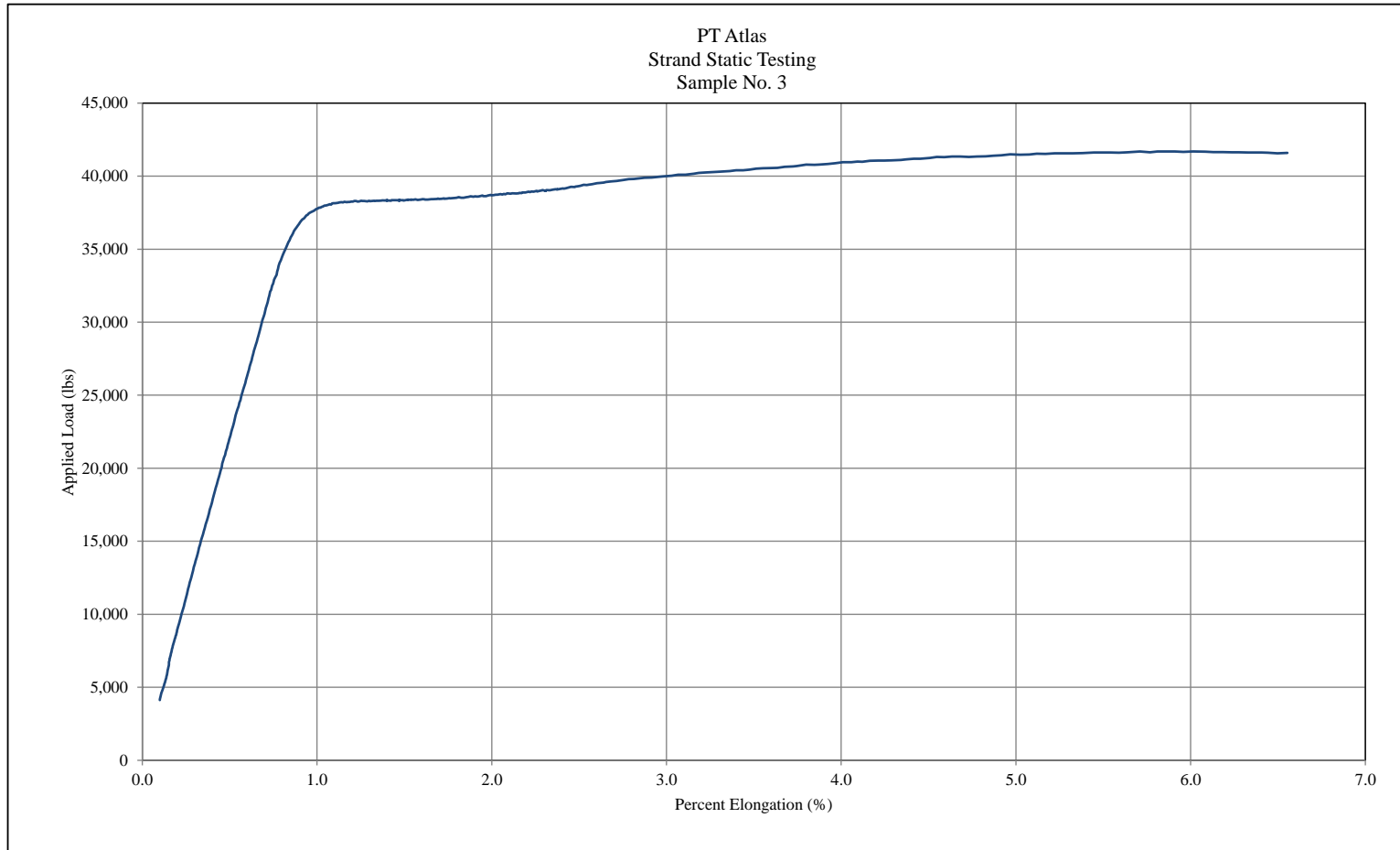
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	235.4 grams
Length	11.902 in
Area	0.153 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,740 lbs
Breaking Load	41,690 lbs
Total Elongation	6.08 percent
Modulus of Elasticity	28,445 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.





# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## APPENDIX D. ANCHORAGE TEST RESULTS



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## Static Test Results



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

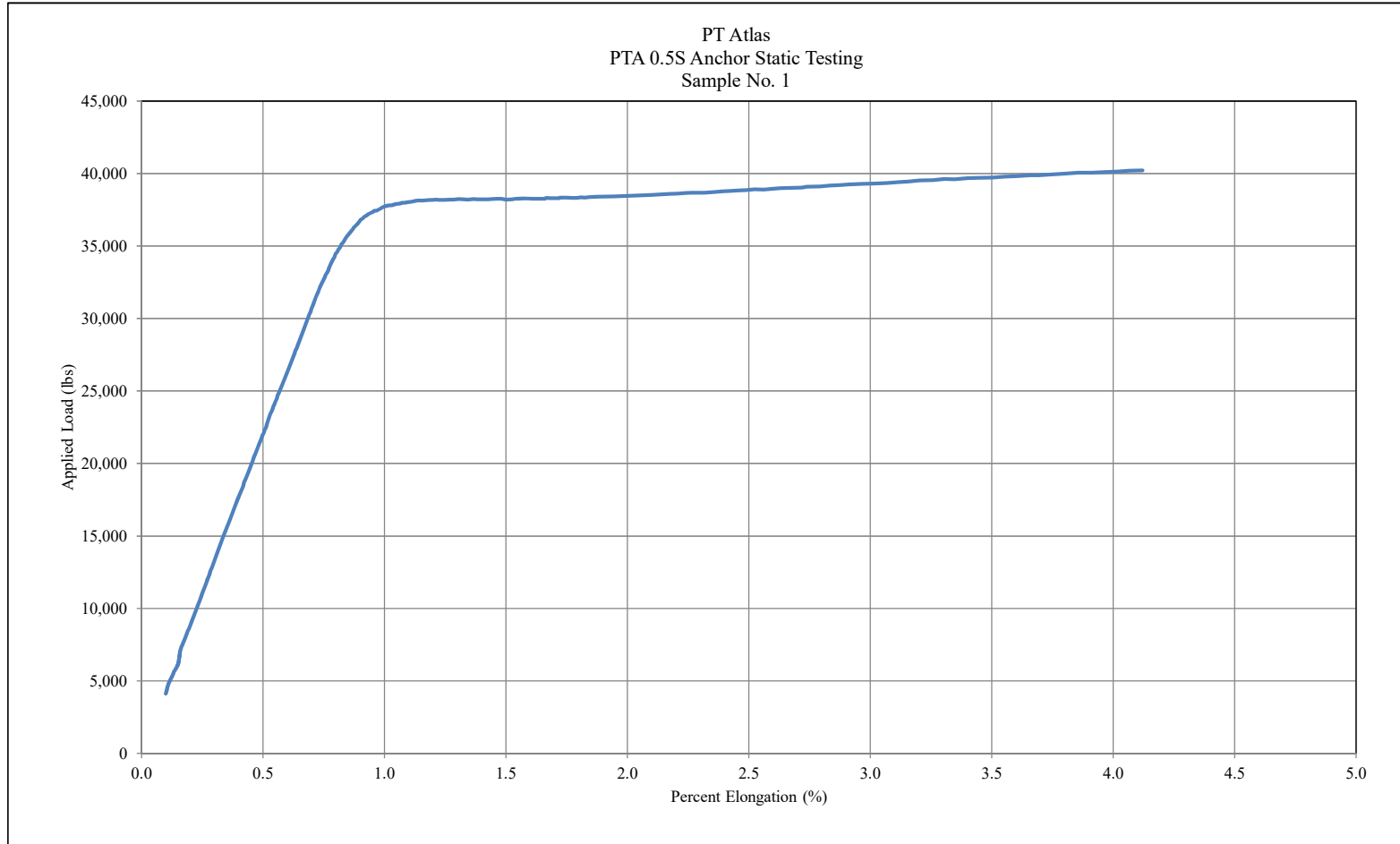
---

## PTA 0.5S End Anchorage



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,710 lbs
Breaking Load	40,220 lbs
Total Elongation	4.29 percent
Modulus of Elasticity	29,203 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

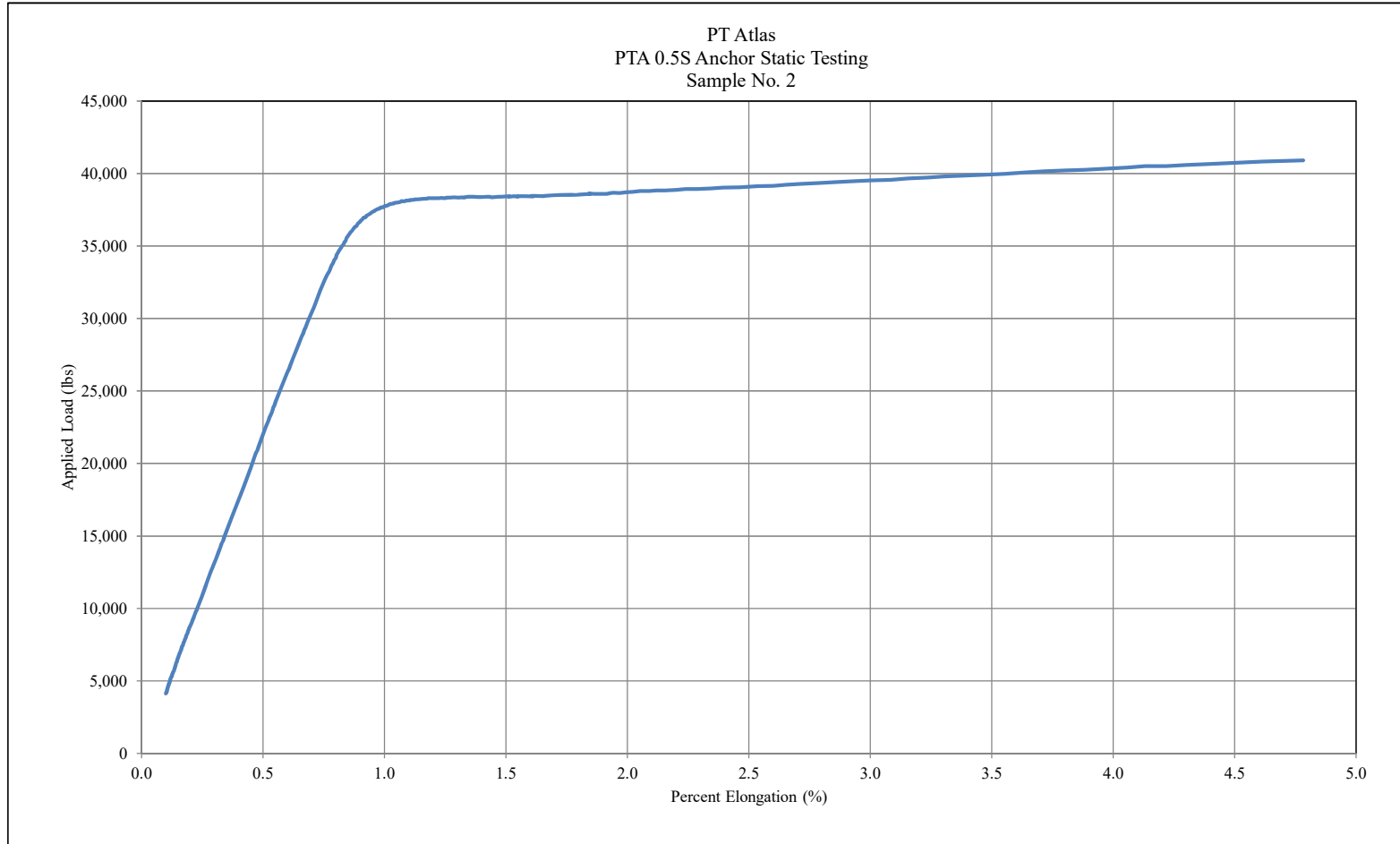
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,680 lbs
Breaking Load	40,920 lbs
Total Elongation	4.89 percent
Modulus of Elasticity	29,002 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

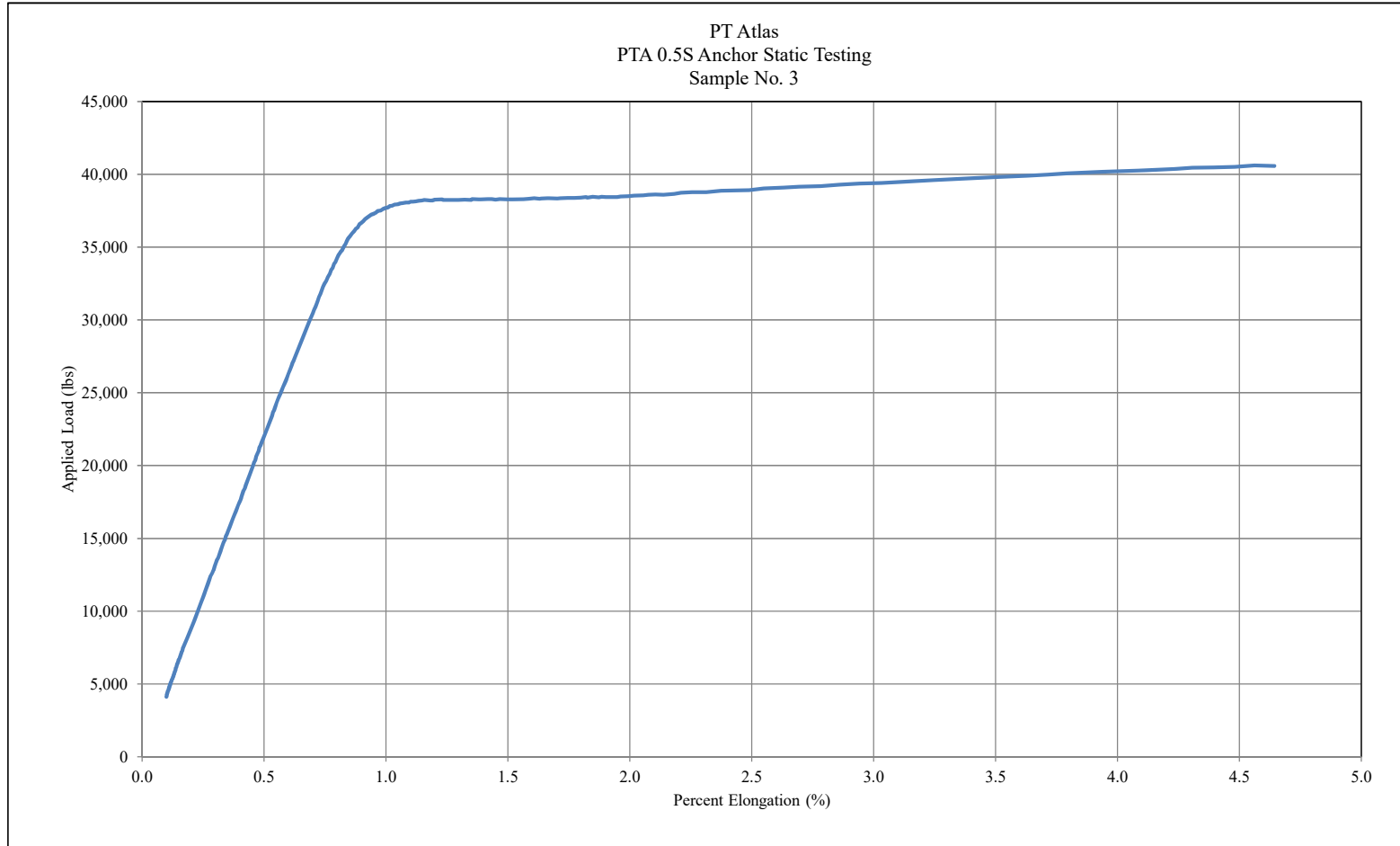
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,690 lbs
Breaking Load	40,620 lbs
Total Elongation	4.73 percent
Modulus of Elasticity	29,107 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	P.T. Atlas
<b>Sample Tested</b>	0.5-in, 270 ksi, 7-wire strand
<b>Notes</b>	

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

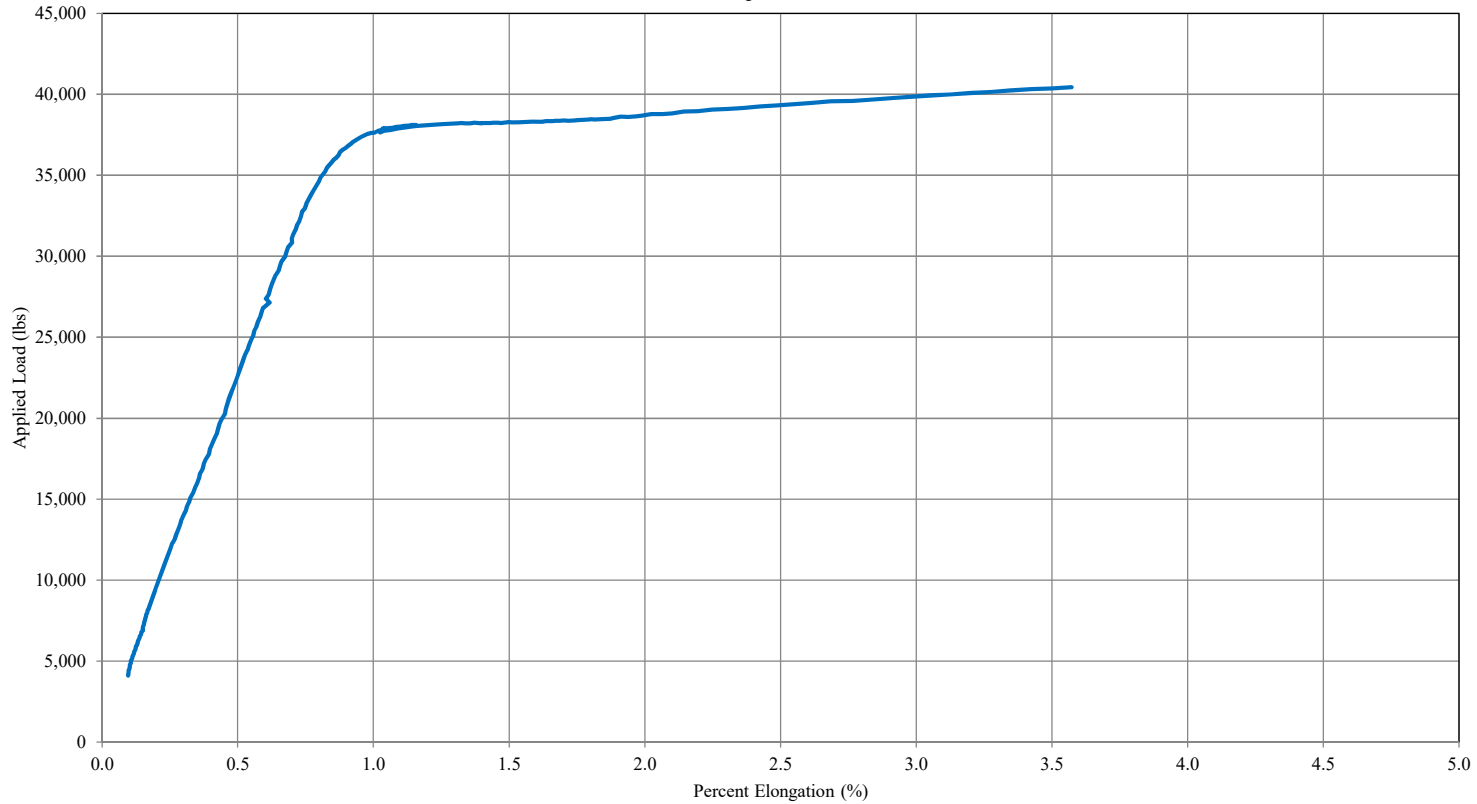
## SC500TU Splice Chuck



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,610 lbs
Breaking Load	40,430 lbs
Total Elongation	3.55 percent
Modulus of Elasticity	28,697 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Top Strand  
Sample No. 1



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	5/11/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.

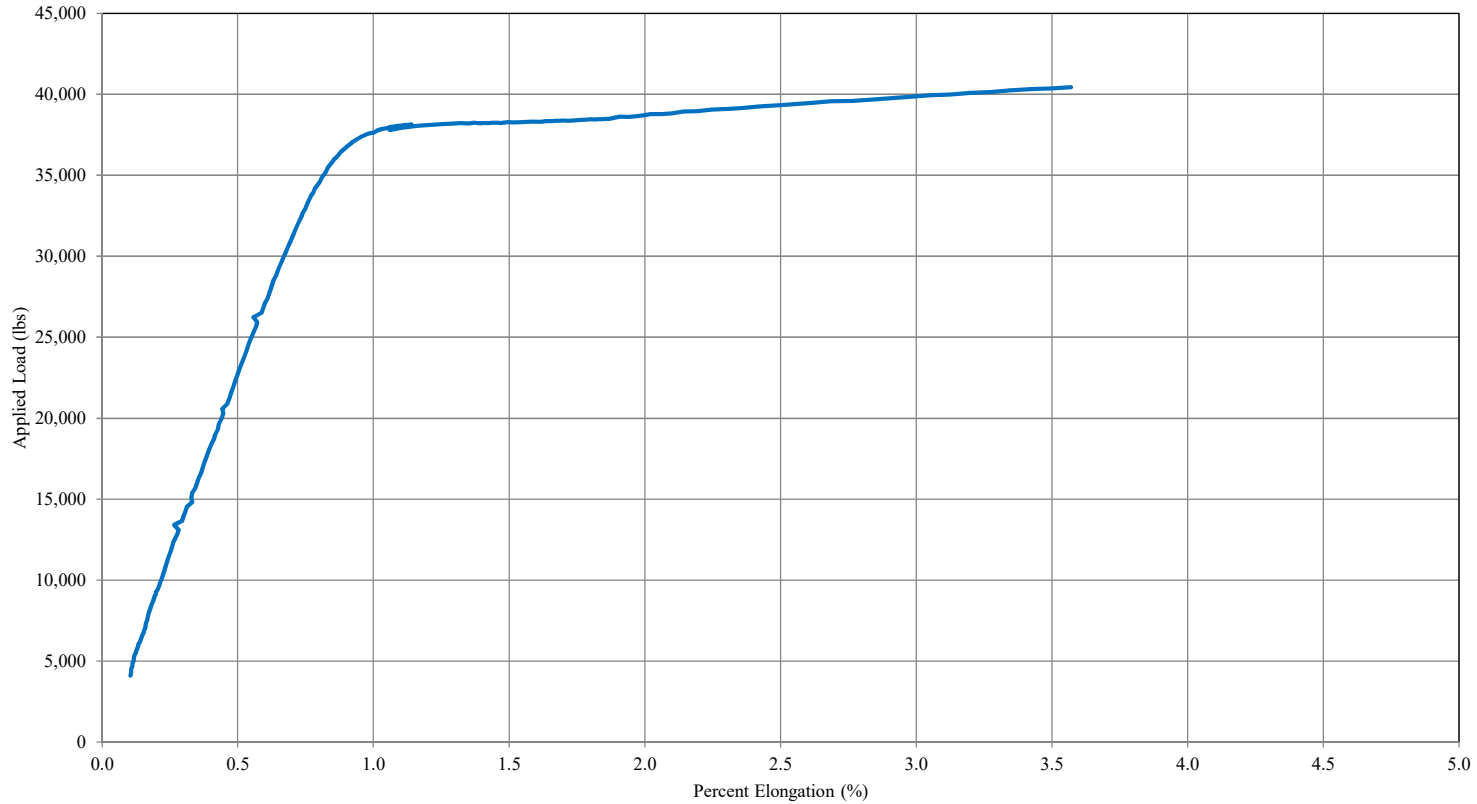




Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.800 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,610 lbs
Breaking Load	40,430 lbs
Total Elongation	3.55 percent
Modulus of Elasticity	29,544 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Bottom Strand  
Sample No. 1



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/29/2020
<b>Test Methods</b>	ASTM A1061, A416

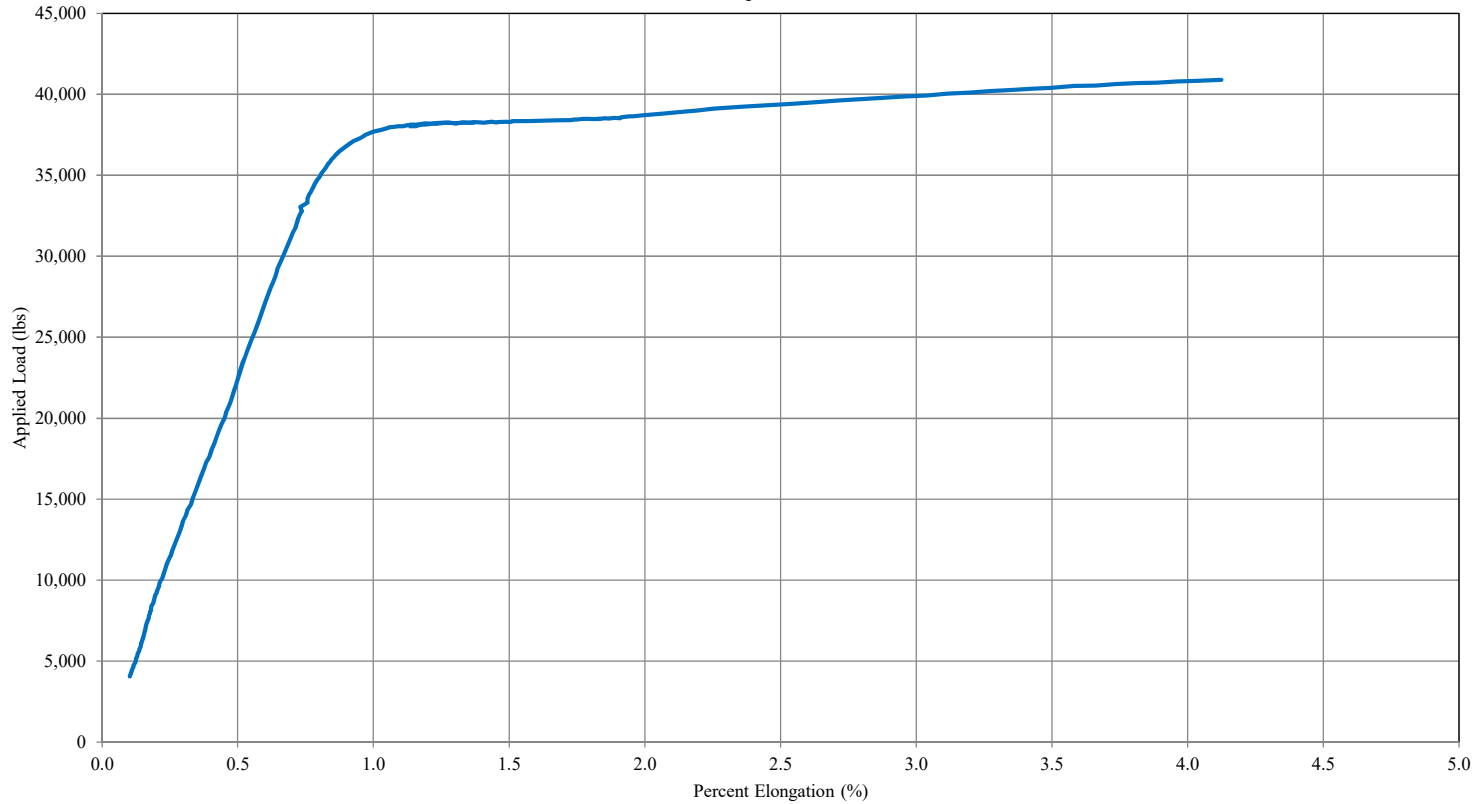
These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,660 lbs
Breaking Load	41,110 lbs
Total Elongation	4.41 percent
Modulus of Elasticity	29,694 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Top Strand  
Sample No. 2



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	5/11/2020
<b>Test Methods</b>	ASTM A1061, A416

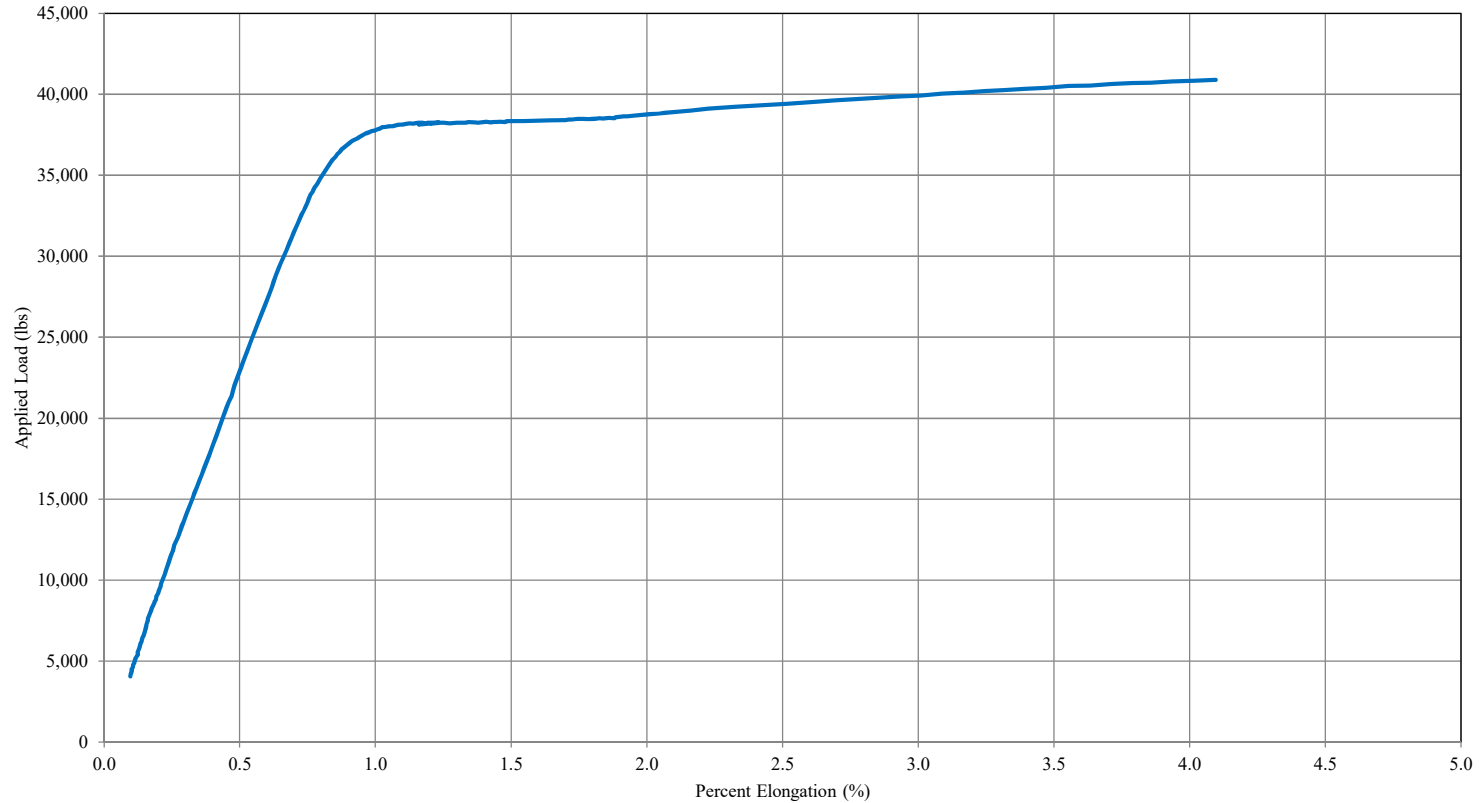
These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.800 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,780 lbs
Breaking Load	41,110 lbs
Total Elongation	4.41 percent
Modulus of Elasticity	29,879 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Bottom Strand  
Sample No. 2



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/29/2020
<b>Test Methods</b>	ASTM A1061, A416

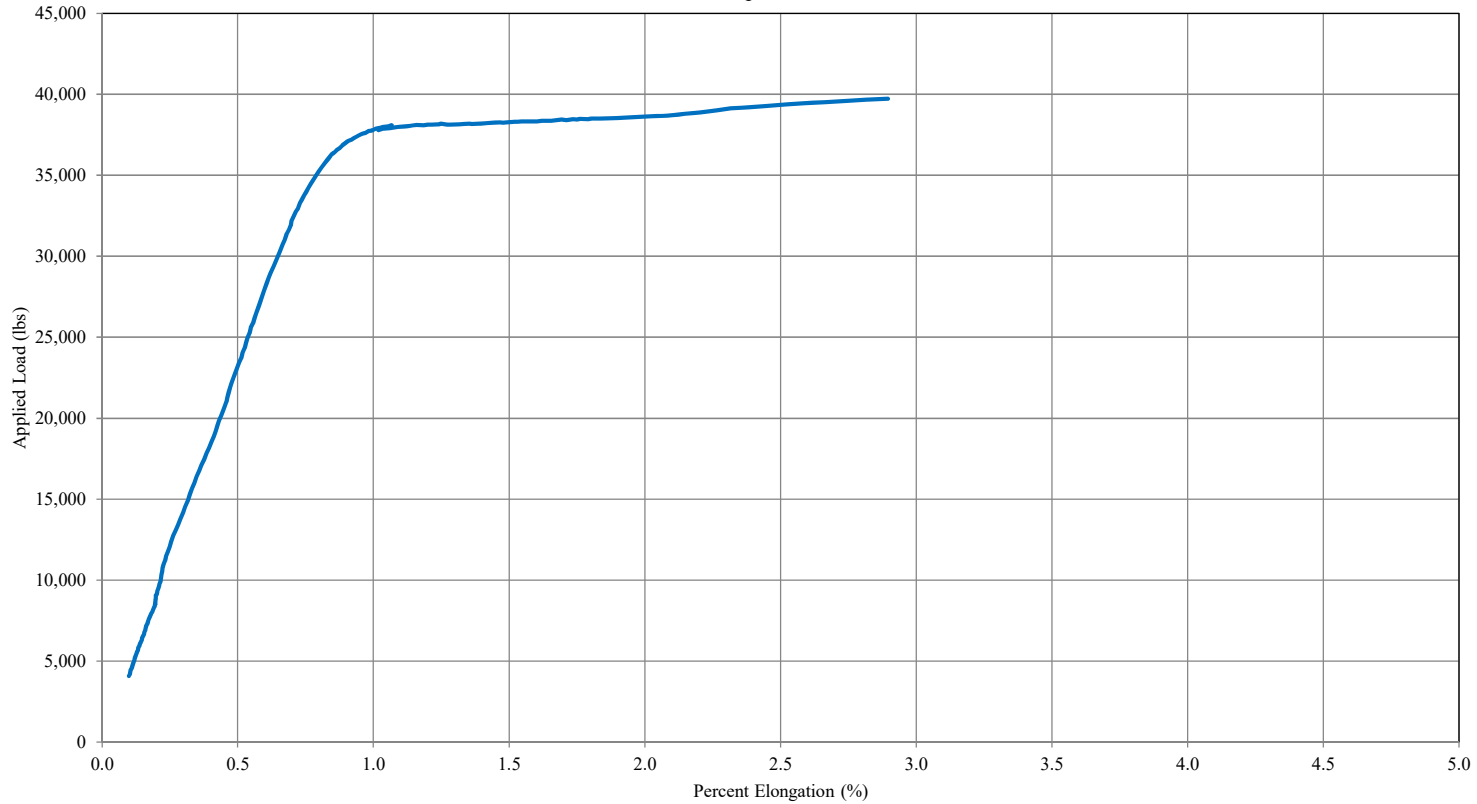
These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,620 lbs
Breaking Load	39,720 lbs
Total Elongation	2.88 percent
Modulus of Elasticity	30,967 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Top Strand  
Sample No. 3



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	5/11/2020
<b>Test Methods</b>	ASTM A1061, A416

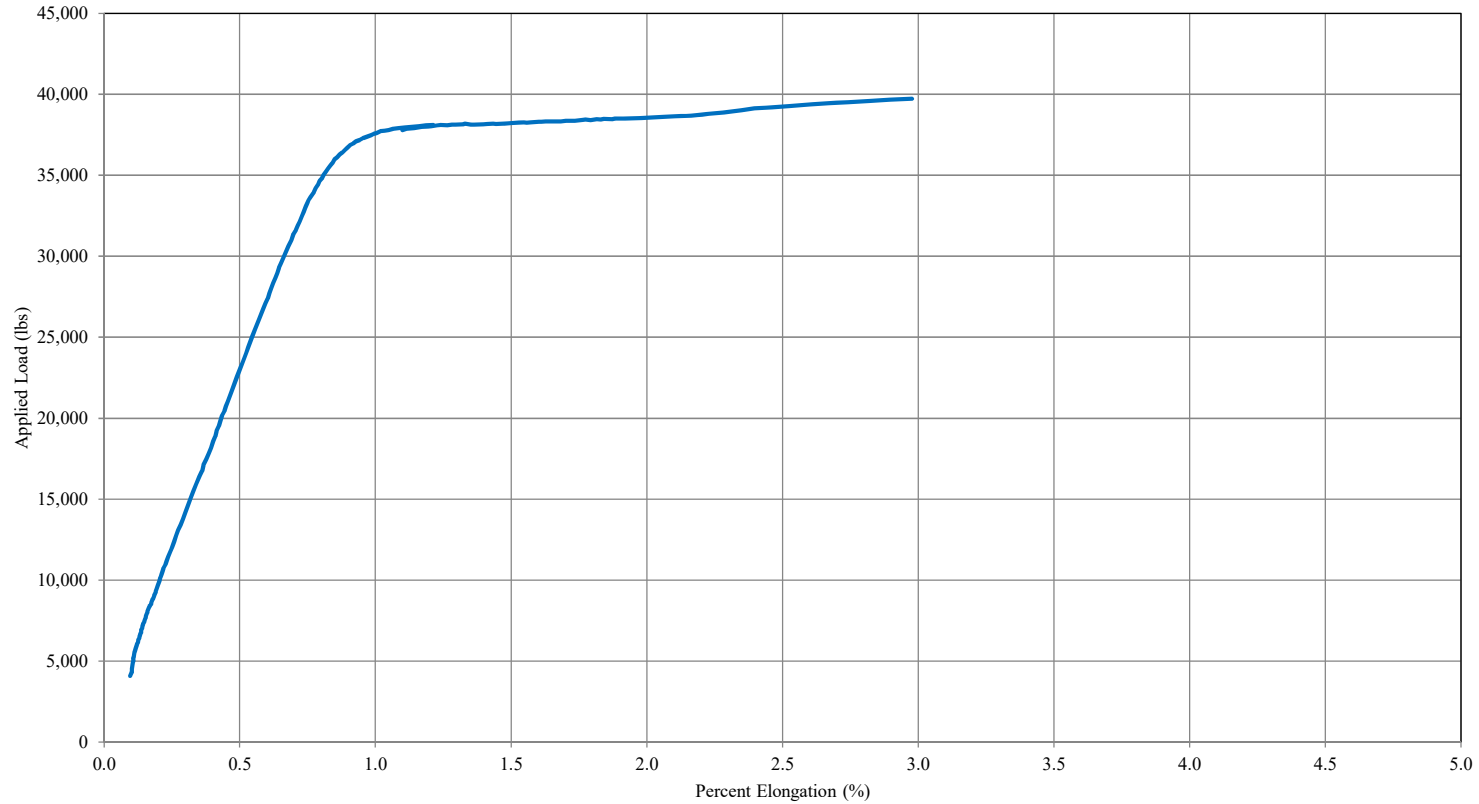
These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.800 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,560 lbs
Breaking Load	39,720 lbs
Total Elongation	2.93 percent
Modulus of Elasticity	29,156 ksi

P.T. Atlas  
SC500TU Splice Chuck Assembly - Bottom Strand  
Sample No. 3



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	0.5-in SC500TU Splice Chuck Assembly

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	4/29/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

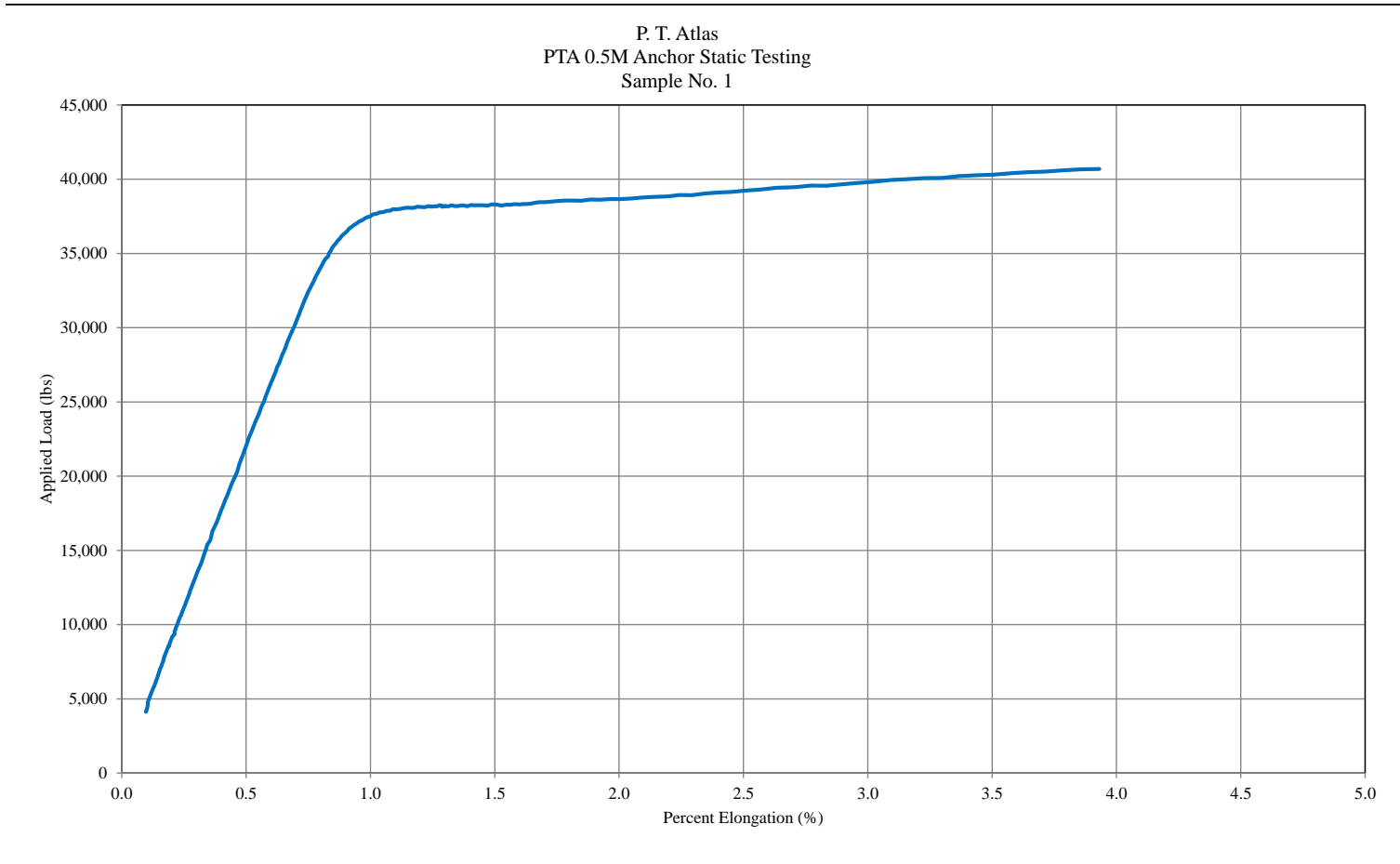
---

## PTA 0.5M End Anchorage



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,490 lbs
Breaking Load	40,690 lbs
Total Elongation	3.85 percent
Modulus of Elasticity	28,576 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	PTA 0.5M 0.5-in End Anchorage

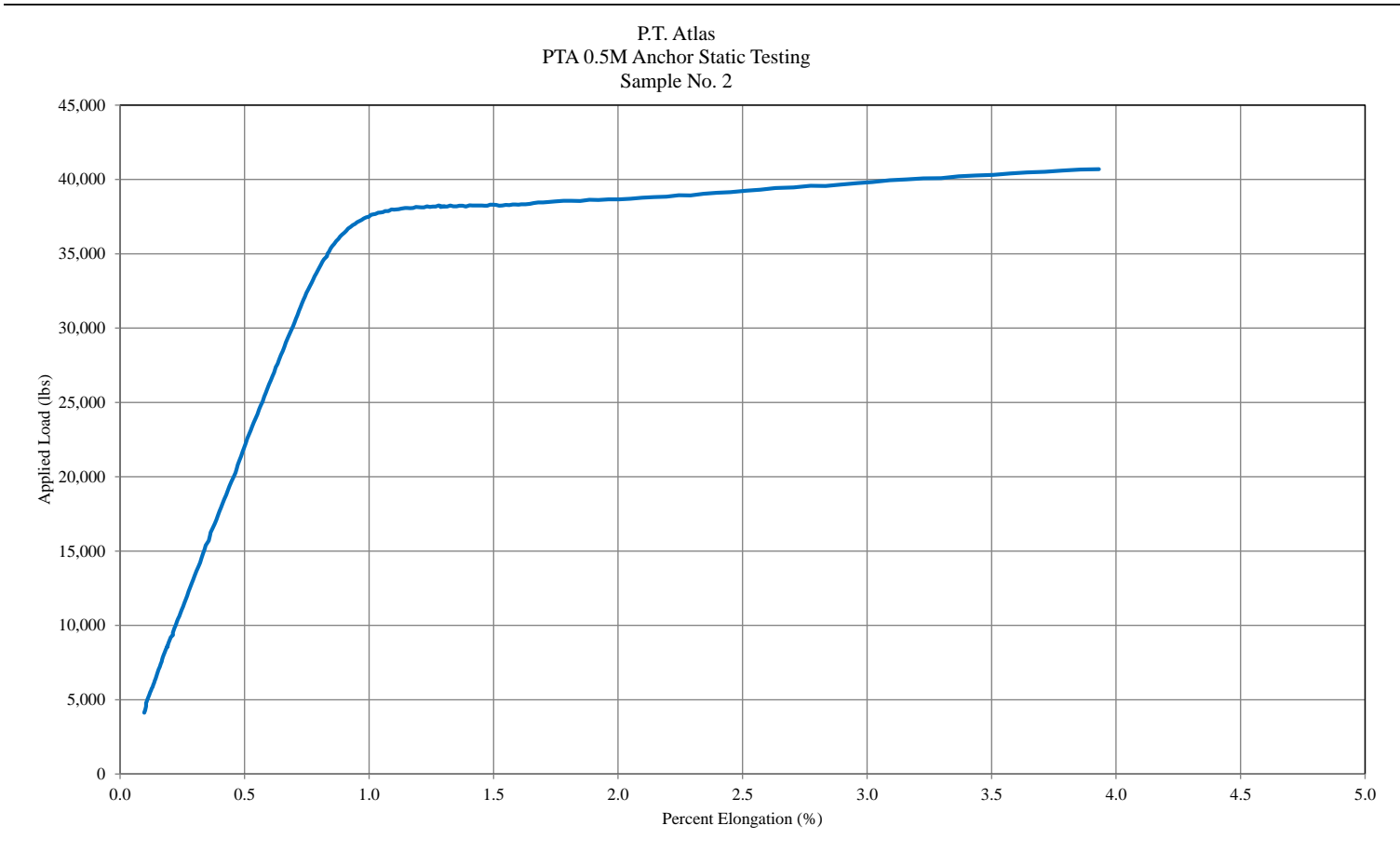
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	6/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,490 lbs
Breaking Load	40,690 lbs
Total Elongation	3.85 percent
Modulus of Elasticity	28,576 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	PTA 0.5M 0.5-in End Anchorage

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	6/9/2020
<b>Test Methods</b>	ASTM A1061, A416

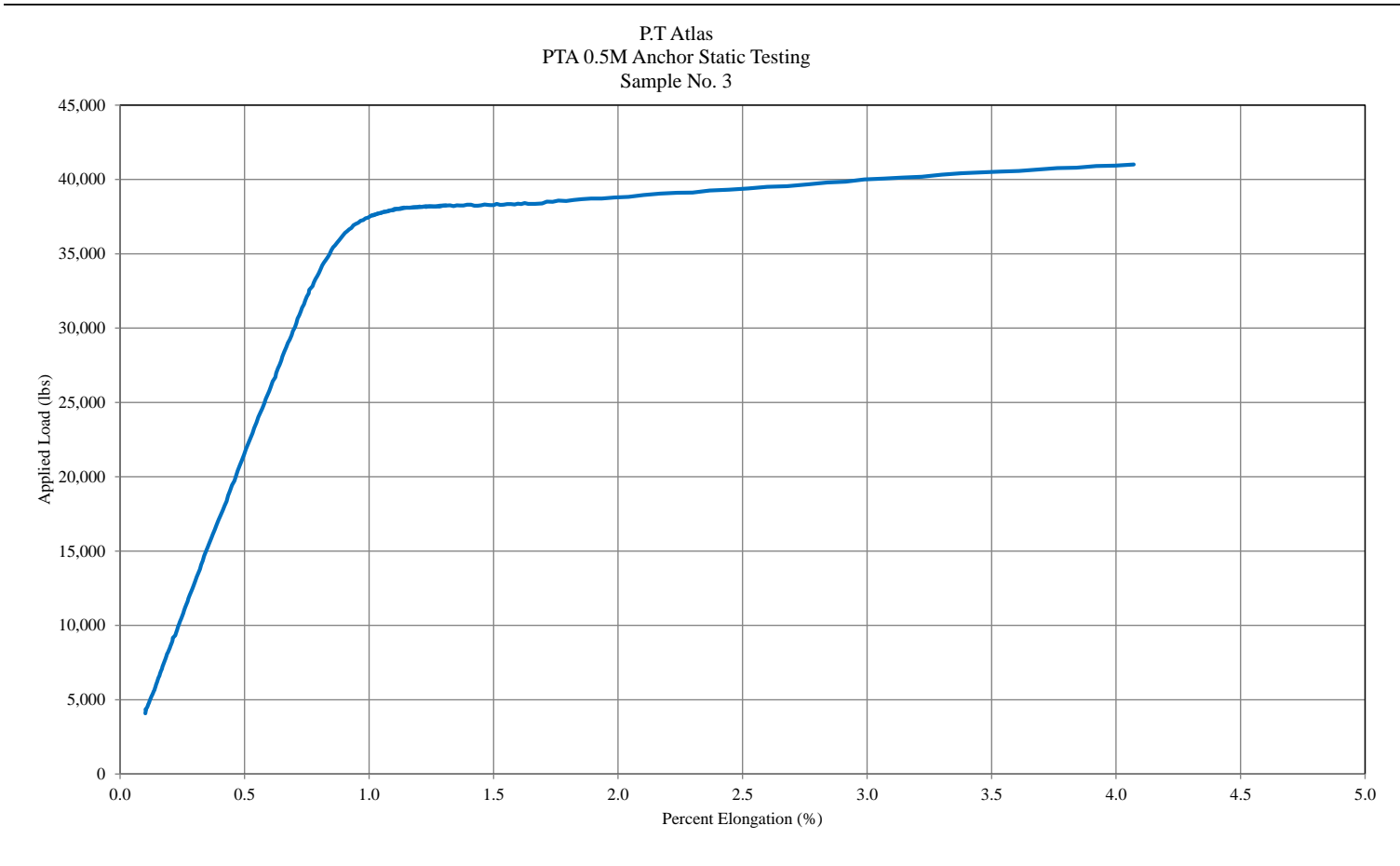
These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.





Verified Dimensions		
Strand Diameter	0.500	in
Weight	232.8	grams
Length	12.020	in
Area	0.150	in <sup>2</sup>

Measured Values		
Load at 1% Elongation	37,440	lbs
Breaking Load	41,010	lbs
Total Elongation	4.08	percent
Modulus of Elasticity	28,795	ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	PTA 0.5M 0.5-in End Anchorage

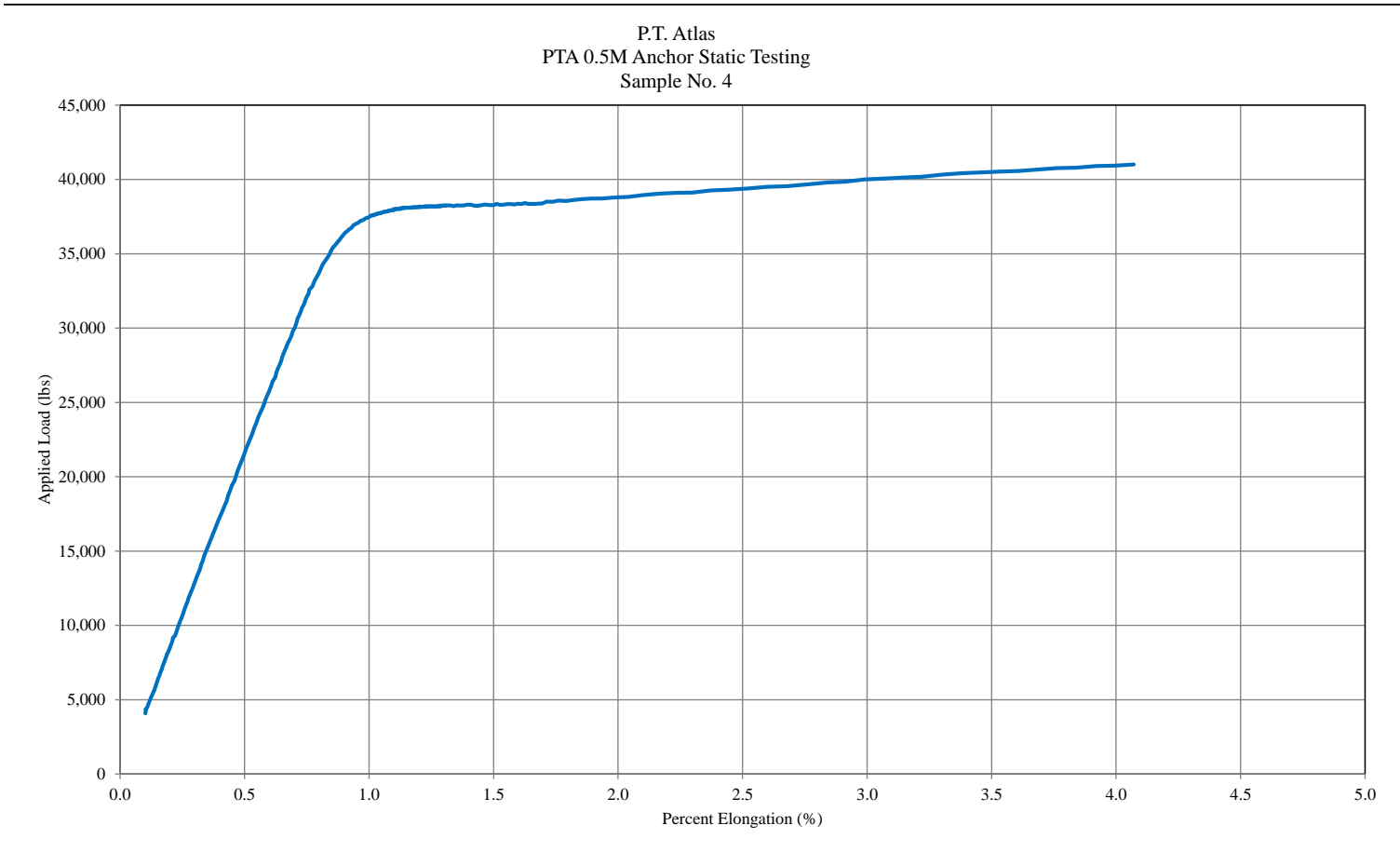
<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	6/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



Verified Dimensions	
Strand Diameter	0.500 in
Weight	232.8 grams
Length	12.020 in
Area	0.150 in <sup>2</sup>

Measured Values	
Load at 1% Elongation	37,440 lbs
Breaking Load	41,010 lbs
Total Elongation	3.88 percent
Modulus of Elasticity	28,795 ksi



<b>WJE Project Number</b>	2019.6324
<b>Client</b>	PTA
<b>Sample Tested</b>	PTA 0.5M 0.5-in End Anchorage

<b>Test Location</b>	Northbrook, IL
<b>Test Operator</b>	B Easton
<b>Test Date</b>	6/9/2020
<b>Test Methods</b>	ASTM A1061, A416

These documents or parts thereof may not be reproduced in advertisements, brochures, or sales material, nor used by the client for any purpose other than the purpose for which they were prepared, nor by third parties, without the written permission of WJE. Any reproduction of this report must be done in full. Concealing or falsifying material contained in this report could constitute a felony punishable under federal statutes.



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

---

## Fatigue Test Results



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

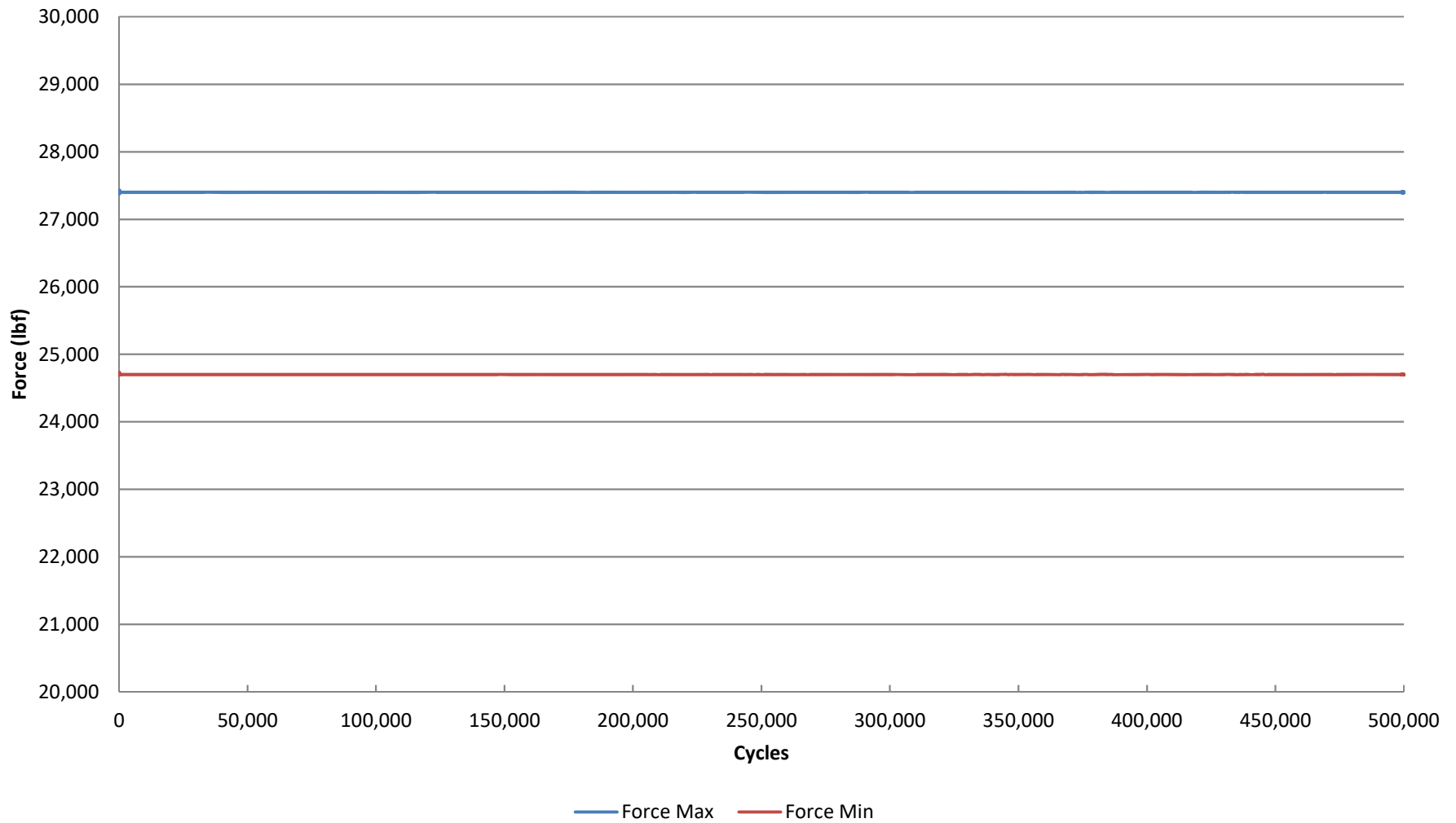
---

## PTA 0.5S End Anchorage and SC500TU Splice Chuck



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

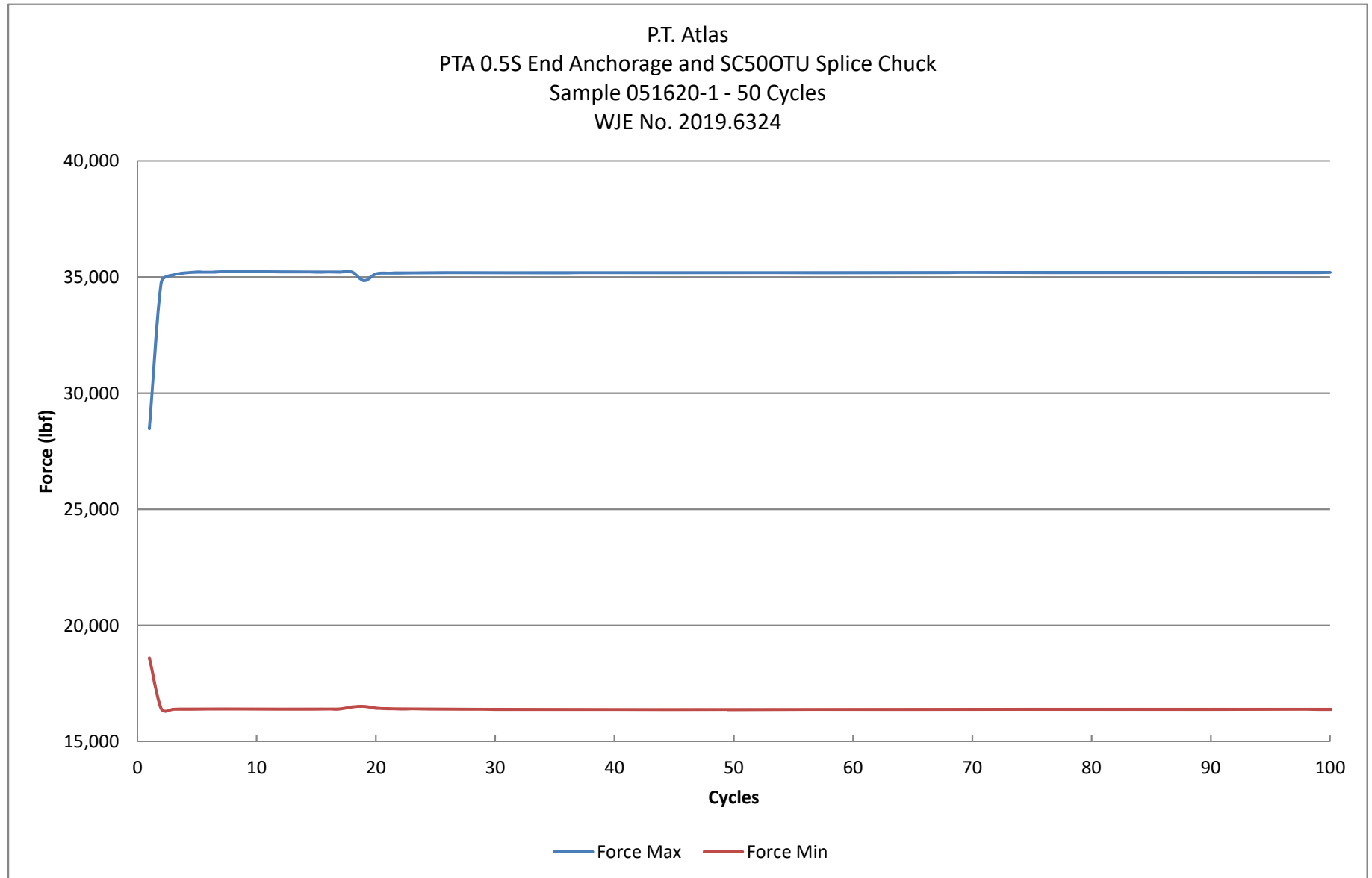
P.T. Atlas  
PTA 0.5S End Anchorage and SC500TU Splice Chuck  
Sample 051220-1 - 500,000 Cycles  
WJE No. 2019.6324



Test Dates: 5/12/2020 - 5/16/2020



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS



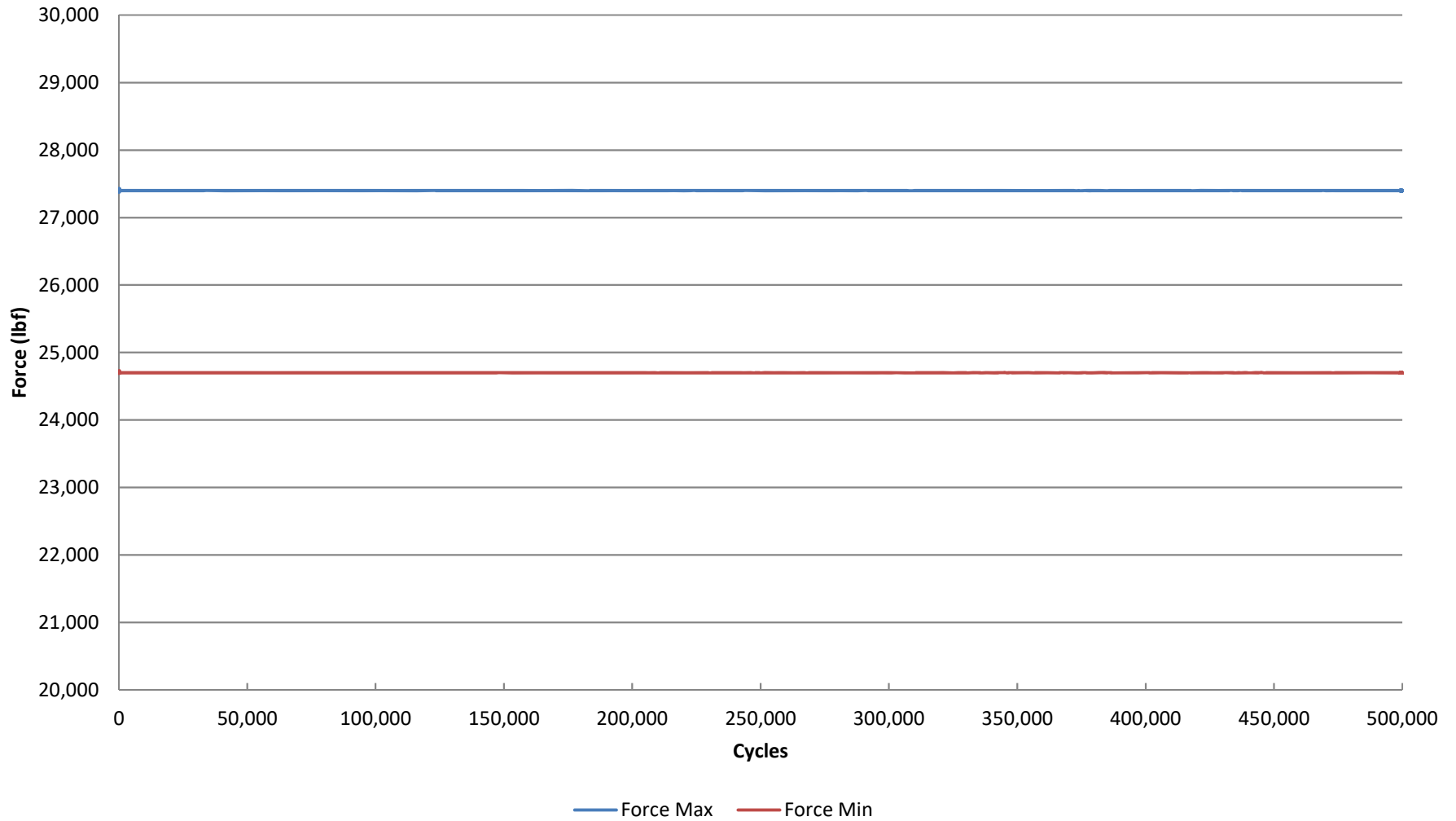
Test Dates: 5/12/2020-5/16/2020





ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

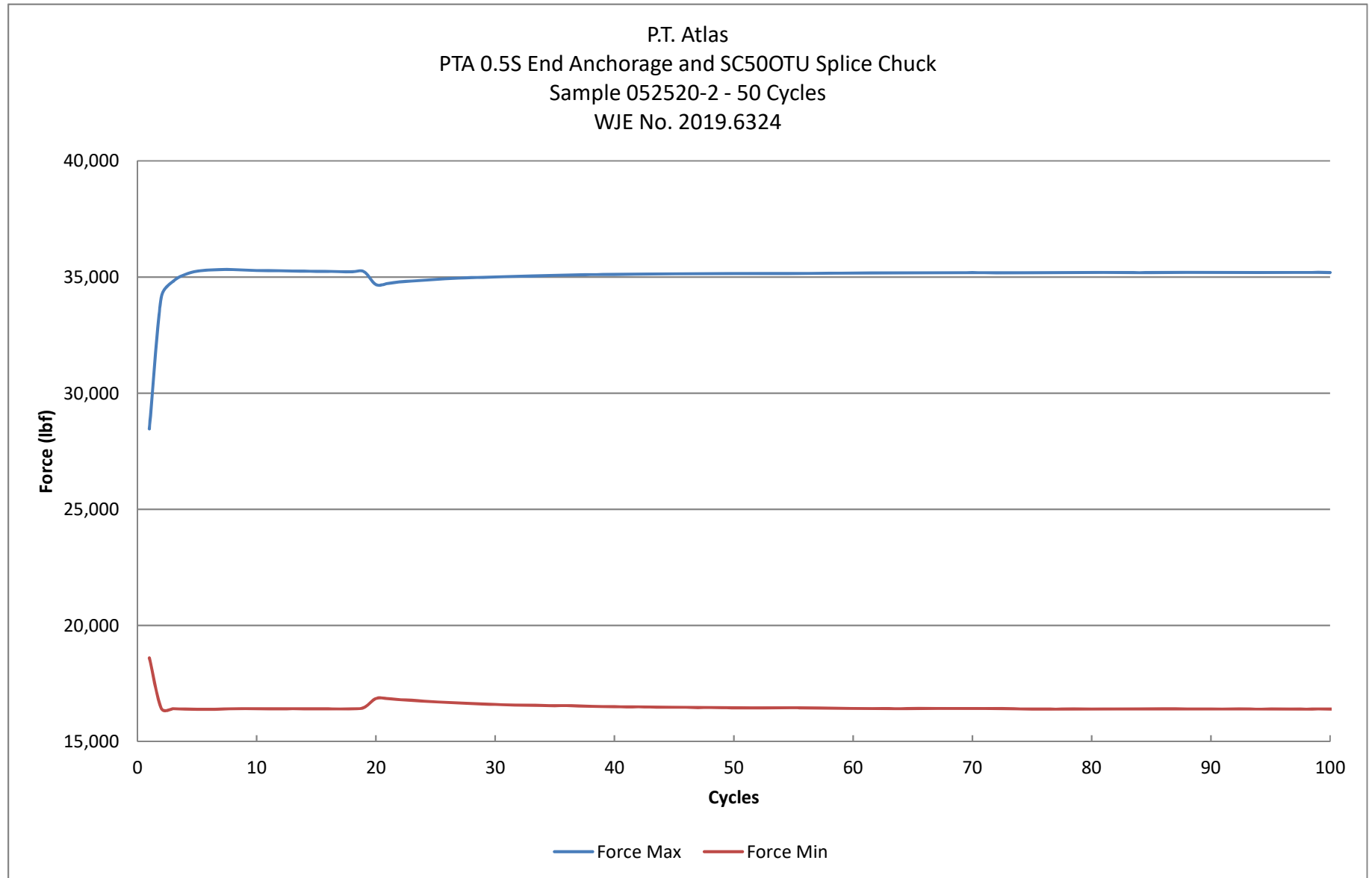
P.T. Atlas  
PTA 0.5S End Anchorage and SC500TU Splice Chuck  
Sample 052120-2 - 500,000 Cycles  
WJE No. 2019.6324



Test Dates: 5/21/2020 - 5/25/2020



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS



Test Dates: 5/21/2020-5/25/2020



# Static and Dynamic Testing of P.T. Atlas Post-Tensioning Anchorage System

AC303 Post-Tension Anchorage Testing

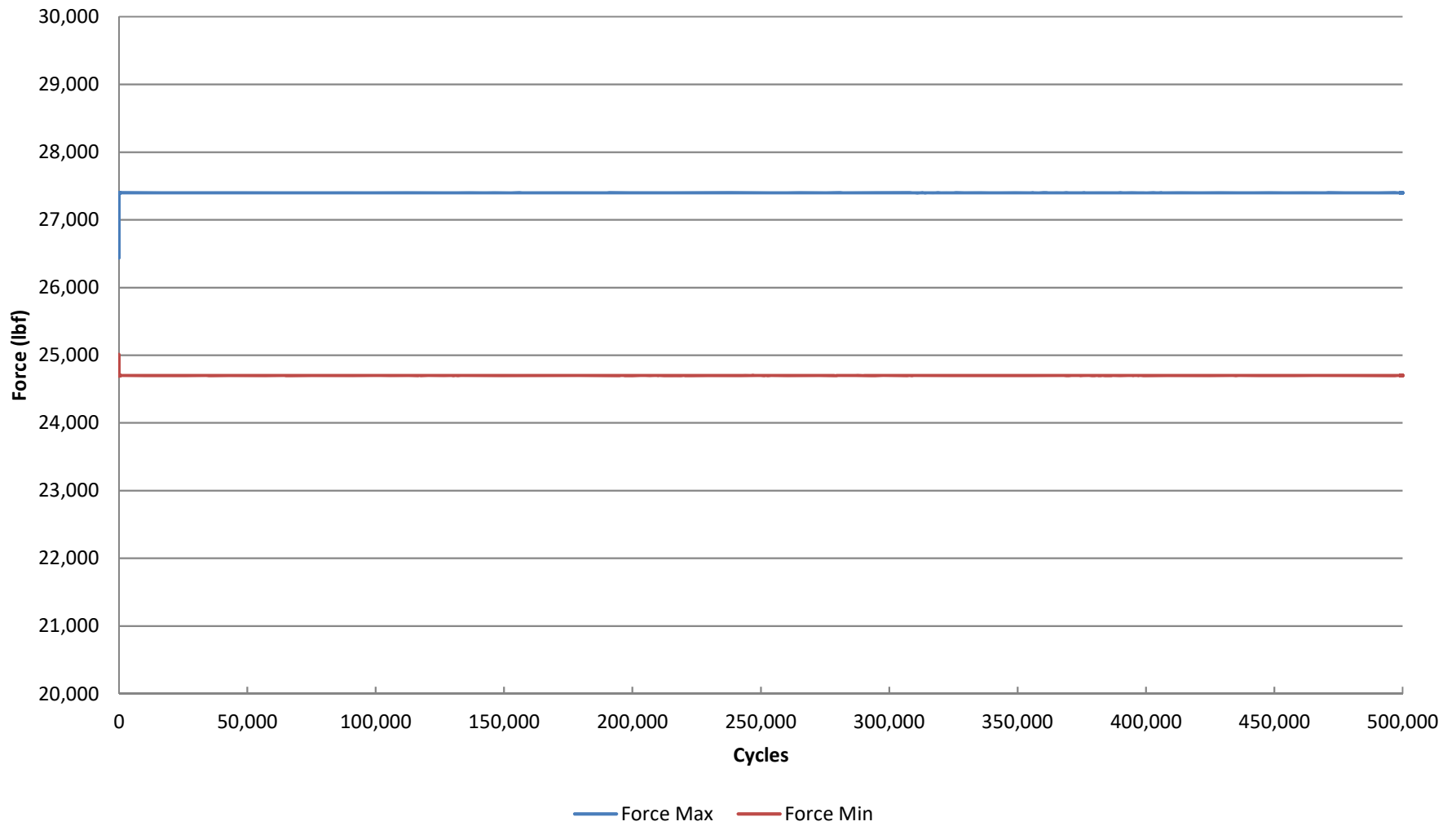
---

## PTA 0.5M End Anchorage



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

P.T. Atlas  
PTA 0.5M End Anchorage  
Sample 060920-1 - 500,000 Cycles  
WJE No. 2019.6324

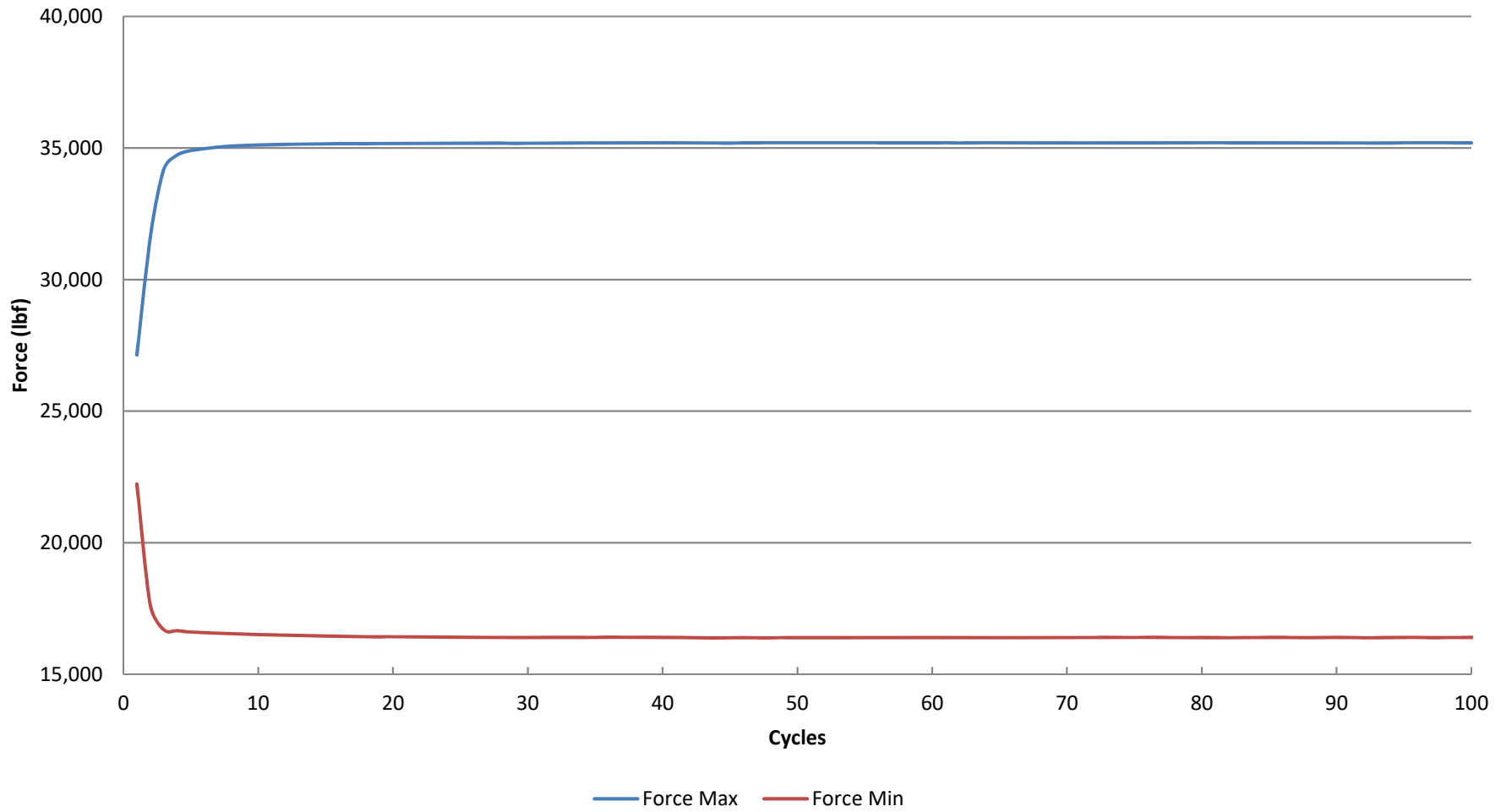


Test Dates: 6/09/2020 - 6/14/2020



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

P.T. Atlas  
PTA 0.5M End Anchorage  
Sample 061420-1 - 50 Cycles  
WJE No. 2019.6324

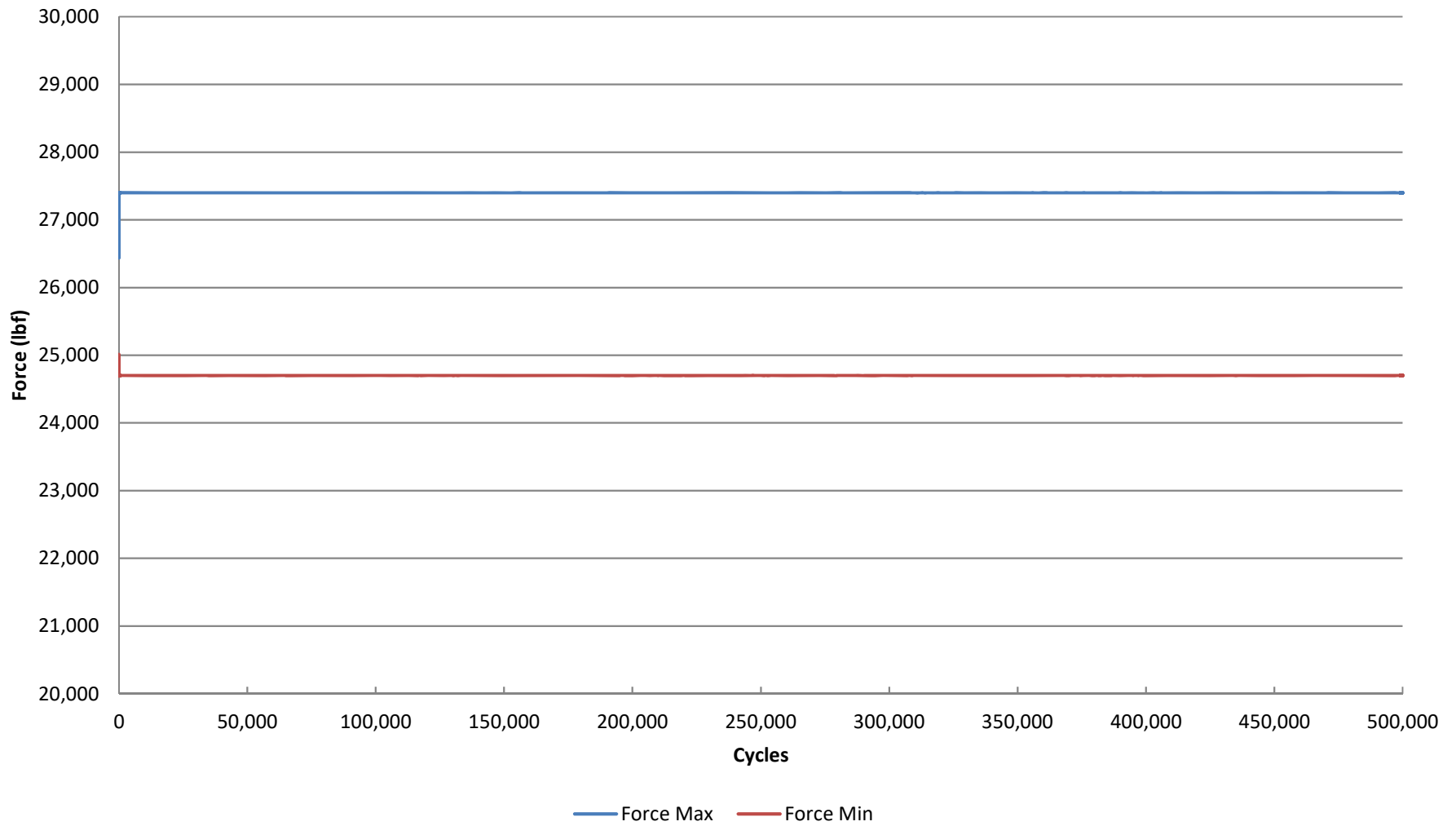


Test Dates: 6/09/2020-6/14/2020



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

P.T. Atlas  
PTA 0.5M End Anchorage  
Sample 060920-2 - 500,000 Cycles  
WJE No. 2019.6324

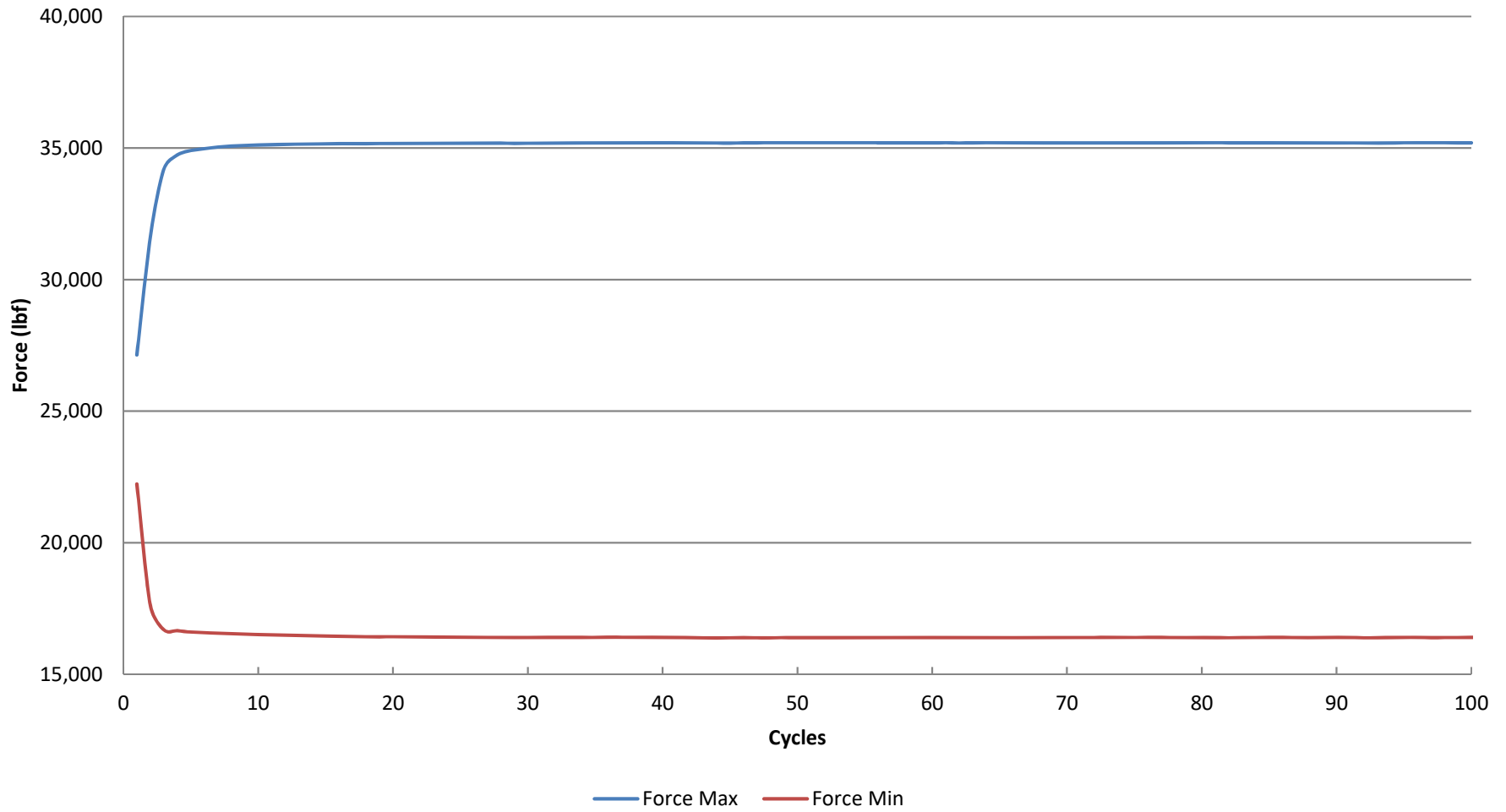


Test Dates: 6/09/2020 - 6/14/2020



ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

P.T. Atlas  
PTA 0.5M End Anchorage  
Sample 061420-2 - 50 Cycles  
WJE No. 2019.6324



Test Dates: 6/09/2020-6/14/2020