Client:	Earth Contact Products
Job Number:	FC05554.009
Product:	**TAF-150-66 08-10-12**

Reference Method

Tests were conducted according to ICC-ES AC358 (4.2.2.1.1), and CTL|Thompson's test procedure TP 1.3.1.

Standard Procedure

Shaft dimensions, shaft length, helix diameter, helix thickness, helix pitch and bolt hole diameter were recorded for all specimens. A torsion fixture was used to accommodate the helix. Each specimen was loaded and tested in the torque machine (see Figure 1). Applied torque, bolt hole elongation and angle deformation were recorded. Maximum torsion resistance was taken as that required to achieve 0.5 shaft revolution per foot of shaft length, that which causes failure of coupling or shaft, that which damages the coupling to an extent that it cannot be decoupled effectively, or that which elongates the coupling bolt hole 0.25 inch, whichever occurs first.

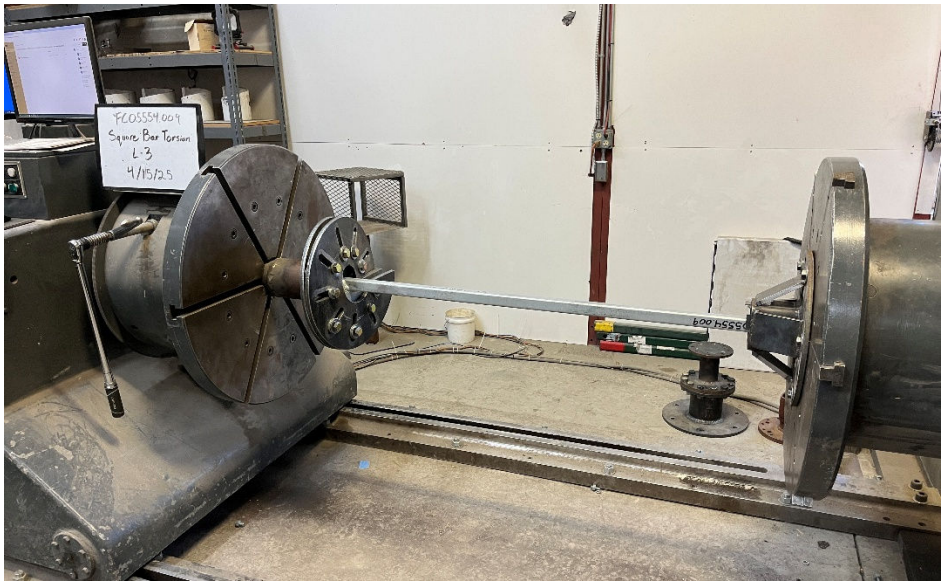


Figure 1

Deviations from Standard Procedure

There were no significant deviations from the standard procedure.

Summary of Results

Specimen Number	Leading Helix Diameter (in)	Shaft Dimensions (in)	Shaft Length (in)	Measured Torque Capacity (ft-lbs)[1]	Failure Mode
L3	8”	1.5 RCS	60	7,942	Weld Failure

[1] *Per AC358 Section 4.2.2.2*

Torsion Test

Client:	Earth Contact Products
Job Number :	FC05554.009
Date Tested :	4/14/2025
Technician:	Scott Van Hoesen
Load Device:	CTL Torsion Bench
Load Frame ID:	46286
Calibration Date:	05.21.2024

Specimen Specification

Specimen Number: L3
Specimine: TAF-150-66 08-10-12

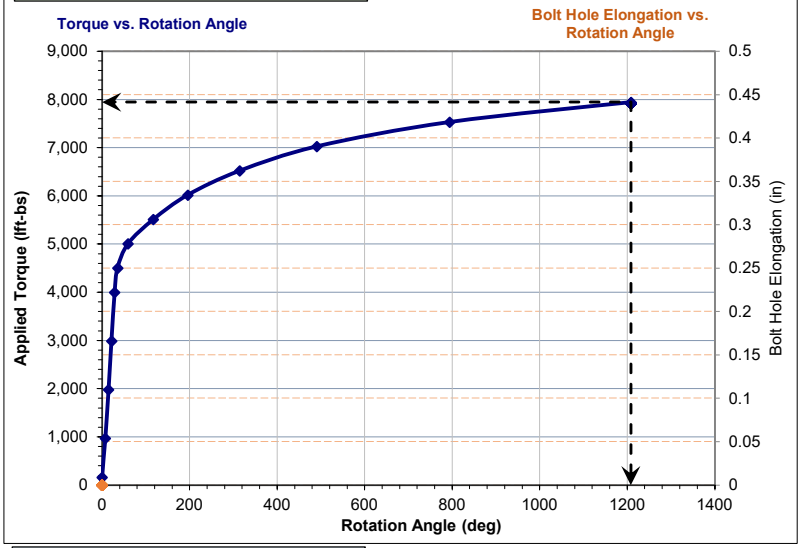
Dimensions[1]:	(inches)	(mm)
Sample Length:	60.0	1524.0
Outside Dimension:	1.515	38.48
Wall Thickness:	-	-
Helix Size:	8	203.20
Helix Thickness	0.374	9.51
Helix Pitch	3.274	83.16

	(inches)	(mm)
Bolt Diameter:	-	-
Bolt Hole Dia:	-	-
Number of Bolts:	0	

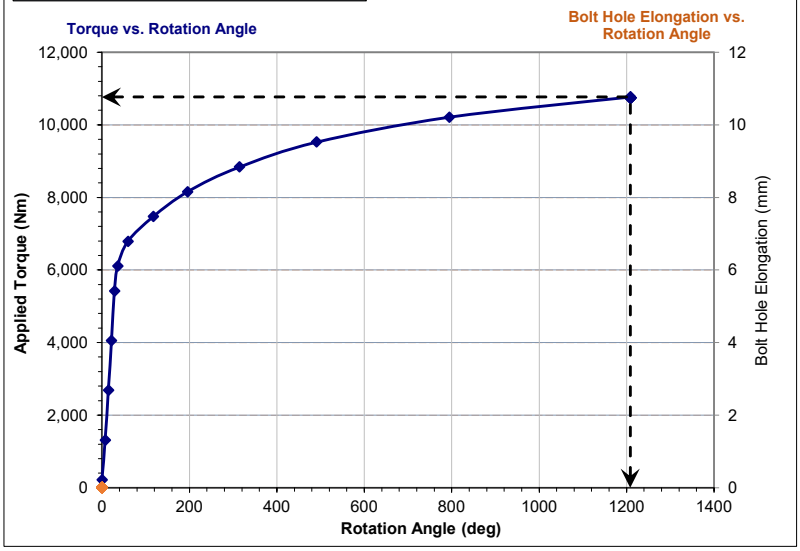
Test Reference(s):

AC358, Section 3.11.3, 3.12.4, 4.2.2

Load / Deflection (Imperial Units)



Load / Deflection (Metric Units)



Rotation Angle (deg)	Imperial Measurements		Metric Measurements	
	Torque (ft-lb)	Hole Elong. (in)	Torque (Nm)	Hole Elong. (mm)
0.0	161	-	218	-
7.3	968	-	1312	-
14.7	1977	-	2681	-
21.5	2987	-	4049	-
28.6	3996	-	5418	-
35.6	4501	-	6102	-
59.3	5005	-	6786	-
116.9	5510	-	7470	-
195.5	6015	-	8155	-
314.2	6519	-	8839	-
490.7	7024	-	9523	-
793.9	7529	-	10207	-
1208.1	7942	-	10768	-
1208.6	7922	-	10741	-

Failure Mode: **Weld Failure**

	ft-lb	*Nm*
Maximum Torque Resistance[2]:	**7,942**	**10,768**

Average Load Rate (deg/min): **17.15**

Testing Photographs







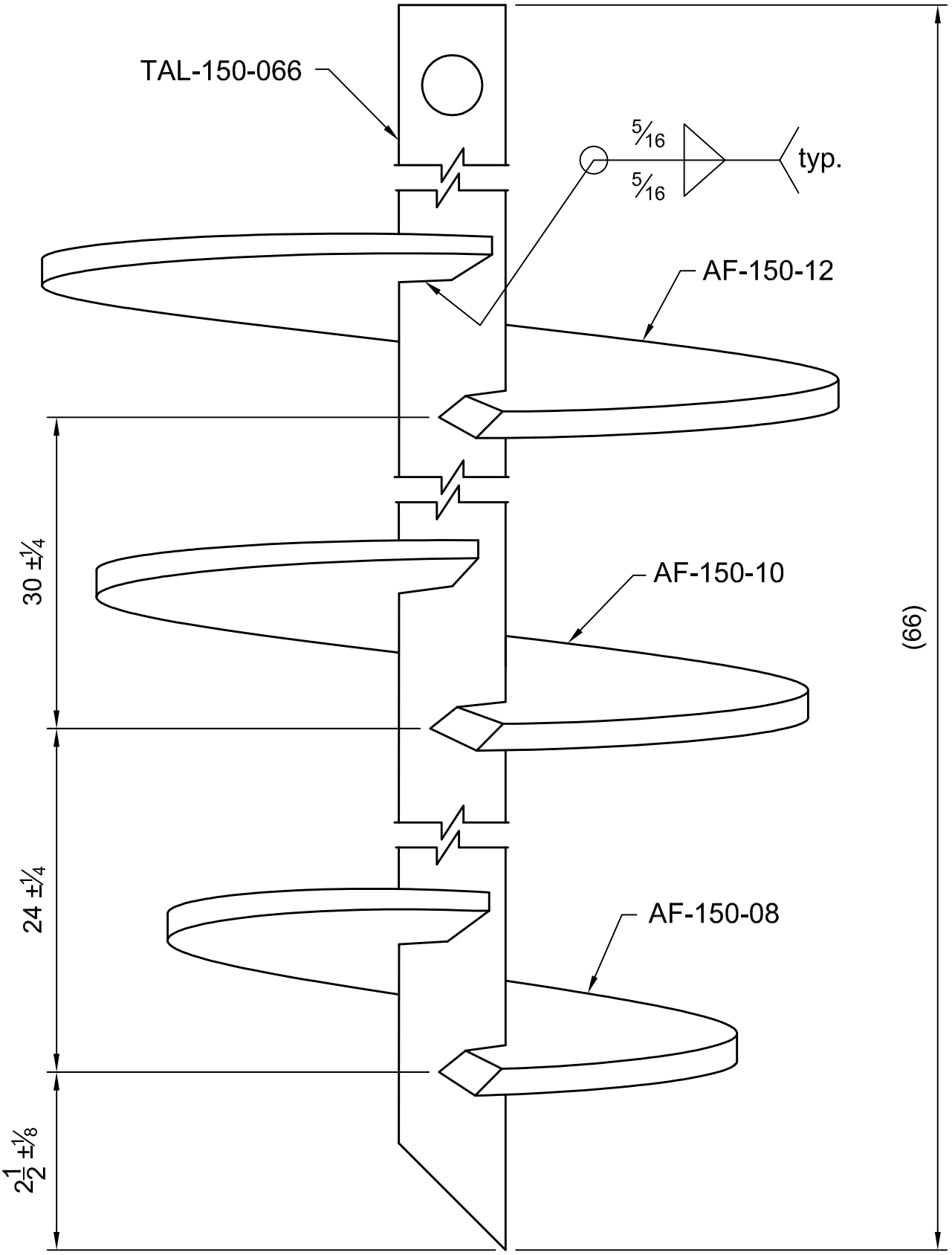
Notes:

1. Average of 3 Caliper Readings

2. Maximum Load applied to sample

Appendix A

Shop Drawings



Earth Contact Products, L.L.C.
15612 S. Keeler Terr.
Olathe, KS. 66062
Phone : (913) 393-0007 Fax : (913) 393-0008

Material :
1½" RCSB - 1550
⅜" (50K) Helix

Description :
1½" x 66" Lg. Torque Anchor Lead w/ (3) Helical Plates

Part Number:
TAF-150-66-08-10-12

DRAWN: *clb* DATE: 07/13/10

Appendix B

Equipment Calibration
and
Certificate

Report and Certificate of Calibration

CAL-CERT
CALIBRATION CERTIFICATION

www.Cal-Cert.com

Toll Free
800-356-4662

Address
5777 SE International Way
Milwaukie, OR 97222

Local
503-654-9620

A2LA ACCREDITED
CERT #4986.01

Report #:	33899-82053-4747	**Customer PO#:**	
Customer Name:	CTL Thompson		
Customer Address:	400 North Link Lane		
City:	Fort Collins	**State:** CO	**Zip:** 80524
Contact:	Craig Ellis		
Service Address:	400 North Link Lane	Fort Collins, CO 80524	

Calibration Standards

1-00065 | Thermo-Hygrometer | Comark | SN: 06217150042 | Cal: 02/07/2024 | Due: 01/31/2025 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 32932-32477-3646
1-01849C / 01498 | Load Cell | Tovey Engineering | SN: 130316A | Cal: 01/31/2024 | Due: 01/31/2025 | Range: 248.00 - 10000 lbf | Report #: 32932-228135-3616

Instrument Data

Calibration Date:	May 21, 2024	**Reference:**	ASTM E-4
Recommended Due Date:	May 21, 2025	**Cal-Cert Procedure:**	CP-001
Calibration Frequency:	12 Months	**Indicating System:**	Computer
Manufacturer:	Tinius Olsen	**Temperature:** 69	°F
Type:	Torsion Testing Machine	**Humidity:** 35%	RH
Model Number:	Electromatic	**Cal Factor:**	None
Serial #:	46286	**Asset #:**	Accredited
Capacity:	750000 in. lbf.	**Service Location:**	Service Address
Tolerance:	1.00% of Reading	**As Found:**	Pass
		As Left:	Pass

Instrument Range: 750000 in. **lbf.** **Resolution:** 1 **lbf.** **Mode Verified:** Compression

Unit Under Test Reading	As Found	Tolerance	Verification Reading #1	Error	Tolerance	Verification Reading #2	Error	Tolerance	Average Error
0	0	0	0	0	0	0	0	0	0
50000	50,360	500.0	50,360	360	500.0	50,150	150	500.0	255
100000	100,640	1000.0	100,640	640	1000.0	100,480	480	1000.0	560
200000	201,160	2000.0	201,160	1160	2000.0	200,760	760	2000.0	960
300000	302,320	3000.0	302,320	2320	3000.0	301,960	1960	3000.0	2140
400000	403,320	4000.0	403,320	3320	4000.0	403,070	3070	4000.0	3195
500000	504,370	5000.0	504,370	4370	5000.0	504,070	4070	5000.0	4220
600000	605,210	6000.0	605,210	5210	6000.0	605,130	5130	6000.0	5170
750000	756,510	7000.0	756,510	6510	7000.0	756,570	6570	7000.0	6540
0	0	0	0	0	0	0	0	0	0

Expanded Uncertainty ± 288.6876 lbf.

Force Percent Full Scale CF-001-26 **Revision 9** **9/7/2018**

Copyright 2013 Cal-Cert. All rights reserved.

Manufacturer: Tinius Olsen **Type:** Torsion Testing Machine **Serial #:** 46286

Remarks:

We sincerely thank you for your business. Please call us at 503-654-9620 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

Cal-Cert is accredited by A2LA under Calibration Laboratory Code #4986.01.
A2LA is recognized under the ILAC mutual recognition agreement (MRA).

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.1, and meets the requirements of all applicable references and Cal-Cert procedures listed above.
Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.
All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.

This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: Cody Sumner **Date:** May 21, 2024

Quality Manager: Jason Wimmer **Signature:** 

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CERTIFICATE OF ACCREDITATION

This is to attest that

CTL/THOMPSON, INC.

400 NORTH LINK LANE
FORT COLLINS, COLORADO 80524, U.S.A.

Testing Laboratory TL-342

has met the requirements of AC89, *IAS Accreditation Criteria for Testing Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories.* This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date April 24, 2024

President

Visit www.iasonline.org for current accreditation information.

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

3060 Saturn Street, Suite 100, Brea, California 92821, U.S.A. | www.iasonline.org

CTL/THOMPSON, INC.

www.ctlthompson.com

Contact Name Chip Leadbetter **Contact Phone** +1-970-206-9455

Accredited to ISO/IEC 17025:2017 *Effective Date April 24, 2024*

CMT	
ASTM C31/C31M	Standard practice for making and curing concrete test specimens in the field (field cure only)
ASTM C39/C39M	Standard test method for compressive strength of cylindrical concrete specimens (test on field cured specimen only)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure
Structural	
ASTM A944	Standard Test Method for Comparing Bond Strength of Steel Reinforcing Bars to Concrete Using Beam-End Specimens
ASTM D1143/D1143M	Standard test methods for deep foundations under static axial compressive load
ASTM D3689/D3689M	Standard test methods for deep foundations under static axial tensile load
ASTM D3966/D3966M	Standard test methods for deep foundations under lateral load
ASTM D7147	Standard Specification for Testing and Establishing Allowable Loads of Joist Hanger
ASTM E72	Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, Sections 9 and 10 only.
IAPMO EC027	Evaluation criteria for helical piles for use under the International Residential Code
ICC ES AC13	Acceptance Criteria for Joist Hanger Devices (test methods referenced in sections 3, 4 and 5)
ICC ES AC237	Nonprestressed Deformed High Strength Steel Bars for concrete Reinforcement (test methods referenced in sections 4.1 and 4.2)
ICC ES AC335	Acceptance Criteria for Adjustable Steel Columns, Sections 3.2.1 and 3.2.2 only.
ICC ES AC336	Acceptance Criteria for Bearing Pin Piers (test methods referenced in sections 4.1, 4.2, and 4.3)
ICC ES AC358	Helical pile systems and devices (test methods referenced in sections 4.1.1 (type A), 4.1.2 (type B), 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3, 4.4.1 and 4.4.2)

ICC ES AC406	Belled segmented pipe foundation systems and devices (test methods referenced in sections 4.2 (side load), 4.3.1, 4.3.2, 4.3.3, 4.4, 4.5.1 and 4.5.2)
ICC ES AC443	Screw foundation systems (SFSs) (test methods referenced in sections 4.1, 4.2.1, 4.2.2, 4.2.3, 4.3, 4.4.1 and 4.4.2)
ICC ES AC517	Acceptance Criteria for Push Pier Foundation Systems [test methods referenced in sections 3 (excluding all sections referring to designs and related to designing) and 4]
Physical	
ASTM D2395	Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials
ASTM D7438	Standard Practice for Field Calibration and Application of Hand-Held Moisture Meter