IAS ACCREDITED Testing Laboratory

TL-342

CTL|THOMPSON, INC.
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PRODUCT TESTING REPORTS
TITAN DECK FOOT ANCHORS
TIGA600 AND TIGA900

Prepared For:

intertek
Total Quality. Assured.

130 Derry Court
York, PA 17406

Attention: Mr. Kendall Leaman

Project Number: FC09763.000-470

Report Number: 1605 (Rev. 2)

October 29, 2021

CTL | THOMPSON INCORPORATED

October 29, 2021

Subject: Product Testing Report
Titan Deck Foot Anchors
TIGA600 and TIGA900

Project Number: FC09763.000-470
Report Number: 1605 (Rev. 2)

CTL|Thompson, Inc. has performed product testing on the products listed below in accordance with the supplied evaluation plan provided by Intertek (Report No: 104057475-YRK-01, dated: 04.23.2020). This report presents the product descriptions, test methods, test data and test summaries of the testing program.

Anchor types for each test were specified by Intertek. Installation instructions were provided by Titan Building Products and are attached in Appendix A. Per client request, testing excluded the load plate (HDKP) as shown in the installation instructions and shop drawings. Testing was only performed fully installed anchors.

Products included in this testing program are as follows:

Manufacturer ID	Shaft Size	Shaft Length	Auger Configuration
TIGA600	19 mm (0.748 in)	600 mm (23.62 in)	60 mm (2.362 in) / 83 mm (3.268 in)
TIGA900		900 mm (35.43 in)	

This report provides the following testing results based on the following test methods:

Main Standard	Reference Standard / Section	Test
AC358	Section 3.11.3, 4.2.2	Torsion
AC336	ASTM D1143 Section 10.1.3	Compression Load Bearing
IBC	ASTM D3689 Section 8.1.2	Tension Load Test

Summary of Testing Results

Standard / Section	Test	Result Summary
AC358 / 4.2.2	Torsion	RTC[1] = 128.3 ft-lbs
AC336 / 4.3.2 ASTM D1143 / 10.1.3	Compression Load Bearing	Clay (TIGA900) RLC[2] = 1,391 lbs Clay (TIGA600) RLC = 1,146 lbs Sand RLC = 6,285 lbs
ASTM D3689 / 8.1.2	Tension Load Test TIGA600	Clay RMLC[3] = 638 lbs Sand RMLC = 3,762 lbs
ASTM D3689 / 8.1.2	Tension Load Test TIGA900	Clay RMLC[3] = 1,244 lbs Sand RMLC = 4,001 lbs

[1] *RTC = Reported Torque Capacity*
[2] *RLC = Reported Load Capacity (at 0.5" Deflection)*
[3] *RMLC = Reported Maximum Load Capacity*

We appreciate the opportunity to work with you on this project. If you have any questions regarding the information provided in this report, please do not hesitate to contact us.

Sincerely,
CTL|THOMPSON, INC.

Ryan S. Beck, P.E.
Associate Engineer
Accredited Laboratory Manager

Reviewed by:

R.B. "Chip" Leadbetter, III, P.E.
Senior Geotechnical Engineer
Accredited Laboratory Director

Report Authorized for Release:

DOCUMENT APPROVED FOR RELEASE

RSB

Oct 29 2021

Revision Log

Date	*Revision No.*	*Explanation*	*By*
09.24.2021	*0*	*Initial Issue*	*R. Beck, Manager*
09.27.2021	*1*	*Include Extra Testing on TIGA600*	*R. Beck, Manager*
10.29.2021	*2*	*Additional Tension Testing on TIGA900*	*R. Beck, Manager*

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SECTION 1:

TITAN DECK FOOT ANCHORS
TIGA600 AND TIGA900

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TORSION

IAS ACCREDITED Testing Laboratory

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Client:	Intertek
Job Number:	FC09763.000
Product:	TIGA900

Reference Method

Tests were conducted according to ICC-ES AC358 (4.2.2.1.3), and CTL|Thompson's test procedure TP 1.3.1.

Standard Procedure

Shaft dimensions, shaft length, auger diameters, auger thickness, and pitch were recorded for all specimens. A torsion fixture was used to accommodate the augers. Each specimen was loaded and tested in the torque machine (see Figure 1). Applied torque and angle deformation were recorded. Maximum torsion resistance was taken as that required to achieve 0.5 shaft revolution per foot of shaft length or that which causes failure of the shaft, whichever occurred first.

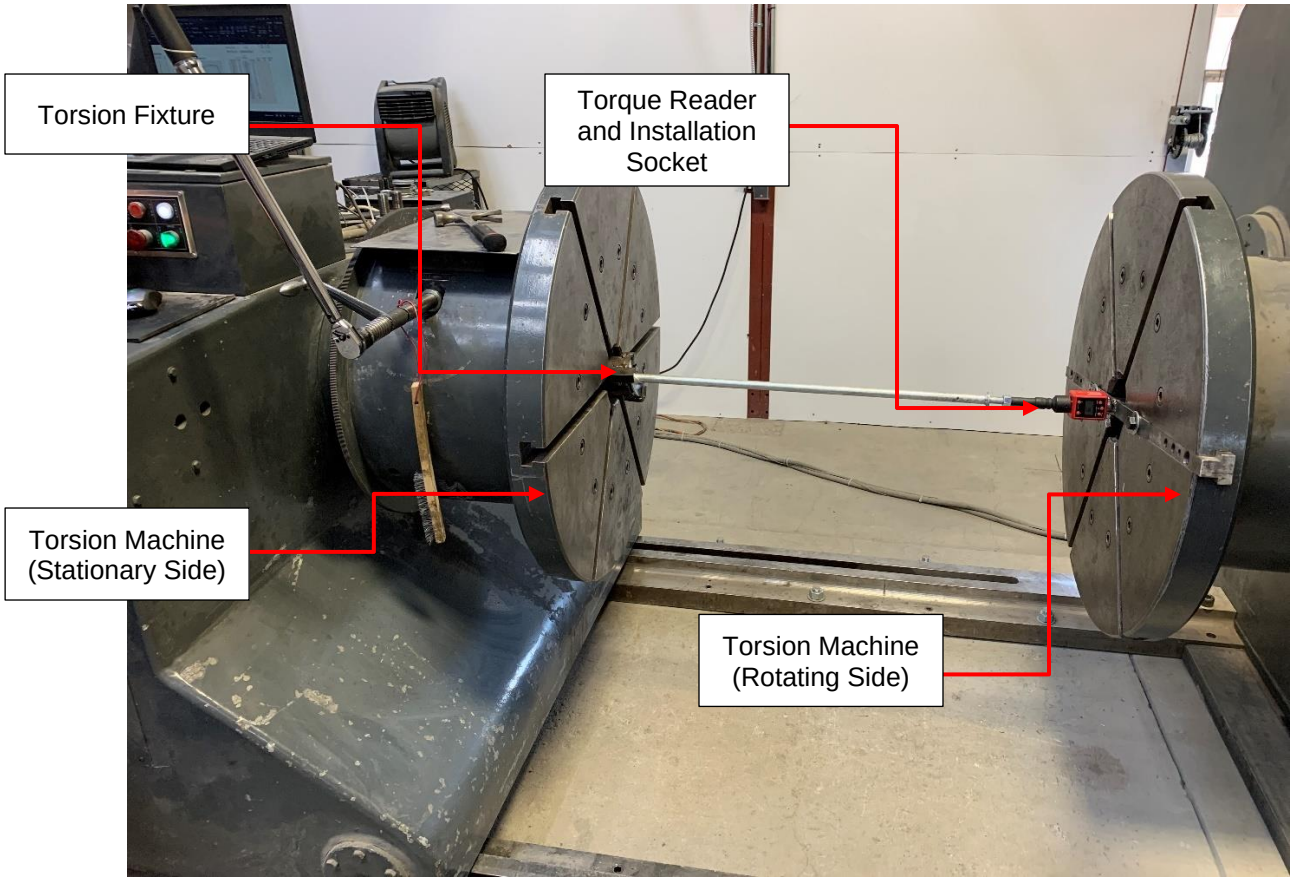

Figure 1. Torsion Test Setup

Deviations from Standard Procedure

There were no significant deviations from the standard procedure.

Summary of Results

Specimen Number	Auger Configuration	Shaft Diameter	Shaft Length	Maximum Torsion Resistance (ft-lbs)[1]	Deviation from Mean (%)	Reported Torque Capacity (ft-lbs)	Failure Mode[2]
L1	60 mm (2.362 in) / 83 mm (3.268 in)	19 mm (0.748 in)	900 mm (35.43 in)	124.6	-2.86%	128.3	Shaft Torsion
L2				128.5	+0.18%		Shaft Torsion
L3				131.7	+2.68%		Shaft Torsion

[1] *Per AC358 Section 4.2.2.2.3*

[2] *Based on the exposed length of the specimen and the provided failure criteria of 0.5 a revolution per foot shaft length, the required rotation for failure was equal to 472.5 degrees.*

COMPRESSION
LOAD BEARING

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INCORPORATED

Client:	Intertek
Job Number:	FC09763.000
Product:	TIGA900 and TIGA600 (Clay)

Reference Method

Tests were conducted according to ICC-ES AC336 (4.3.2), and ASTM D1143 (10.1.3) Maintained Load Test Method.

Standard Procedure

The anchors were installed per instructions provided by the manufacturer. The final installation torque was recorded after installation. Load and deflection were recorded at intervals of about 25% up to the design load capacity. Tests were stopped when the measured load when the net deflection exceeded 0.5 inches.

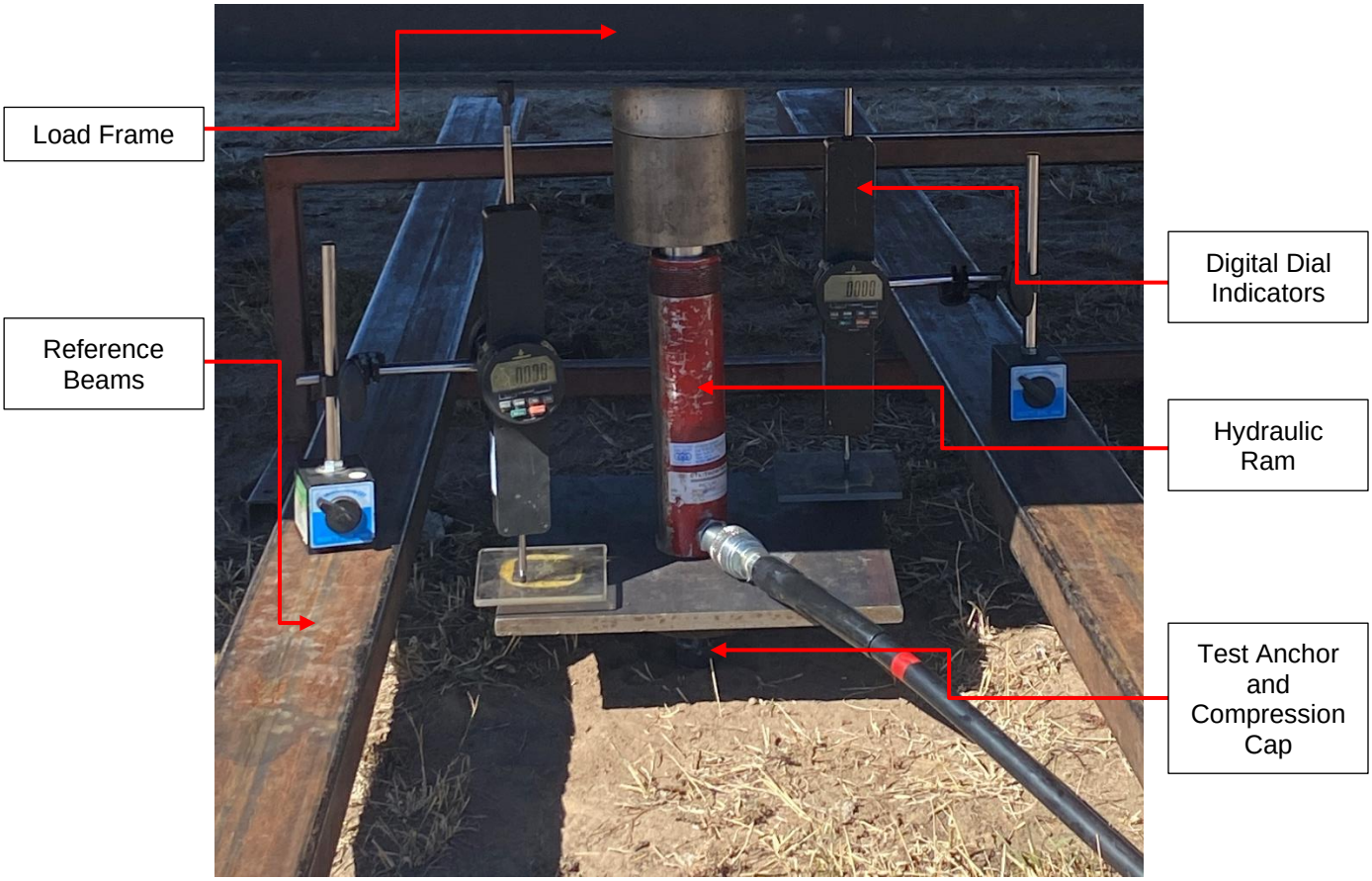

Figure 1. Compression Load Test Setup

Deviations from Standard Procedure

There were no significant deviations from the standard procedure.

Summary of Results

Test Site	Specimen	Measured Installation Torque (ft-lbs)	Measured Load Capacity at 0.5" Deflection (lbs)[1]	Deviation from Mean (%)	Reported Load Capacity (lbs)[2]
Loveland #5 (Clay)	LC1	37.2	1,510	-6.33%	**1,391**
	LC2	31.9	1,391	-13.67%	
	LC3	44.2	1,934	+20.01%	
	LC4	26.8	1,122	-2.09%	**1,146**
	LC5	24.3	1,170	+2.16%	
	LC6	25.7	1,145	-0.07%	
Platteville #1 (Sand)	PC1	97.9	6,314	+0.46%	**6,285**
	PC2	98.3	7,175	+14.17%	
	PC3	90.1	5,365	-14.63%	

[1] *Per AC336 Section 3.5, the settlement at the design load shall be no greater than 0.5-inches.*
[2] *Per AC336 Section 4.3.1 and Intertek Evaluation Plan Section 5.6.2, should any individual result deviate more than 15% from the average, the lowest of the three tests shall apply.*

Compression Load Bearing Test

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Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

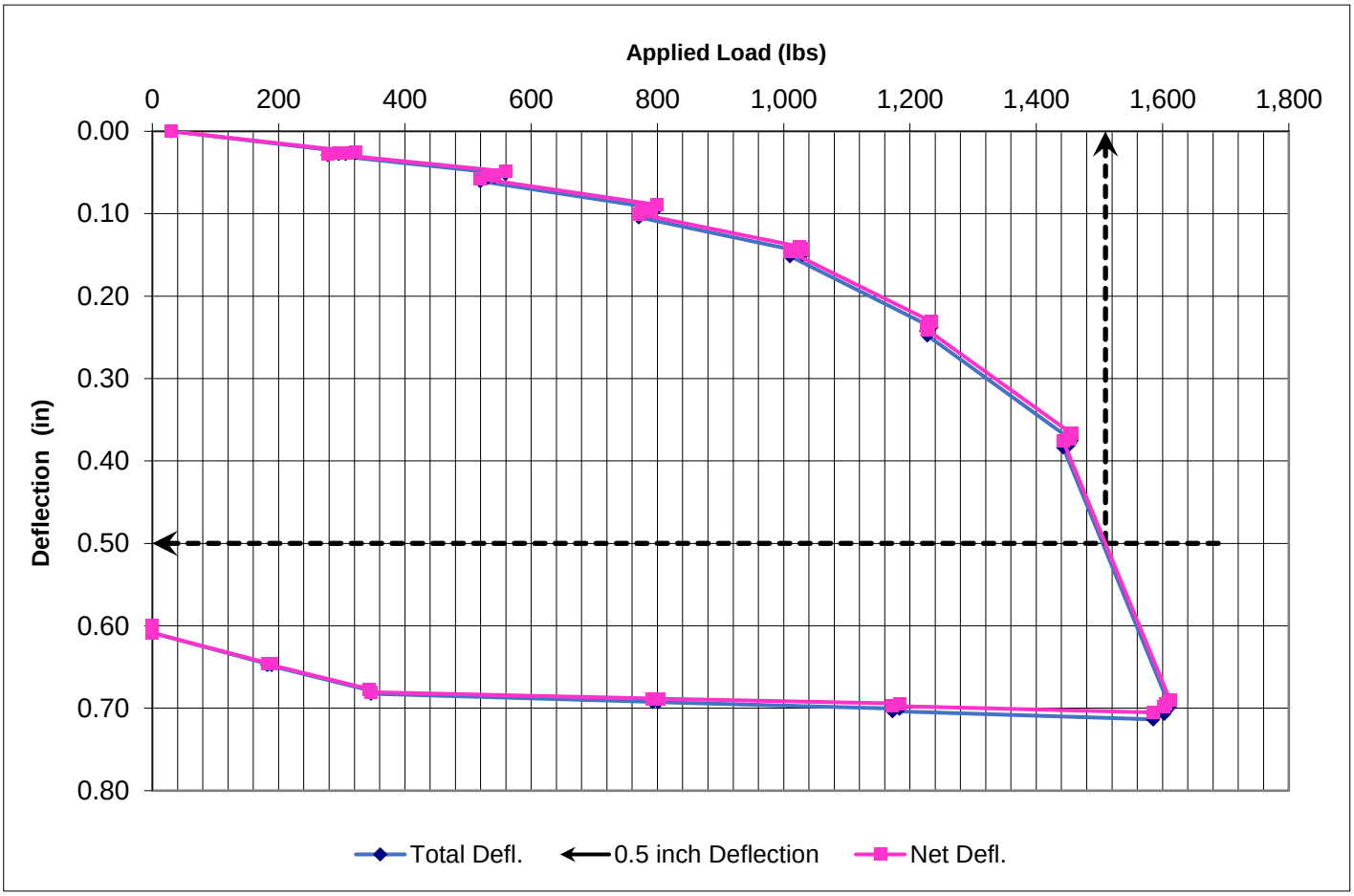
Specimen Number:	LC1
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	37.2
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.14.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	1,612
Capacity at 0.5 inch Deflection (lbs):	1,510

Per AC336, Section 3.5

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Brandon Edwards

Specimen Number:	LC1

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
30	0.000	1,612	0.689				
322	0.025	1,605	0.695				
306	0.026	1,603	0.698				
295	0.026	1,585	0.705				
277	0.027	1,172	0.697				
559	0.049	1,183	0.694				
542	0.053	792	0.688				
531	0.054	801	0.688				
519	0.058	346	0.681				
799	0.089	344	0.677				
790	0.093	182	0.647				
775	0.096	189	0.646				
770	0.100	0	0.609				
1,026	0.140	0	0.600				
1,028	0.142						
1,030	0.144						
1,010	0.146						
1,234	0.231						
1,230	0.235						
1,225	0.236						
1,228	0.241						
1,456	0.367						
1,454	0.370						
1,452	0.373						
1,443	0.376						

Note:

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

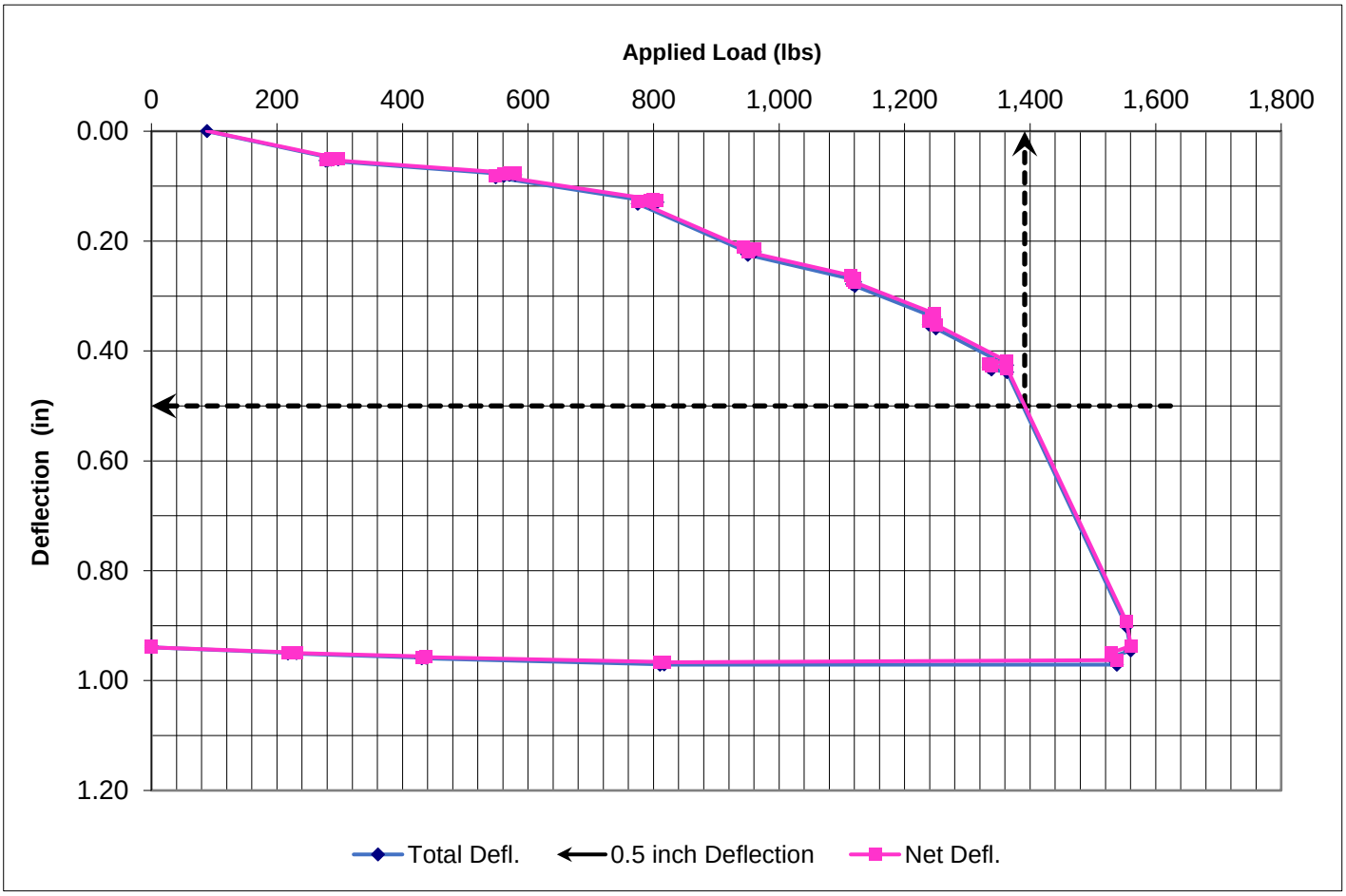
Specimen Number:	LC2
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	31.9
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.14.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	1,561
Capacity at 0.5 inch Deflection (lbs):	1,391

Per AC336, Section 3.5

Compression Load Bearing Test

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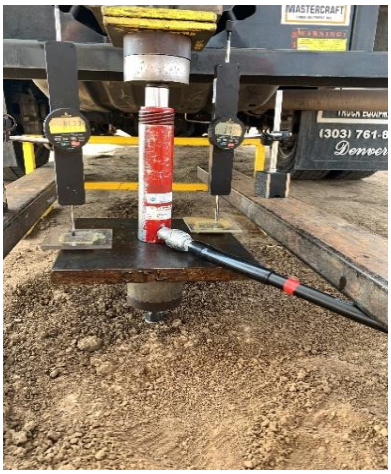
IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Brandon Edwards

Specimen Number:	LC2



Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
89	0.000	1,363	0.419				
297	0.049	1,334	0.423				
286	0.050	1,339	0.426				
282	0.051	1,363	0.431				
277	0.052	1,554	0.893				
579	0.076	1,561	0.937				
570	0.076	1,529	0.949				
562	0.078	1,538	0.963				
548	0.081	810	0.967				
799	0.124	817	0.966				
806	0.125	431	0.957				
795	0.126	437	0.956				
775	0.128	218	0.949				
943	0.211	231	0.949				
961	0.214	0	0.940				
952	0.217	0	0.937				
950	0.220						
1,114	0.263						
1,121	0.268						
1,117	0.272						
1,121	0.276						
1,248	0.332						
1,243	0.339						
1,239	0.345						
1,250	0.352						

Note:

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

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Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

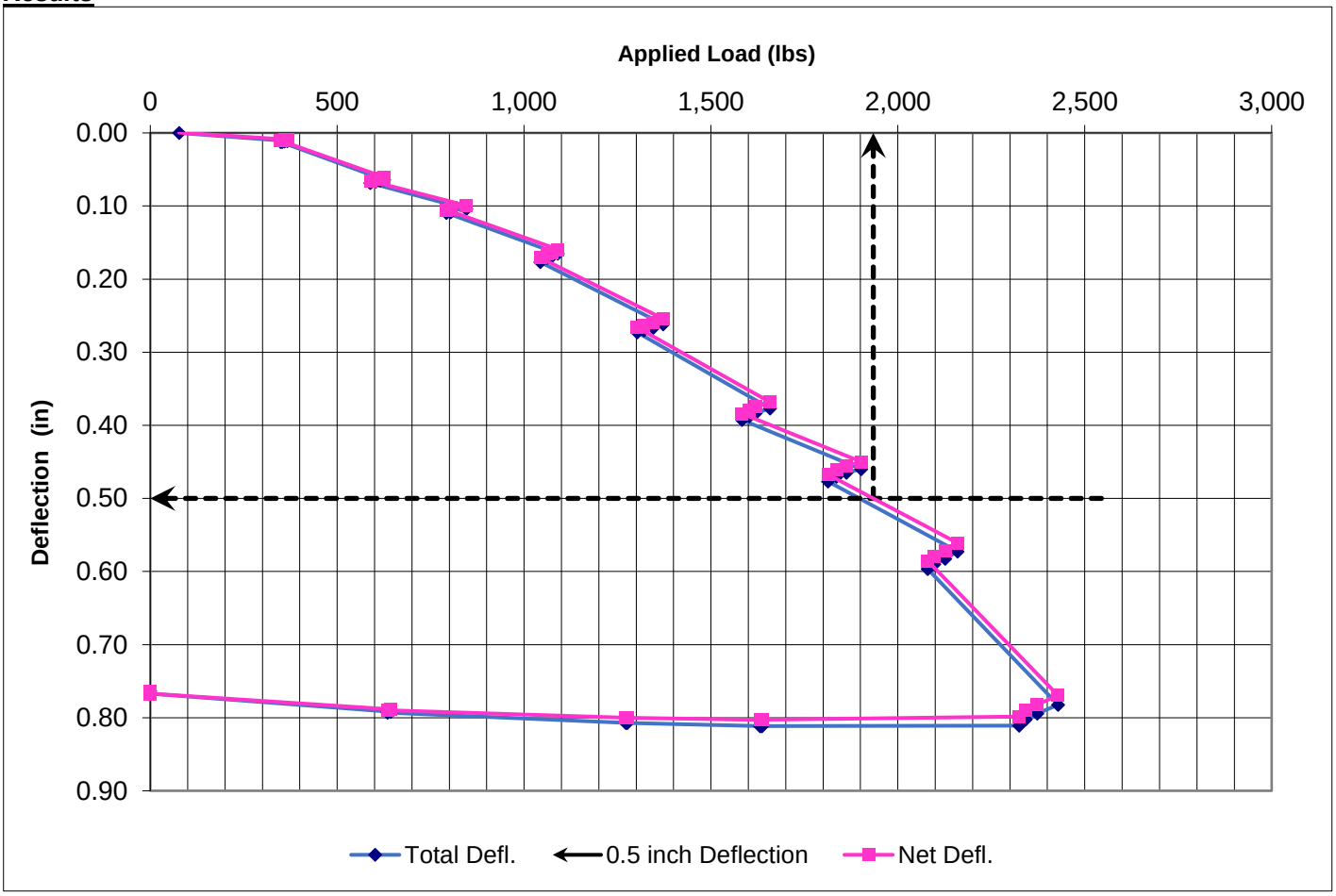
Specimen Number:	LC3
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	44.2
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.14.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	2,428
Capacity at 0.5 inch Deflection (lbs):	1,934

Per AC336, Section 3.5

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Brandon Edwards

Specimen Number:	LC3

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
78	0.000	1,902	0.450				
366	0.009	1,862	0.455				
360	0.010	1,836	0.460				
353	0.011	1,814	0.467				
349	0.011	2,160	0.561				
626	0.061	2,127	0.571				
615	0.062	2,098	0.579				
604	0.063	2,080	0.585				
588	0.065	2,428	0.770				
846	0.100	2,373	0.782				
804	0.102	2,342	0.790				
804	0.104	2,324	0.799				
792	0.105	1,632	0.803				
1,090	0.159	1,636	0.803				
1,074	0.163	1,272	0.800				
1,061	0.165	1,276	0.800				
1,043	0.171	635	0.790				
1,372	0.254	644	0.789				
1,345	0.259	0	0.767				
1,321	0.263	0	0.764				
1,303	0.266						
1,658	0.368						
1,620	0.374						
1,603	0.379						
1,583	0.384						

Note:

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.09.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

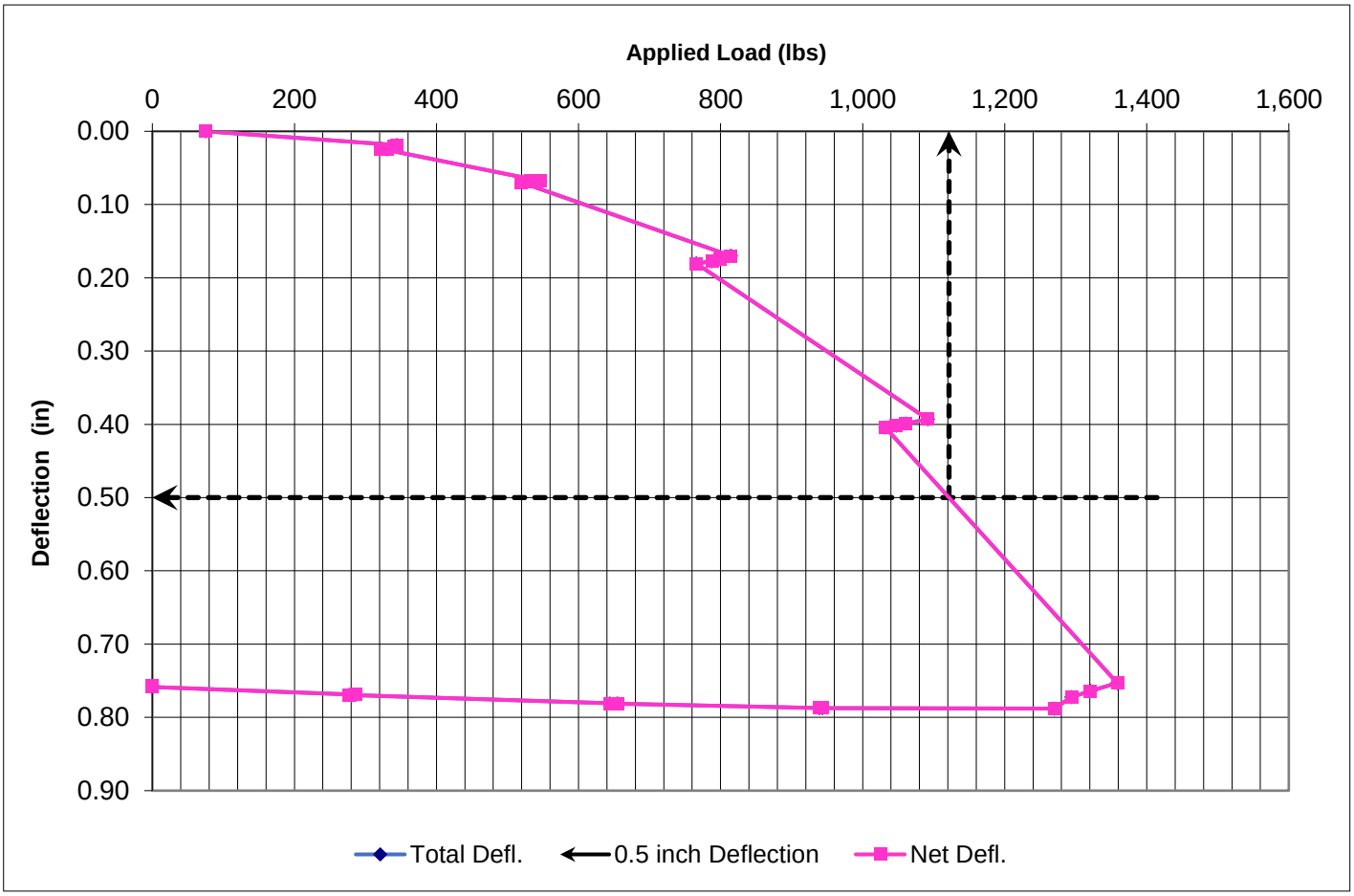
Specimen Number:	LC4
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	26.8
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.09.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	1,359
Capacity at 0.5 inch Deflection (lbs):	1,122

Per AC336, Section 3.5

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.09.2021
Technician:	Brandon Edwards

Specimen Number:	LC4

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
75	0.000	277	0.770				
344	0.019	286	0.769				
340	0.020	0	0.759				
331	0.025	0	0.757				
322	0.024						
546	0.068						
533	0.068						
524	0.069						
519	0.070						
815	0.170						
799	0.175						
788	0.178						
766	0.181						
1,092	0.393						
1,061	0.399						
1,048	0.402						
1,032	0.405						
1,359	0.753						
1,321	0.764						
1,294	0.773						
1,270	0.788						
939	0.788						
943	0.788						
644	0.781						
655	0.781						

Note:

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.09.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

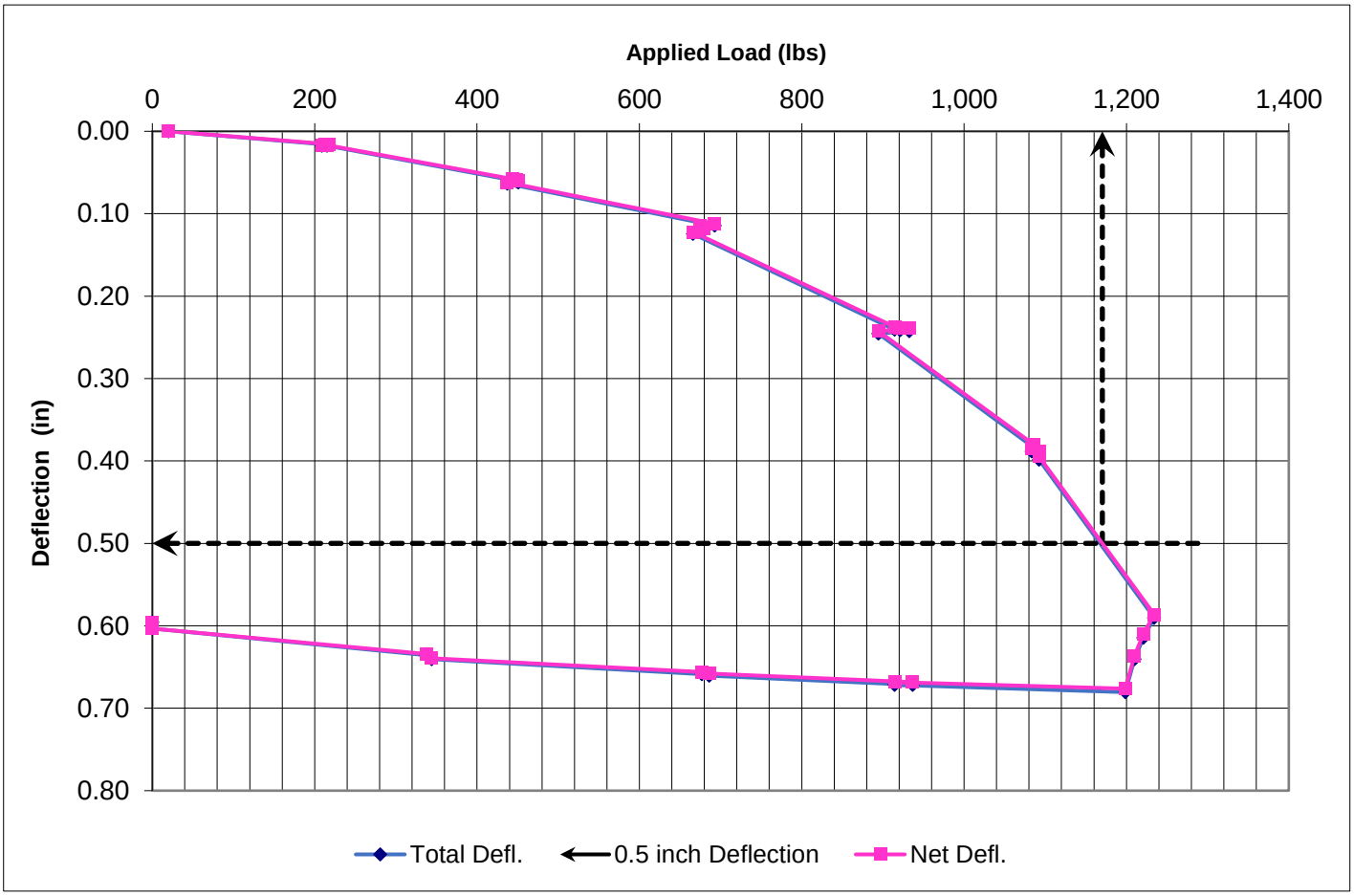
Specimen Number:	LC5
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	24.3
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.09.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	1,234
Capacity at 0.5 inch Deflection (lbs):	1,170

Per AC336, Section 3.5

Compression Load Bearing Test

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.09.2021
Technician:	Brandon Edwards

Specimen Number:	LC5

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
20	0.000	915	0.668				
218	0.016	937	0.668				
213	0.016	686	0.658				
209	0.017	677	0.656				
215	0.017	344	0.639				
444	0.058	337	0.634				
448	0.059	0	0.604				
451	0.061	0	0.596				
437	0.062						
693	0.112						
675	0.115						
679	0.118						
666	0.122						
915	0.237						
921	0.238						
932	0.239						
895	0.242						
1,085	0.380						
1,083	0.385						
1,092	0.389						
1,092	0.395						
1,234	0.586						
1,221	0.610						
1,210	0.636						
1,199	0.676						

Note:

Compression Load Bearing Test

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IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

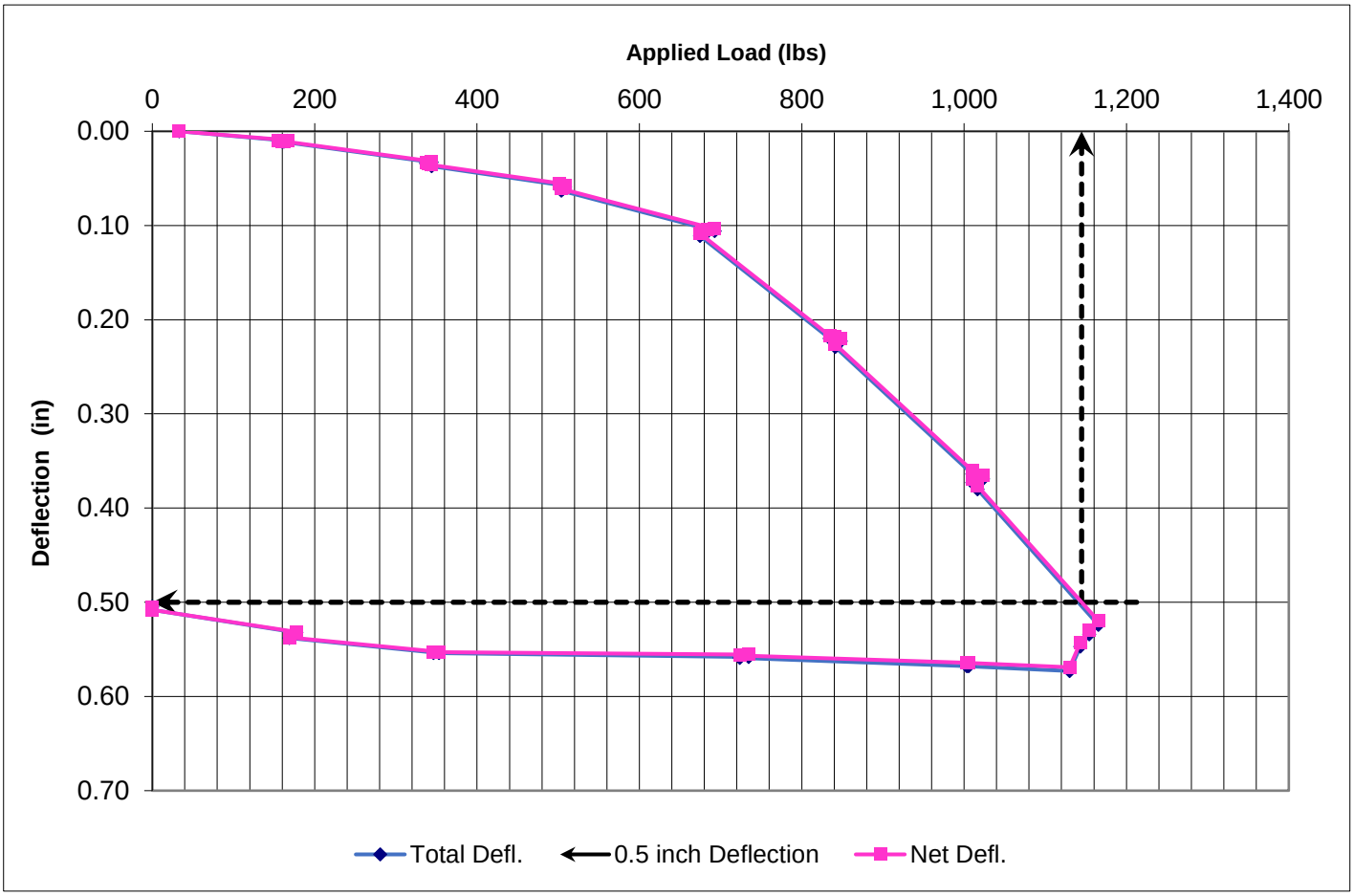
Specimen Number:	LC6
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	25.7
SPT Blowcount at Depth:	11/12
Nearest Test Reaction (ft):	5
Installation Date:	09.09.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	1,165
Capacity at 0.5 inch Deflection (lbs):	1,145

Per AC336, Section 3.5

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Brandon Edwards

Specimen Number:	LC6

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
33	0.000	1,165	0.520				
166	0.009	1,154	0.530				
155	0.009	1,143	0.543				
162	0.010	1,130	0.569				
160	0.010	1,003	0.564				
344	0.032	1,006	0.564				
337	0.033	724	0.556				
340	0.034	735	0.555				
344	0.036	346	0.553				
502	0.055	353	0.553				
508	0.057	169	0.537				
506	0.059	178	0.531				
504	0.061	0	0.508				
693	0.104	0	0.505				
684	0.105						
677	0.107						
675	0.109						
835	0.217						
841	0.218						
848	0.220						
841	0.226						
1,010	0.360						
1,023	0.365						
1,010	0.369						
1,017	0.376						

Note:

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.16.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

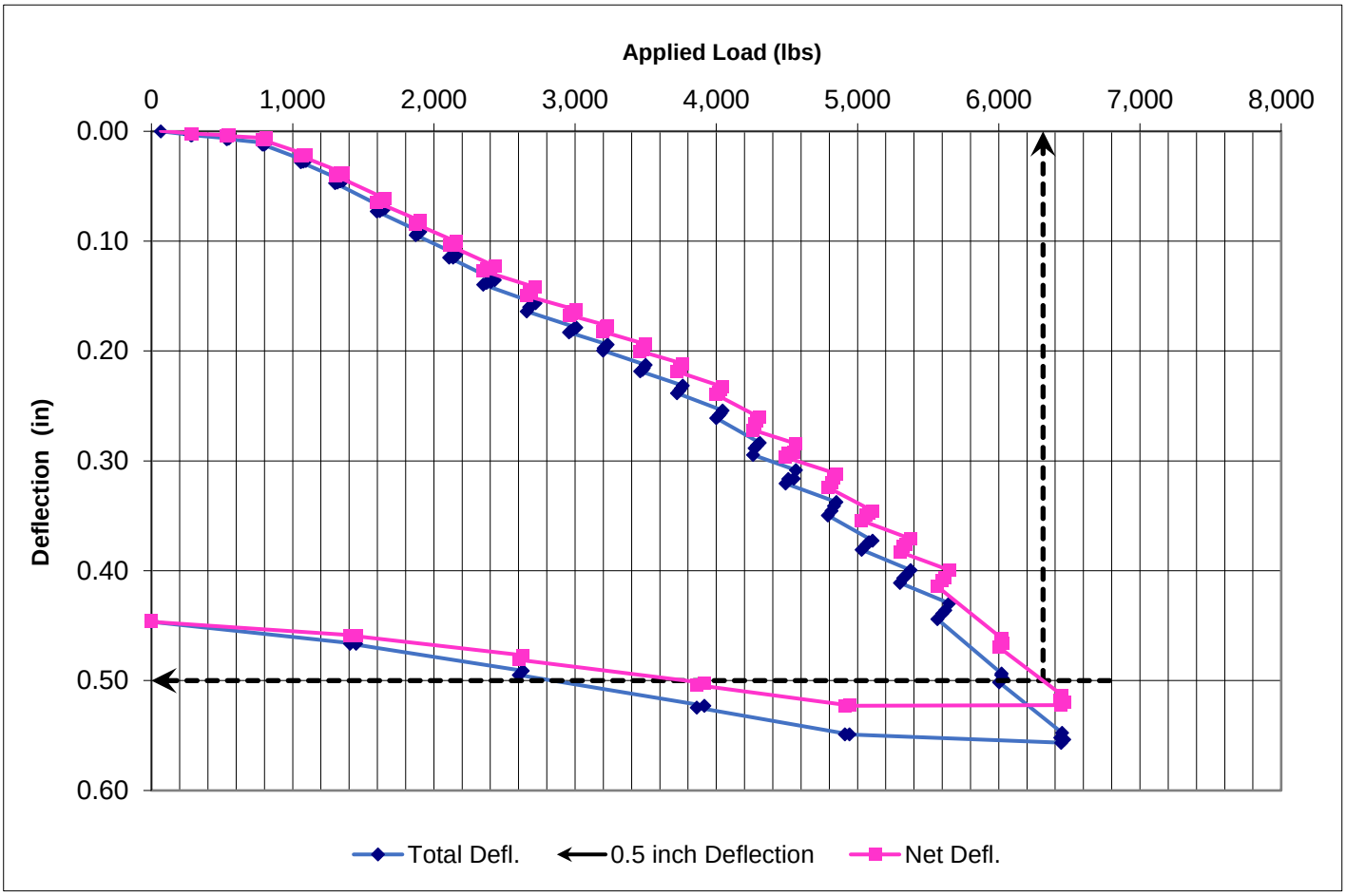
Specimen Number:	PC1
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	97.9
SPT Blowcount at Depth:	13/12
Nearest Test Reaction (ft):	5
Installation Date:	09.15.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	6,464
Capacity at 0.5 inch Deflection (lbs):	6,314

Per AC336, Section 3.5

Compression Load Bearing Test

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.16.2021
Technician:	Brandon Edwards

Specimen Number:	PC1

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
67	0.000	1,905	0.081	3,487	0.197	5,061	0.350
289	0.002	1,891	0.083	3,478	0.199	5,030	0.354
284	0.002	1,880	0.083	3,461	0.200	5,376	0.371
282	0.002	1,871	0.085	3,763	0.212	5,345	0.376
277	0.002	2,160	0.101	3,749	0.214	5,323	0.378
548	0.004	2,151	0.102	3,738	0.216	5,301	0.383
542	0.004	2,135	0.104	3,723	0.219	5,649	0.399
535	0.004	2,109	0.104	4,044	0.233	5,621	0.406
531	0.004	2,431	0.123	4,031	0.235	5,601	0.409
812	0.006	2,404	0.124	4,018	0.237	5,565	0.414
801	0.008	2,373	0.125	4,000	0.240	6,020	0.462
792	0.008	2,349	0.127	4,306	0.261	6,018	0.463
786	0.008	2,719	0.142	4,289	0.263	6,029	0.466
1,094	0.021	2,690	0.145	4,271	0.266	6,002	0.470
1,077	0.022	2,675	0.146	4,260	0.272	6,449	0.513
1,066	0.022	2,657	0.150	4,564	0.284	6,435	0.518
1,057	0.022	3,008	0.163	4,548	0.292	6,464	0.519
1,356	0.038	2,990	0.164	4,511	0.293	6,442	0.522
1,336	0.038	2,972	0.166	4,491	0.297	4,910	0.523
1,319	0.039	2,957	0.167	4,850	0.312	4,943	0.523
1,301	0.040	3,230	0.177	4,833	0.315	3,862	0.504
1,654	0.061	3,219	0.178	4,815	0.320	3,916	0.502
1,636	0.062	3,203	0.180	4,790	0.324	2,602	0.481
1,616	0.064	3,199	0.182	5,106	0.345	2,630	0.477
1,596	0.065	3,501	0.194	5,081	0.347	1,405	0.459

Note:

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.21.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

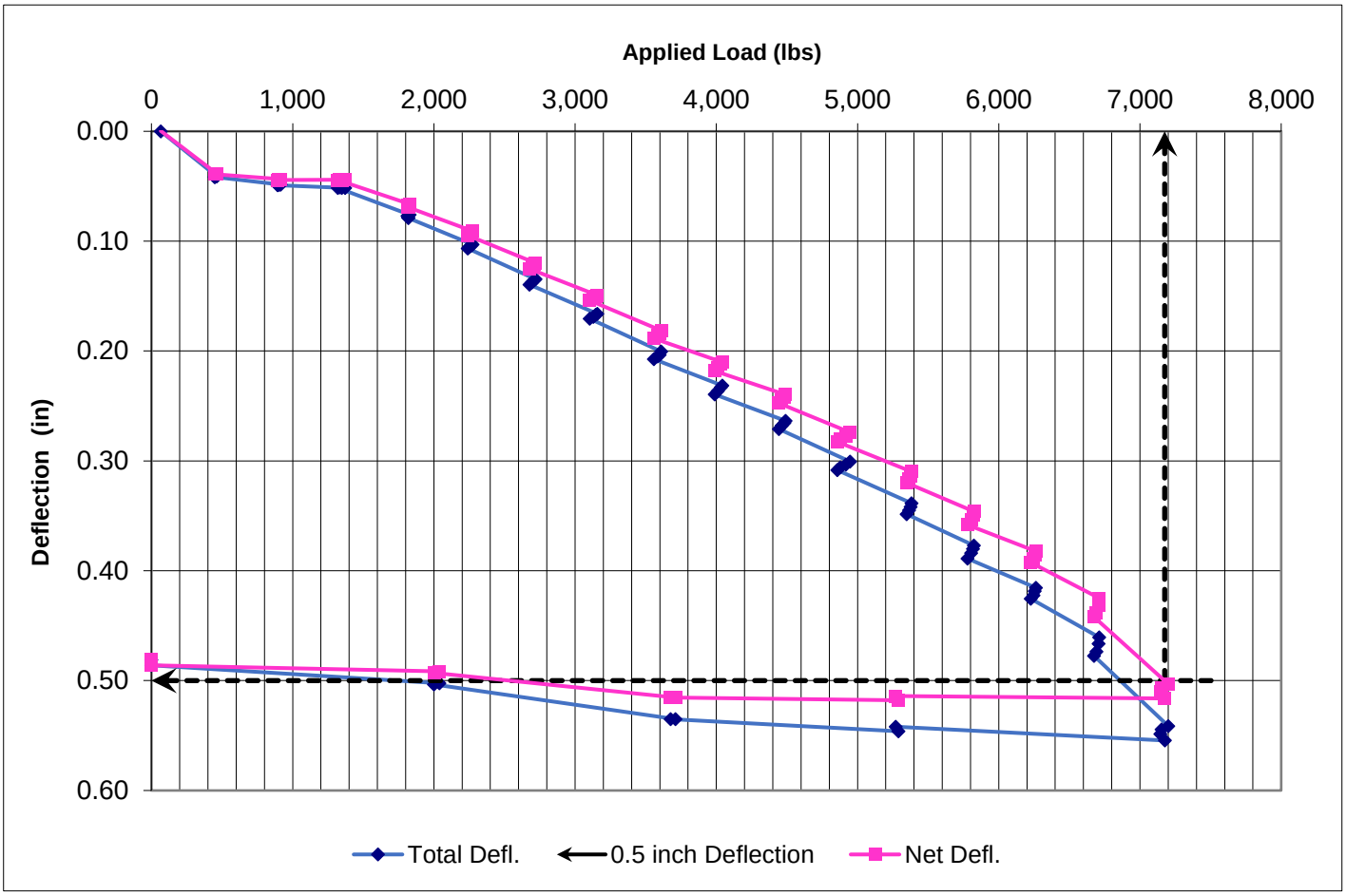
Specimen Number:	PC2
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	98.3
SPT Blowcount at Depth:	13/12
Nearest Test Reaction (ft):	5
Installation Date:	09.21.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	7,201
Capacity at 0.5 inch Deflection (lbs):	7,175

Per AC336, Section 3.5

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.21.2021
Technician:	Brandon Edwards

Specimen Number: PC2

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
67	0.000	3,157	0.149	5,818	0.349		
462	0.039	3,145	0.150	5,805	0.353		
453	0.039	3,130	0.152	5,778	0.358		
451	0.039	3,103	0.154	6,264	0.382		
448	0.039	3,609	0.181	6,255	0.385		
915	0.044	3,598	0.184	6,247	0.389		
906	0.044	3,583	0.186	6,227	0.392		
899	0.044	3,558	0.189	6,710	0.425		
892	0.044	4,042	0.210	6,706	0.431		
1,372	0.044	4,031	0.212	6,693	0.438		
1,347	0.044	4,011	0.215	6,675	0.442		
1,332	0.044	3,989	0.218	7,201	0.503		
1,321	0.044	4,491	0.240	7,152	0.506		
1,829	0.066	4,482	0.242	7,143	0.511		
1,814	0.067	4,462	0.244	7,177	0.516		
1,818	0.069	4,444	0.247	5,270	0.514		
1,820	0.069	4,948	0.274	5,290	0.518		
2,273	0.091	4,917	0.277	3,676	0.515		
2,262	0.092	4,879	0.280	3,712	0.515		
2,249	0.094	4,857	0.283	2,000	0.493		
2,240	0.095	5,383	0.310	2,040	0.492		
2,719	0.120	5,376	0.313	0	0.486		
2,710	0.121	5,365	0.316	0	0.481		
2,695	0.123	5,347	0.320				
2,677	0.125	5,825	0.346				

Note:

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.21.2021
Technician:	Brandon Edwards

Test Method	
	AC336 4.3
	ASTM D1143

Specimen Specification

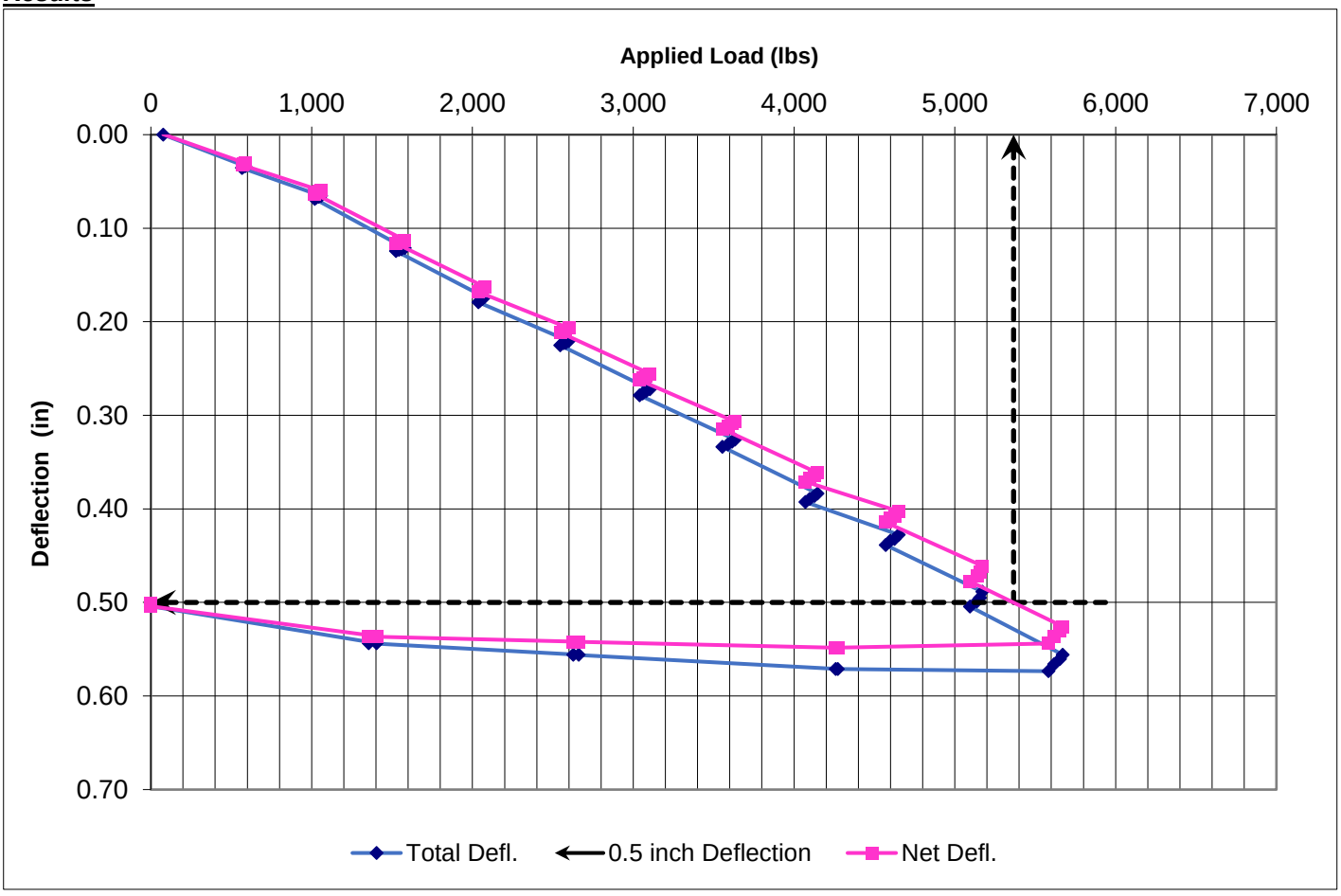
Specimen Number:	PC3
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	90.1
SPT Blowcount at Depth:	13/12
Nearest Test Reaction (ft):	5
Installation Date:	09.21.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Recorded Test Capacity (lbs):	5,672
Capacity at 0.5 inch Deflection (lbs):	5,365

Per AC336, Section 3.5

Compression Load Bearing Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.21.2021
Technician:	Brandon Edwards

Specimen Number:	PC3

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
78	0.000	3,634	0.307	1,403	0.536		
588	0.030	3,614	0.309	0	0.504		
573	0.031	3,587	0.312	0	0.501		
568	0.032	3,554	0.315				
566	0.032	4,147	0.361				
1,059	0.060	4,127	0.364				
1,043	0.061	4,098	0.368				
1,030	0.062	4,071	0.371				
1,019	0.063	4,650	0.403				
1,578	0.113	4,624	0.407				
1,558	0.114	4,597	0.410				
1,543	0.115	4,571	0.414				
1,525	0.116	5,172	0.461				
2,076	0.162	5,157	0.468				
2,062	0.165	5,137	0.472				
2,047	0.167	5,094	0.477				
2,038	0.168	5,672	0.526				
2,599	0.207	5,654	0.530				
2,579	0.209	5,618	0.536				
2,566	0.209	5,583	0.544				
2,546	0.211	4,260	0.548				
3,103	0.256	4,273	0.548				
3,079	0.258	2,626	0.542				
3,059	0.260	2,662	0.542				
3,039	0.262	1,354	0.536				

Note:

TENSION LOAD TEST

IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

Client:	Intertek
Job Number:	FC09763.000
Product:	TIGA600 and TIGA900

Reference Method

Tests were conducted according to ASTM D3689 (8.1.2) Quick Load Test Method.

Standard Procedure

The anchors were installed per instructions provided by the manufacturer. The final installation torque was recorded after installation. Load and deflection were recorded at intervals of approximately 5-15% of the estimated ultimate load capacity. Tests were stopped when plunging occurred and the pile could not maintain the test load, the maximum test load was recorded.

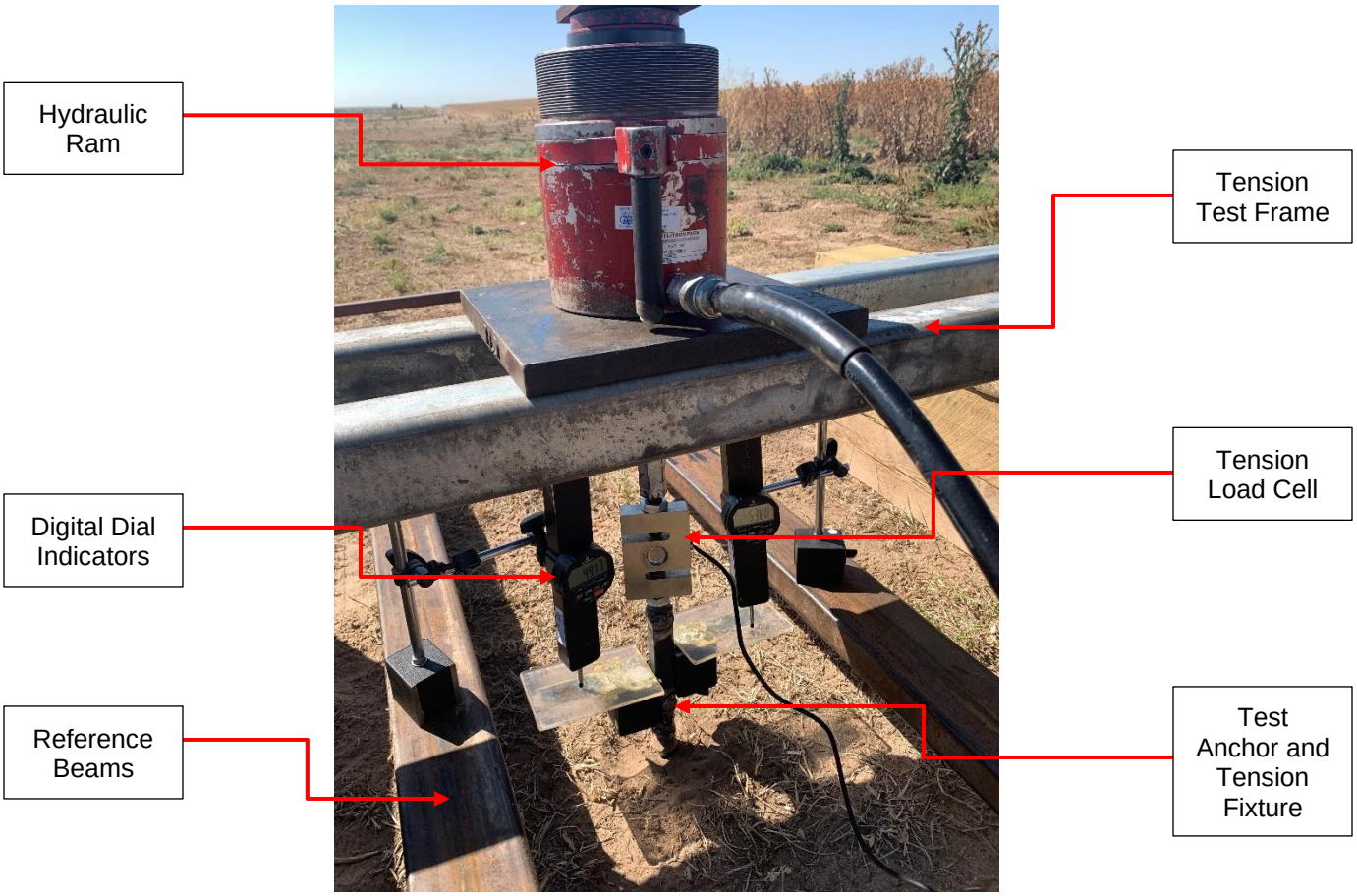


Figure 1. Tension Test Setup

Deviations from Standard Procedure

There were no significant deviations from the standard procedure.

Summary of Results – TIGA600

Test Site	Specimen	Measured Installation Torque (ft-lbs)	Measured Maximum Load Capacity (lbs)	Deviation from Mean (%)	Reported Average Maximum Capacity (lbs)[1]
Loveland #5 (Clay)	LT1	26.2	662	+3.72%	638
	LT2	28.7	685	+7.34%	
	LT3	20.1	567	-11.06%	
Platteville #1 (Sand)	PT1	98.2	3,707	-1.47%	3,762
	PT2	101.3	3,893	+3.49%	
	PT3	99.9	3,686	-2.03%	

[1] *Per Intertek Evaluation Plan Section 5.6.2, should any individual result deviate more than 15% from the average, the lowest of the three tests shall apply.*

Summary of Results – TIGA900

Test Site	Specimen	Measured Installation Torque (ft-lbs)	Measured Maximum Load Capacity (lbs)	Deviation from Mean (%)	Reported Average Maximum Capacity (lbs)[1]
Loveland #5 (Clay)	LT4	51.9	1,347	+8.25%	1,244
	LT5	44.3	1,080	-13.20%	
	LT6	50.8	1,306	+4.95%	
Platteville #1 (Sand)	PT4	93.1	3,886	-2.87%	4,001
	PT5	98.2	4,149	+3.70%	
	PT6	95.5	3,968	-0.84%	

[1] *Per Intertek Evaluation Plan Section 5.6.2, should any individual result deviate more than 15% from the average, the lowest of the three tests shall apply.*

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

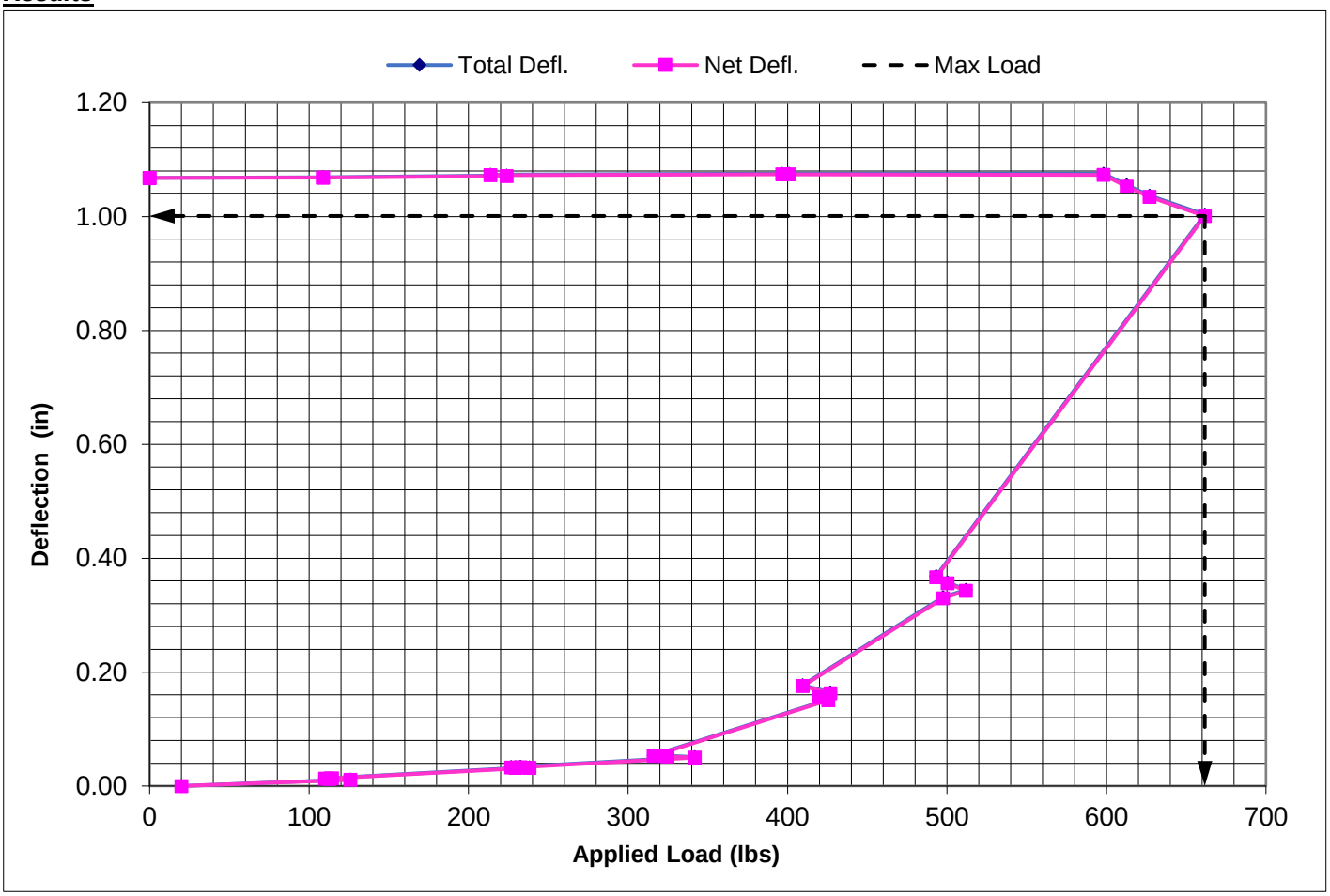
Specimen Number:	LT1
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	26.2
SPT Blowcount at Depth:	11/12
Installation Date:	09.10.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	662
Maximum Net Deflection (in):	1.074

Tension Load Test

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Ryan Beck

Specimen Number:	LT1

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
20	0.000	397	1.074				
126	0.011	401	1.074				
113	0.013	214	1.073				
110	0.013	224	1.071				
114	0.014	109	1.069				
238	0.032	109	1.069				
230	0.032	0	1.068				
227	0.033	0	1.068				
232	0.033						
342	0.050						
325	0.052						
323	0.052						
316	0.053						
425	0.150						
420	0.156						
427	0.163						
410	0.176						
497	0.330						
512	0.343						
500	0.356						
493	0.367						
662	1.001						
627	1.035						
613	1.053						
598	1.073						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

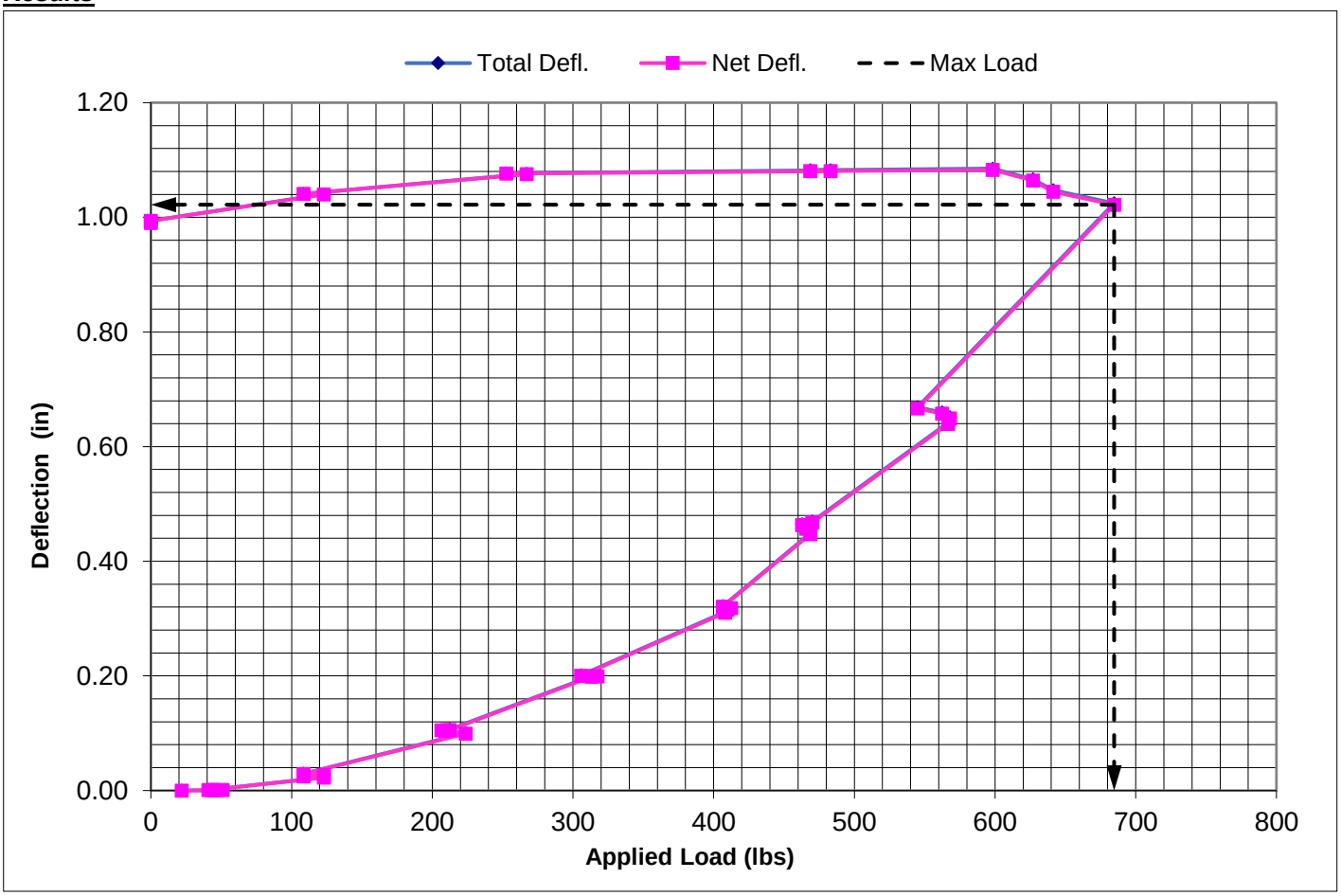
Specimen Number:	LT2
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	28.7
SPT Blowcount at Depth:	11/12
Installation Date:	09.10.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	685
Maximum Net Deflection (in):	1.083

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.10.2021
Technician:	Ryan Beck

Specimen Number:	LT2

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
22	0.000	567	0.639				
51	0.001	568	0.649				
44	0.001	562	0.658				
45	0.001	545	0.667				
41	0.001	685	1.022				
123	0.023	641	1.045				
109	0.025	627	1.064				
123	0.027	598	1.083				
109	0.029	469	1.080				
224	0.099	483	1.080				
209	0.104	253	1.076				
207	0.105	267	1.075				
212	0.106	109	1.041				
313	0.198	123	1.040				
317	0.199	0	0.994				
315	0.199	0	0.990				
306	0.200						
408	0.310						
410	0.315						
412	0.318						
407	0.321						
469	0.447						
466	0.457						
463	0.463						
470	0.468						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

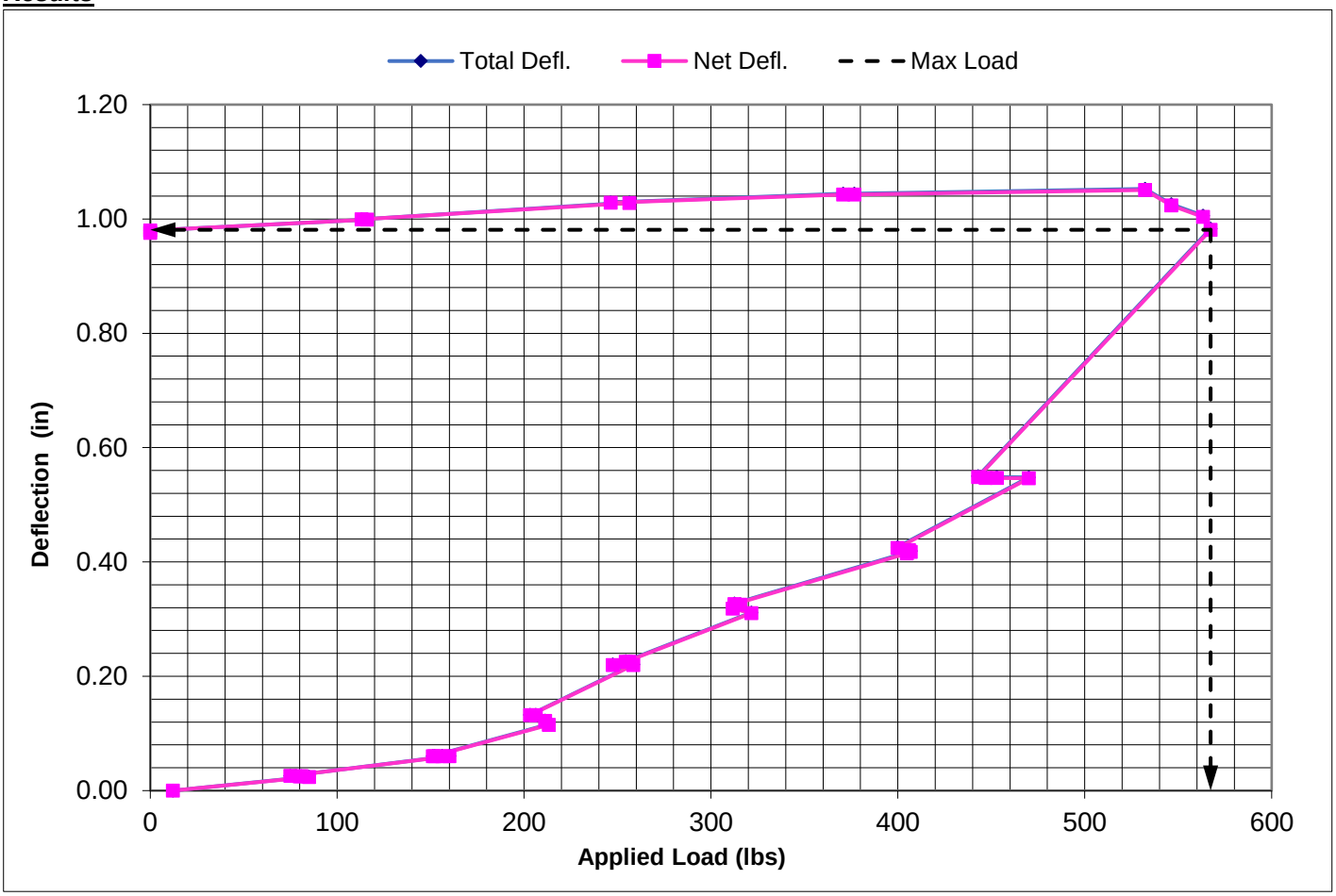
Specimen Number:	LT3
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	20.1
SPT Blowcount at Depth:	11/12
Installation Date:	09.14.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	567
Maximum Net Deflection (in):	1.051

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.14.2021
Technician:	Ryan Beck

Specimen Number:	LT3

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
12	0.000	470	0.546				
85	0.024	453	0.547				
80	0.025	447	0.547				
81	0.025	443	0.548				
75	0.026	567	0.981				
160	0.060	563	1.004				
156	0.060	546	1.024				
152	0.060	532	1.051				
151	0.060	377	1.043				
213	0.115	371	1.043				
211	0.122	246	1.028				
206	0.132	256	1.028				
203	0.132	113	0.999				
258	0.220	116	0.999				
247	0.220	0	0.980				
256	0.225	0	0.976				
254	0.226						
322	0.310						
312	0.318						
316	0.325						
313	0.326						
405	0.415						
407	0.418						
406	0.421						
400	0.425						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

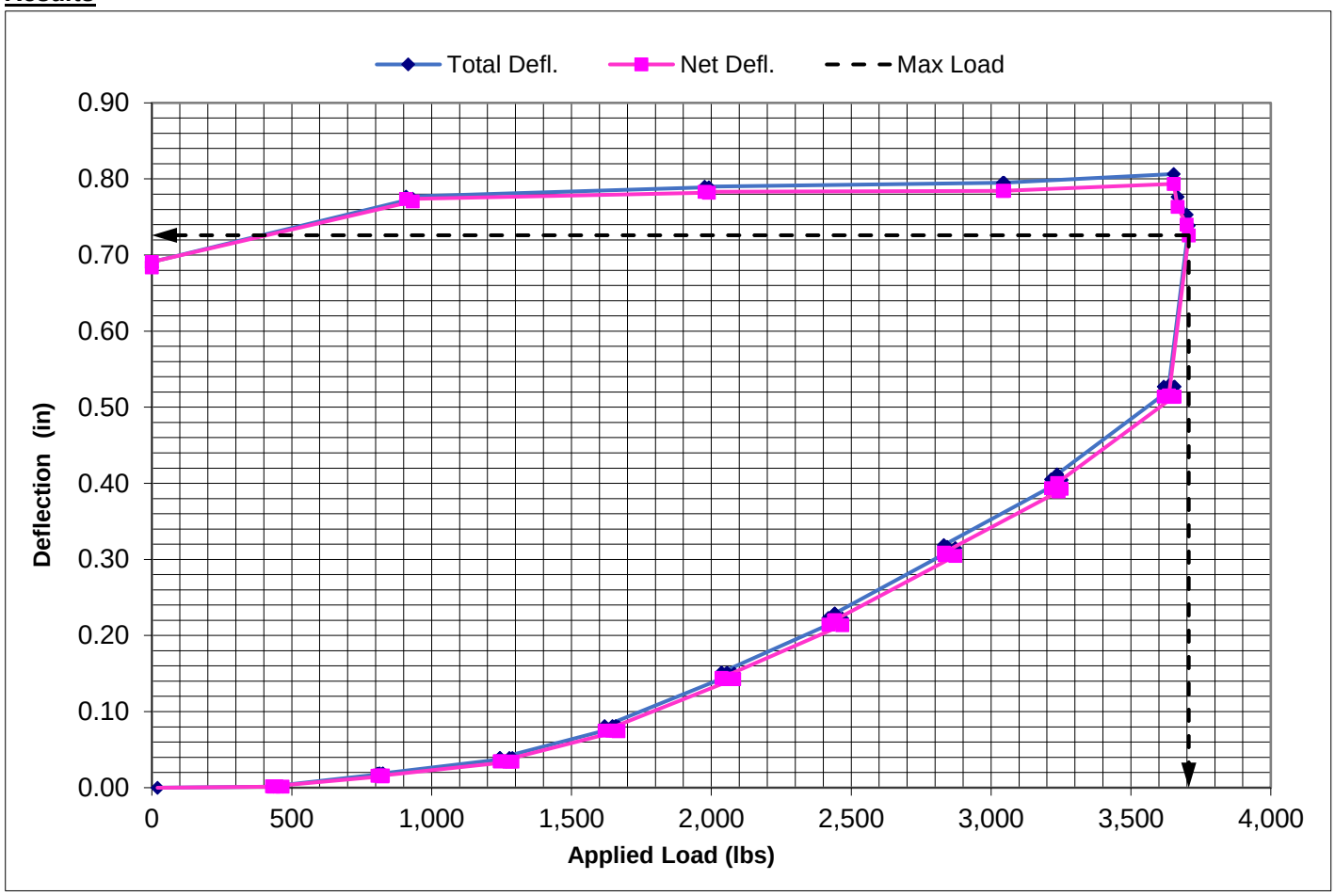
Specimen Number:	PT1
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	108.2
SPT Blowcount at Depth:	13/12
Installation Date:	09.15.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	3,707
Maximum Net Deflection (in):	0.794

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Specimen Number:	PT1

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
21	0.000	2,872	0.305				
467	0.002	2,834	0.306				
435	0.002	2,843	0.306				
444	0.002	2,831	0.309				
429	0.002	3,241	0.390				
825	0.015	3,252	0.393				
806	0.016	3,214	0.394				
814	0.016	3,236	0.401				
826	0.016	3,653	0.514				
1,288	0.034	3,657	0.514				
1,244	0.035	3,617	0.514				
1,278	0.034	3,636	0.516				
1,243	0.035	3,707	0.726				
1,668	0.074	3,699	0.740				
1,647	0.075	3,667	0.764				
1,659	0.075	3,653	0.794				
1,618	0.075	3,042	0.784				
2,082	0.143	3,047	0.784				
2,052	0.143	1,976	0.783				
2,057	0.144	1,992	0.782				
2,037	0.144	908	0.774				
2,468	0.214	932	0.771				
2,419	0.214	0	0.691				
2,438	0.219	0	0.684				
2,441	0.220						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

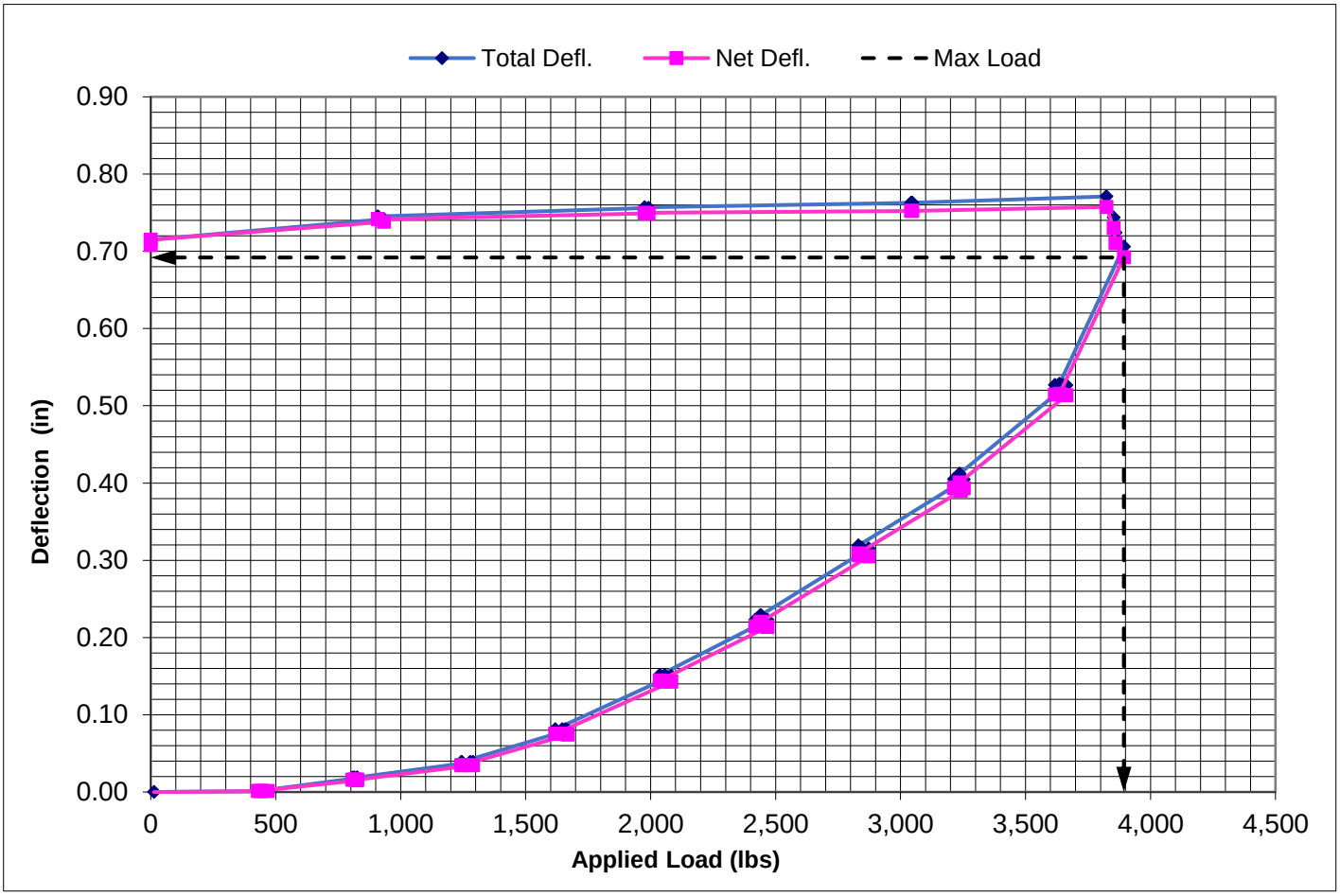
Specimen Number:	PT2
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	111.3
SPT Blowcount at Depth:	13/12
Installation Date:	09.15.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	3,893
Maximum Net Deflection (in):	0.757

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Specimen Number:	PT2

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
13	0.000	2,872	0.305				
467	0.001	2,834	0.306				
435	0.001	2,843	0.306				
444	0.001	2,831	0.309				
429	0.001	3,241	0.390				
825	0.015	3,252	0.393				
806	0.016	3,214	0.394				
814	0.016	3,236	0.401				
826	0.016	3,664	0.514				
1,288	0.034	3,651	0.514				
1,244	0.035	3,617	0.514				
1,278	0.034	3,636	0.516				
1,243	0.035	3,893	0.692				
1,668	0.074	3,860	0.710				
1,647	0.075	3,853	0.730				
1,659	0.075	3,824	0.757				
1,618	0.075	3,042	0.752				
2,082	0.143	3,047	0.752				
2,052	0.143	1,976	0.750				
2,057	0.144	1,992	0.749				
2,037	0.144	908	0.742				
2,468	0.214	932	0.738				
2,419	0.214	0	0.715				
2,438	0.219	0	0.708				
2,441	0.220						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Test Method ASTM D3689

Specimen Specification

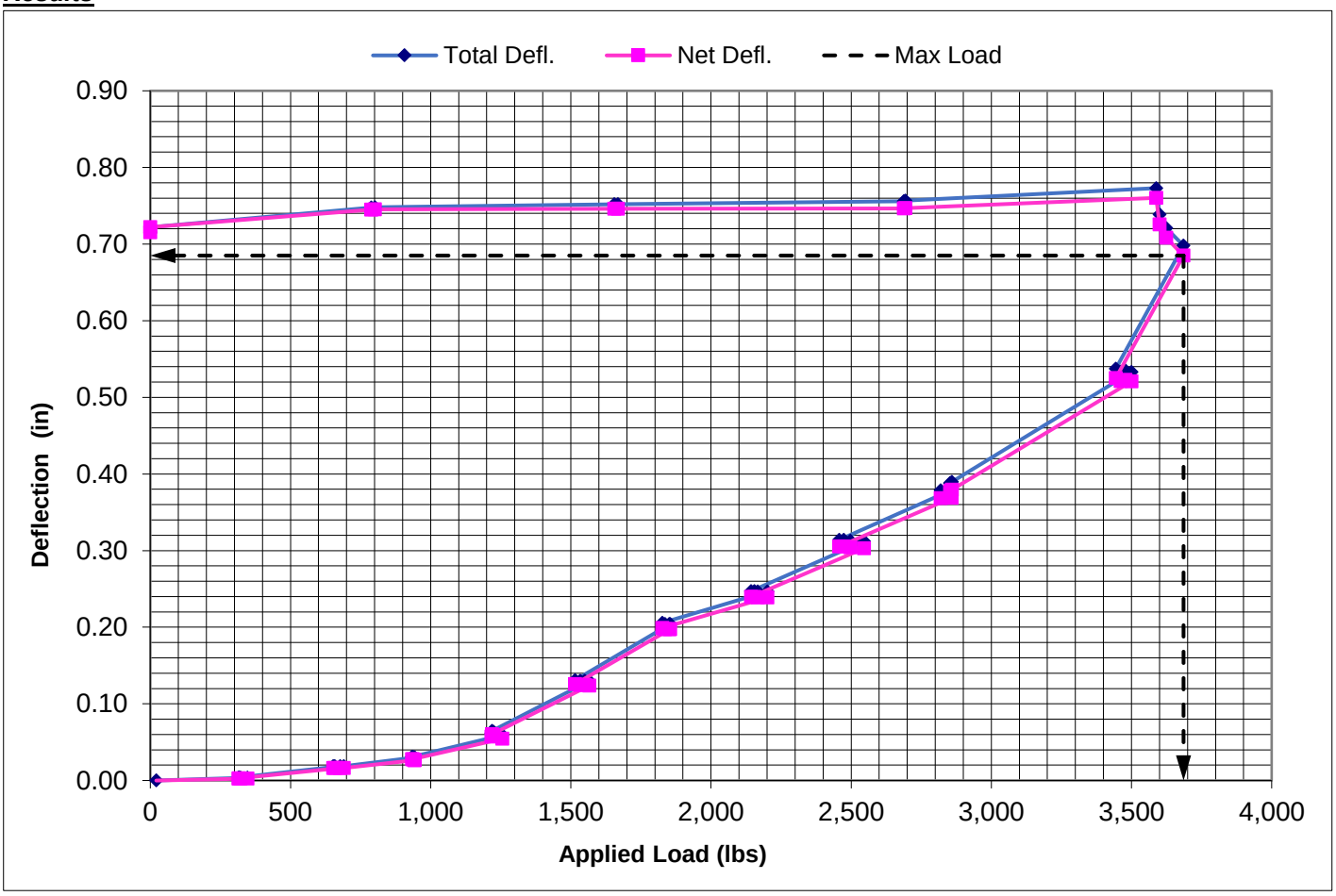
Specimen Number:	PT3
Specimen I.D.:	TIGA600
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	23.62

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	2
Final Install Torque (ft-lbs):	109.9
SPT Blowcount at Depth:	13/12
Installation Date:	09.15.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	3,686
Maximum Net Deflection (in):	0.760

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	09.15.2021
Technician:	Ryan Beck

Specimen Number:	PT3

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
21	0.000	2,201	0.239	788	0.745		
347	0.002	2,166	0.239	0	0.722		
315	0.002	2,155	0.239	0	0.716		
322	0.002	2,143	0.239				
317	0.003	2,545	0.303				
677	0.016	2,497	0.304				
658	0.016	2,474	0.305				
653	0.016	2,457	0.305				
690	0.016	2,858	0.369				
943	0.027	2,819	0.369				
941	0.027	2,853	0.378				
936	0.028	2,859	0.379				
933	0.028	3,500	0.521				
1,255	0.055	3,461	0.521				
1,216	0.057	3,478	0.523				
1,224	0.059	3,444	0.525				
1,219	0.060	3,686	0.685				
1,565	0.124	3,623	0.708				
1,549	0.125	3,600	0.726				
1,533	0.125	3,588	0.760				
1,515	0.126	2,694	0.747				
1,854	0.197	2,688	0.746				
1,836	0.197	1,655	0.746				
1,851	0.197	1,668	0.746				
1,826	0.199	801	0.745				

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.27.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

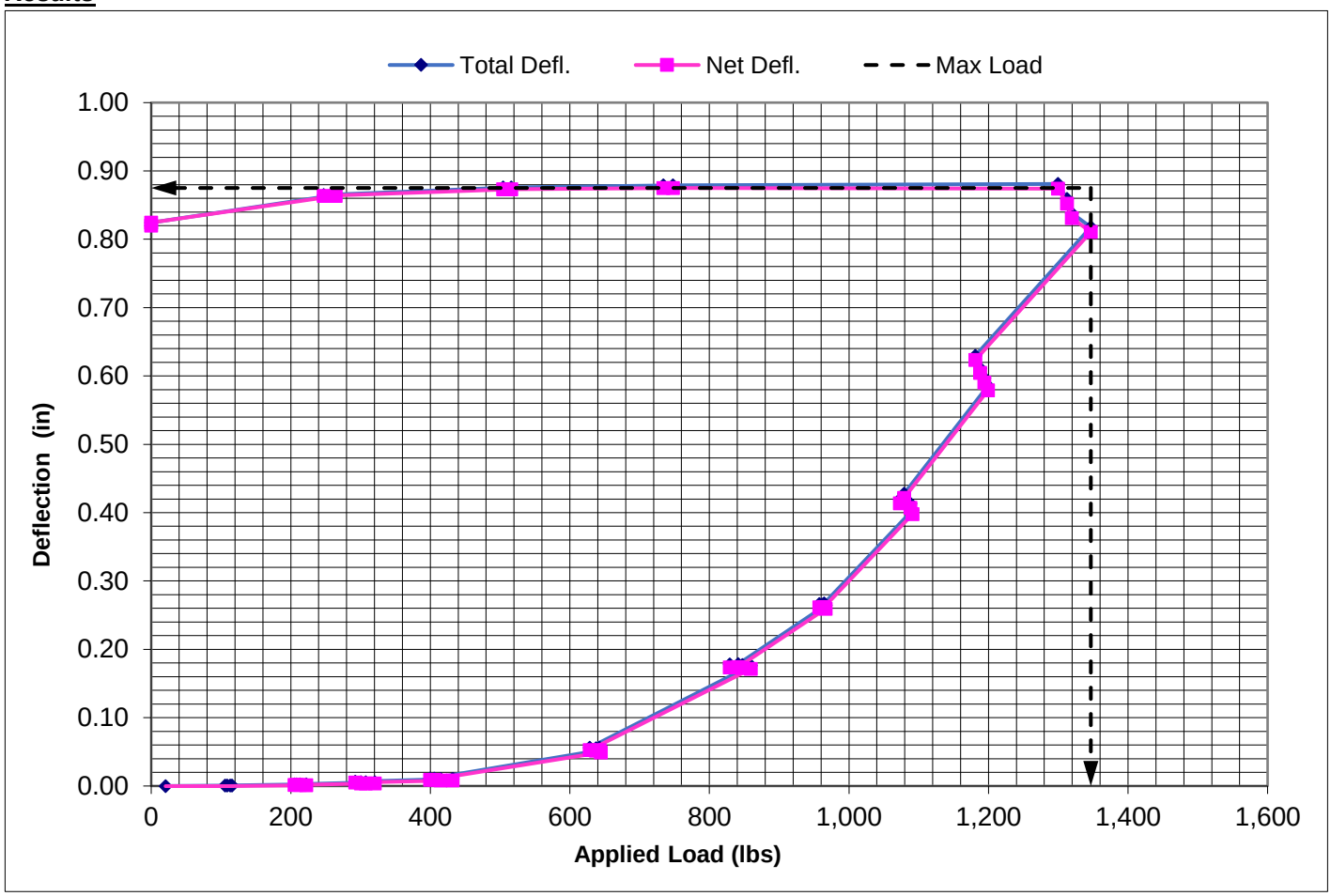
Specimen Number:	LT4
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	51.9
SPT Blowcount at Depth:	11/12
Installation Date:	10.27.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	1,347
Maximum Net Deflection (in):	0.875

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.27.2021
Technician:	Brandon Edwards

Specimen Number:	LT4

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
21	0.000	967	0.259				
116	0.000	962	0.260				
113	0.000	958	0.261				
109	0.000	965	0.262				
106	0.000	1,091	0.398				
222	0.001	1,088	0.407				
213	0.001	1,073	0.414				
208	0.001	1,079	0.422				
205	0.001	1,199	0.579				
321	0.004	1,194	0.591				
308	0.004	1,188	0.605				
301	0.004	1,181	0.623				
293	0.005	1,347	0.811				
432	0.008	1,320	0.831				
415	0.008	1,313	0.852				
406	0.009	1,300	0.874				
400	0.009	734	0.875				
645	0.049	748	0.875				
638	0.052	504	0.873				
643	0.053	516	0.873				
629	0.053	247	0.864				
859	0.171	264	0.864				
847	0.172	0	0.825				
829	0.174	0	0.820				
841	0.174						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.28.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

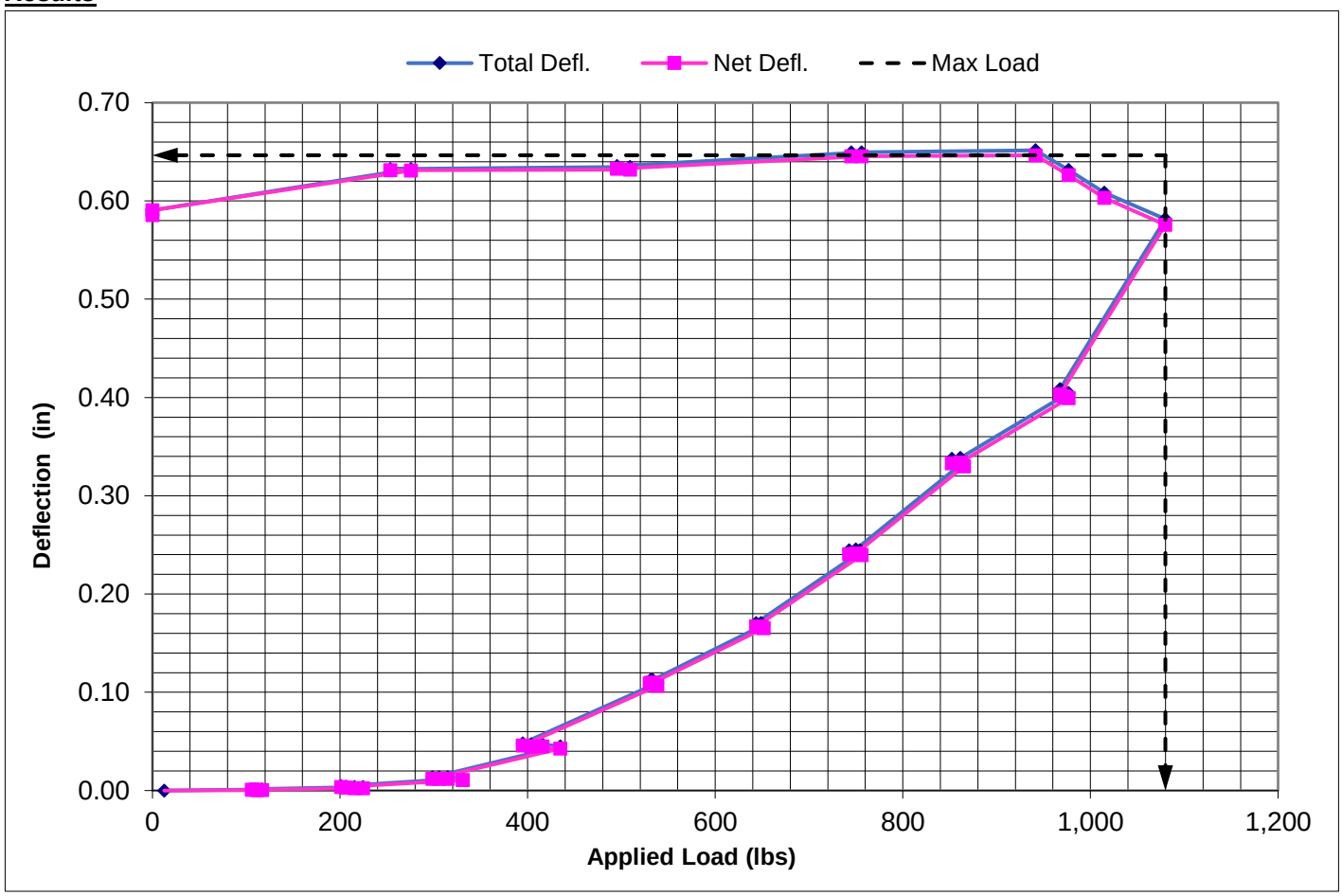
Specimen Number:	LT5
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	44.3
SPT Blowcount at Depth:	11/12
Installation Date:	10.28.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	1,080
Maximum Net Deflection (in):	0.646

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.28.2021
Technician:	Brandon Edwards

Specimen Number:	LT5

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
13	0.000	756	0.239				
117	0.000	754	0.240				
112	0.000	743	0.241				
109	0.001	750	0.242				
106	0.001	865	0.330				
224	0.002	862	0.332				
215	0.002	852	0.333				
206	0.003	861	0.334				
201	0.003	977	0.399				
331	0.011	974	0.400				
315	0.012	972	0.401				
306	0.012	968	0.403				
299	0.012	1,080	0.576				
435	0.043	1,015	0.603				
416	0.045	977	0.626				
404	0.045	941	0.646				
395	0.046	745	0.646				
538	0.107	756	0.645				
530	0.109	495	0.633				
531	0.110	509	0.632				
533	0.110	253	0.631				
652	0.165	275	0.631				
650	0.166	0	0.591				
649	0.167	0	0.586				
644	0.167						

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.28.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

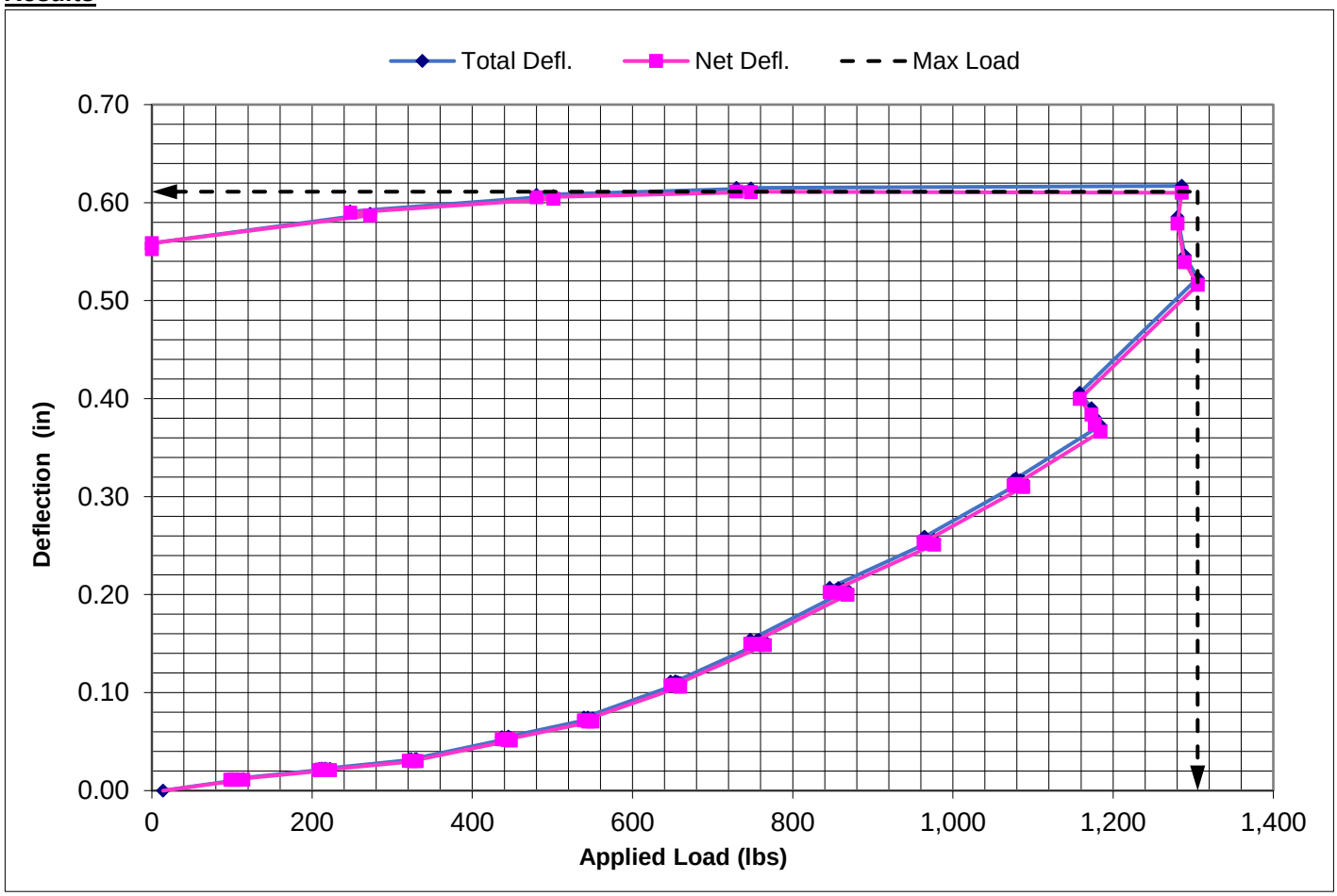
Specimen Number:	LT6
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Loveland #5
Test Boring Hole:	TH-3
Soil Type:	Stiff Clay
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	50.8
SPT Blowcount at Depth:	11/12
Installation Date:	10.28.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	1,306
Maximum Net Deflection (in):	0.611

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.28.2021
Technician:	Brandon Edwards

Specimen Number:	LT6

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
14	0.000	765	0.148	748	0.611		
114	0.011	755	0.149	480	0.605		
106	0.011	758	0.149	501	0.604		
101	0.011	747	0.150	247	0.590		
98	0.011	868	0.200	272	0.587		
222	0.021	863	0.201	0	0.559		
209	0.021	857	0.202	0	0.553		
212	0.021	846	0.203				
216	0.021	977	0.251				
331	0.030	967	0.252				
329	0.030	964	0.253				
321	0.030	965	0.254				
324	0.030	1,088	0.310				
448	0.051	1,084	0.311				
444	0.052	1,076	0.311				
437	0.052	1,079	0.313				
445	0.053	1,184	0.366				
550	0.071	1,177	0.374				
544	0.071	1,173	0.384				
544	0.072	1,158	0.400				
539	0.072	1,306	0.516				
660	0.106	1,289	0.539				
657	0.107	1,280	0.579				
648	0.108	1,285	0.610				
654	0.108	730	0.611				

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

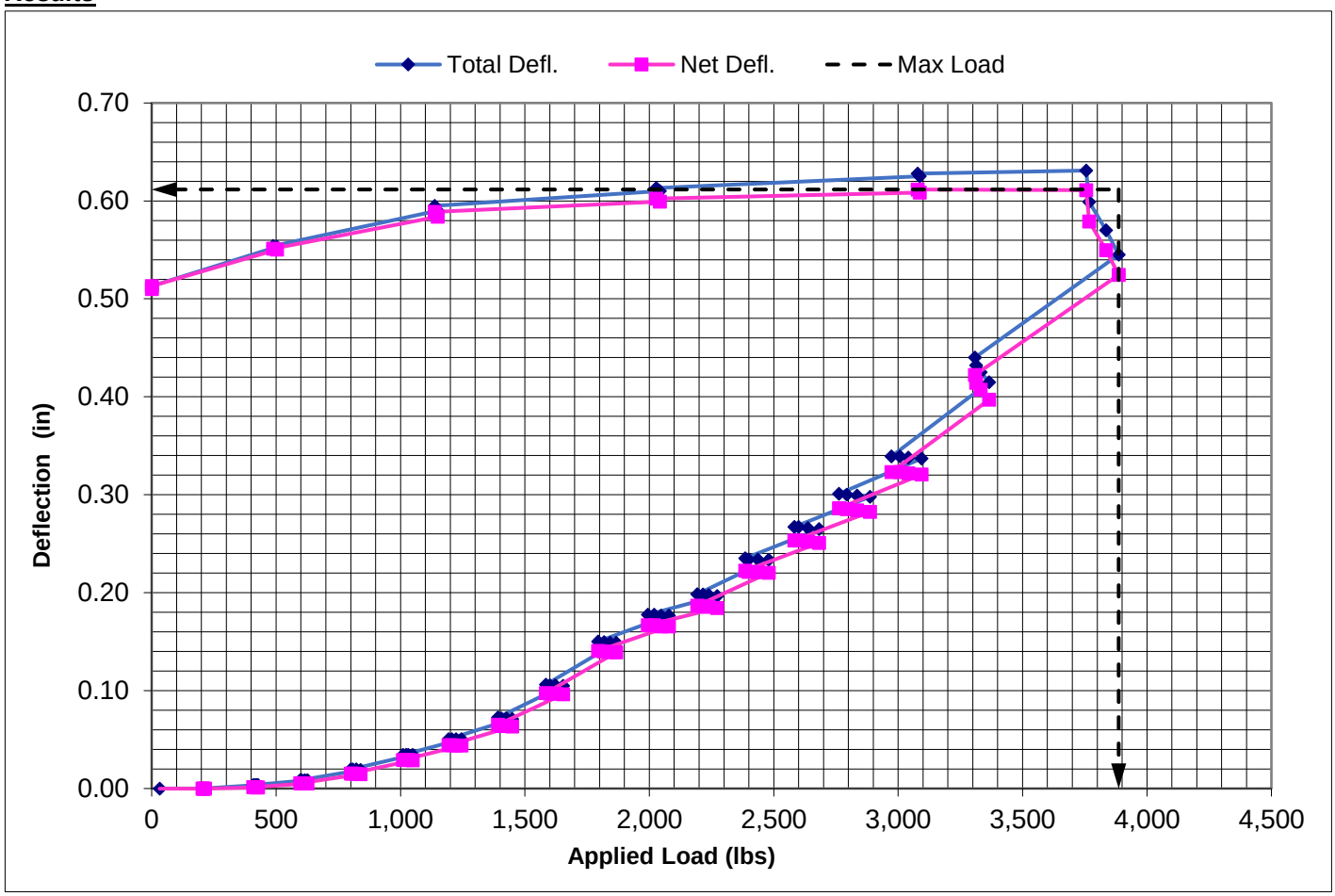
Specimen Number:	PT4
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	93.1
SPT Blowcount at Depth:	13/12
Installation Date:	10.26.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	3,886
Maximum Net Deflection (in):	0.612

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Specimen Number:	PT4

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
33	0.000	1,449	0.063	2,638	0.252	488	0.551
214	0.000	1,426	0.064	2,600	0.253	504	0.550
209	0.000	1,405	0.064	2,582	0.253	1	0.513
206	0.000	1,392	0.065	2,887	0.283	1	0.510
204	0.000	1,654	0.096	2,835	0.284		
428	0.001	1,621	0.097	2,794	0.285		
422	0.001	1,600	0.097	2,762	0.286		
415	0.001	1,584	0.098	3,094	0.321		
408	0.001	1,867	0.139	3,041	0.322		
627	0.005	1,843	0.139	3,007	0.323		
615	0.005	1,818	0.140	2,973	0.323		
603	0.005	1,794	0.140	3,366	0.397		
596	0.005	2,079	0.165	3,332	0.407		
839	0.015	2,047	0.166	3,314	0.414		
822	0.015	2,020	0.167	3,309	0.422		
808	0.015	1,994	0.167	3,886	0.524		
800	0.015	2,272	0.184	3,836	0.550		
1,049	0.029	2,238	0.186	3,768	0.579		
1,031	0.029	2,215	0.186	3,756	0.611		
1,023	0.029	2,192	0.187	3,079	0.612		
1,011	0.029	2,480	0.220	3,087	0.609		
1,245	0.044	2,436	0.221	2,028	0.602		
1,223	0.044	2,399	0.221	2,043	0.599		
1,206	0.044	2,385	0.222	1,137	0.589		
1,193	0.044	2,682	0.251	1,150	0.584		

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

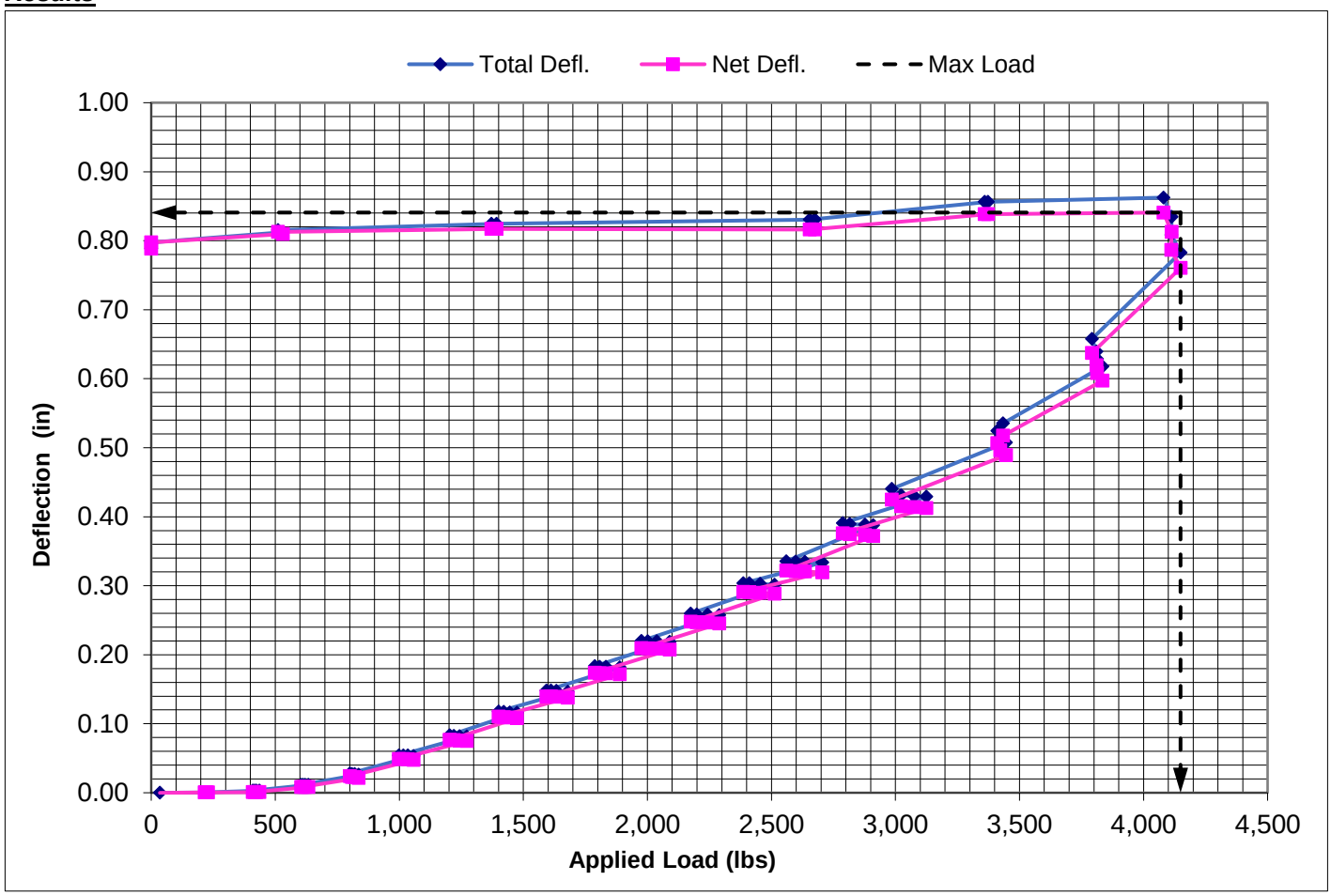
Specimen Number:	PT5
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	98.2
SPT Blowcount at Depth:	13/12
Installation Date:	10.26.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	4,149
Maximum Net Deflection (in):	0.841

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Specimen Number:	PT5

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
35	0.000	1,474	0.108	2,636	0.320	2,655	0.816
228	0.001	1,445	0.109	2,597	0.321	2,675	0.816
222	0.001	1,421	0.109	2,560	0.322	1,372	0.817
218	0.001	1,401	0.110	2,910	0.372	1,392	0.817
215	0.001	1,679	0.138	2,877	0.373	511	0.813
436	0.001	1,634	0.139	2,815	0.375	530	0.810
424	0.001	1,611	0.139	2,788	0.376	0	0.798
417	0.001	1,593	0.140	3,124	0.412	0	0.789
409	0.001	1,888	0.171	3,075	0.414		
634	0.008	1,833	0.173	3,023	0.415		
620	0.008	1,807	0.173	2,985	0.425		
611	0.008	1,788	0.174	3,446	0.489		
604	0.008	2,090	0.207	3,423	0.496		
836	0.022	2,038	0.209	3,411	0.506		
820	0.023	2,002	0.209	3,433	0.517		
809	0.023	1,976	0.209	3,834	0.597		
801	0.024	2,289	0.245	3,813	0.608		
1,058	0.047	2,242	0.247	3,810	0.619		
1,035	0.049	2,199	0.247	3,792	0.637		
1,017	0.049	2,174	0.248	4,149	0.760		
999	0.049	2,512	0.288	4,112	0.787		
1,271	0.075	2,455	0.289	4,113	0.813		
1,242	0.075	2,411	0.291	4,080	0.841		
1,219	0.076	2,387	0.291	3,360	0.839		
1,203	0.077	2,705	0.319	3,373	0.839		

Note:

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Test Method ASTM D3689

Specimen Specification

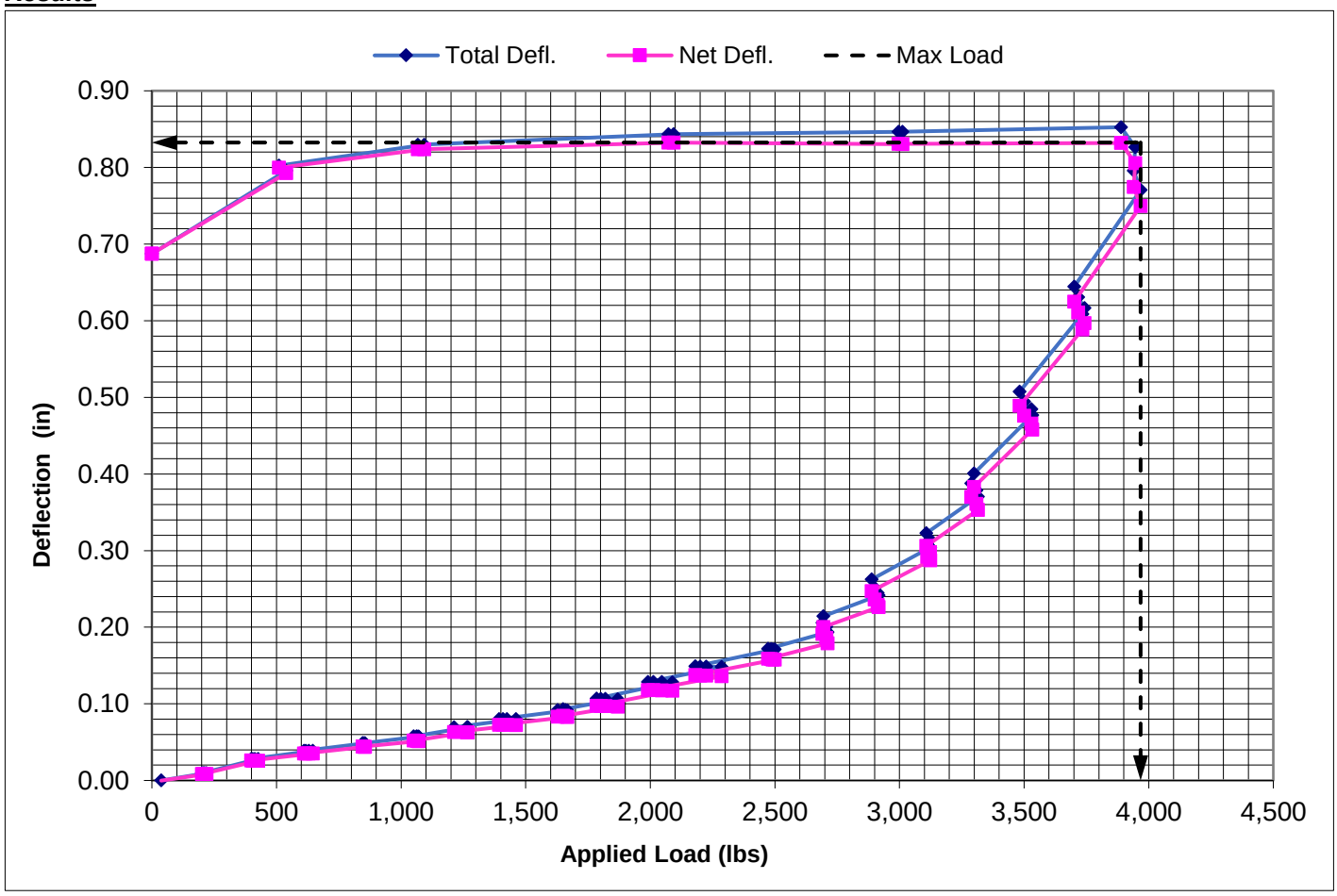
Specimen Number:	PT6
Specimen I.D.:	TIGA900
Auger Size 1 (in):	2.362
Auger Size 2 (in):	3.268
Auger Thickness (in):	0.118
Shaft Dimensions (in):	0.748
Shaft Thickness (in):	0.118
Shaft Length (in):	35.43

Installation Information

Test Site Location:	Platteville #1
Test Boring Hole:	TH-1
Soil Type:	Silty Sand
Final Install Depth (ft):	3
Final Install Torque (ft-lbs):	95.5
SPT Blowcount at Depth:	13/12
Installation Date:	10.26.2021

Note: Installed Per Titan Building Products Installation Criteria

Results



Maximum Test Capacity (lbs):	3,968
Maximum Net Deflection (in):	0.832

Tension Load Test

CTL | THOMPSON INCORPORATED

IAS ACCREDITED Testing Laboratory

Client:	Intertek
Job Number :	FC09763.000
Date Tested :	10.26.2021
Technician:	Brandon Edwards

Specimen Number:	PT6

Measurements

Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)	Load (lbs)	Net Def (in)
37	0.000	1,461	0.072	2,707	0.186	3,945	0.806
219	0.008	1,425	0.072	2,691	0.191	3,889	0.832
211	0.008	1,409	0.073	2,695	0.200	2,997	0.831
207	0.008	1,393	0.073	2,916	0.226	3,012	0.830
201	0.008	1,667	0.083	2,912	0.229	2,073	0.832
426	0.026	1,660	0.083	2,900	0.236	2,094	0.832
413	0.026	1,628	0.083	2,888	0.247	1,067	0.824
405	0.026	1,650	0.084	3,123	0.287	1,093	0.824
398	0.026	1,869	0.096	3,111	0.292	510	0.800
646	0.035	1,820	0.097	3,122	0.298	539	0.793
630	0.035	1,801	0.097	3,108	0.306	0	0.688
617	0.035	1,784	0.098	3,315	0.353	0	0.688
610	0.035	2,089	0.117	3,309	0.361		
855	0.044	2,046	0.118	3,288	0.370		
851	0.044	2,012	0.118	3,299	0.383		
846	0.044	1,991	0.118	3,532	0.458		
845	0.044	2,286	0.136	3,529	0.466		
1,071	0.051	2,224	0.137	3,500	0.476		
1,068	0.051	2,200	0.137	3,482	0.489		
1,063	0.052	2,181	0.137	3,734	0.589		
1,050	0.052	2,499	0.158	3,742	0.597		
1,267	0.063	2,491	0.158	3,717	0.611		
1,264	0.063	2,485	0.158	3,701	0.625		
1,265	0.063	2,473	0.159	3,968	0.749		
1,212	0.063	2,712	0.179	3,939	0.775		

Note:

SECTION 2:

TEST SITE
GEOTECHNICAL REPORTS

IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

CTL|THOMPSON INCORPORATED

September 4, 2020

Attention: Mr. Chip Leadbetter
Director of IAS Testing, Lab #342

Subject: ICC Evaluation Testing
Helical Pier Testing Site Loveland #5
West 50th Street and Florence Drive
Loveland, Colorado

CTL|Thompson, Inc., specifically the Fort Collins Geotechnical Engineering Group, performed a geotechnical investigation at Florence Drive and West 50th Avenue in Loveland, Colorado (Figure 1). Our helical pier testing lab is performing full-scale load tests at this site and is referring to this site as Loveland #5. Our scope of work included drilling five exploratory borings at the site, logging subsurface conditions encountered in the borings, collecting soil and bedrock samples at 5-foot intervals, conducting a laboratory testing program, and providing our opinions and recommendations for soil and bedrock properties for this site. This letter summarizes the results of our investigation.

Site Description

The site is located south of southwest of the intersection of 50th Street and Wilson Avenue in Loveland, Colorado (Figure 1). A residential development is under construction to the south of the site, and further development is planned in the area. Part of the proposed construction includes extending Florence Drive north and 50th Street west until they intersect. The borings are located southeast of this proposed intersection. At the time of our investigation, the site was agricultural land and had recently been plowed. Boring TH-2 was located on a fill pile.

Geology

The site is located in the Colorado Piedmont Section of the Great Plains Physiographic Province. The Colorado Piedmont is an elongated trough where overlying sediments were eroded adjacent to the east flank of the Rocky Mountains during mountain building events. Structurally, the site lies along the western edge of the Denver Basin, an accumulation of primarily Mesozoic sediments which underlie overburden soils at the site and are sources of fossil fuels in the region. The Dakota Hogback, a north-south trending ridge of sandstone that dips approximately 12 to 15 degrees to the east in this area, is located approximately 1¼ miles west of the site.

Surface soils at the site are mapped as Quaternary Slocum alluvium, water-deposited soils (USGS Map I-855-G, Colton, 1978). The Slocum alluvium is described as cobble and boulder gravel. Based on our borings drilled for this site and our experience in the area, we consider the surficial soils at the site to be pediment soils consisting of clay with sand and occasional small gravel mostly confined to thin layers or small buried rills or channels. The thickness of the pediment soils at the site was approximately 8 to 12 feet in our borings. Typically, the thickness of the pediment soils

decreases to the west, and is not present at the hogback. The Natural Resource Conservation Service (NRCS) has mapped the site as the Fort Collins loam. The Fort Collins loam is described as loam, a varying mixture of sand, silt and clay. The NRCS describes a few small areas of the Fort Collins loam as having a gravelly layer below a depth of 40 inches. NRCS soil data is limited to a depth of about 5 feet. The description of the Fort Collins loam appears to be consistent with the soils encountered our borings.

The near-surface bedrock that underlies the pediment soils in this area is the lower shale member of the Cretaceous Pierre Shale. The lower shale member is described as dark olive-gray bentonitic shale. The lower shale member in the area consists of claystone and shale. The Pierre Shale in this area typically dips 12 to 15 degrees to the east. However, variations in dip direction and slope are anticipated at the site. The thickness of the Pierre Shale at the site is believed to range from about 1,000 to 2,000 feet. No outcrops of the Pierre Shale were observed at the site.

Subsurface Conditions

Subsurface conditions encountered in our borings consisted of nil to 16 feet of sandy clay fill over 7 to 14 feet of sandy clay, underlain by weathered and competent claystone bedrock to the depths explored. Groundwater was not encountered in the borings during drilling. Unconfined compression testing of one sample of the clay indicated a unconfined compressive strength of 11,700 psf. Five unconfined compression tests of the claystone bedrock resulted in unconfined compressive strengths of 11,700 to 14,600 psf for weathered samples and 11,600 to 20,300 psf for unweathered samples. Samples of the sandy clay selected for laboratory testing had fines contents (percent passing the No. 200 sieve) of 62 to 84 percent. Atterberg limit testing indicated liquid limits of 41 to 49, and plasticity indices of 20 to 31. One sample of the claystone bedrock selected for laboratory testing had a fines content (percent passing the No. 200 sieve) of 98 percent. Atterberg limit testing indicated a liquid limit of 45, and a plasticity index of 26. Laboratory test results from samples of the fill materials were within the ranges measured in the overburden sandy clay encountered elsewhere at the site and from previous investigations. Further descriptions of the subsurface conditions are presented on our boring logs (Figure 2) and in our laboratory test results (Table I).

Soil and Bedrock Properties

We used the measured soil properties from the samples collected from this site to estimate appropriate strength parameters. Based on the laboratory test results and our experience with similar subsurface conditions, we believe the following ranges of properties can be used for the clay and claystone bedrock underlying this site.

Material	Friction Angle, Φ (deg)	Cohesion, c (psf)	Total Unit Weight (pcf)
Sandy Clay Fill	0	1,000 – 2,000	120 - 130
Sandy Clay	0	3,000 – 5,000	120 - 130
Claystone Bedrock	0	6,000 – 10,000	130 - 140

If you have any questions regarding the information provided in this letter, please contact the undersigned.

Sincerely,
CTL|THOMPSON, INC.

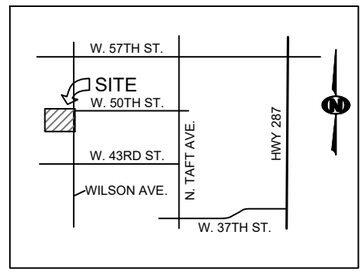
Taylor Ray, EIT
Staff Geotechnical Engineer

Reviewed by:

Spencer A. Schram, PE
Project Manager

N

APPROXIMATE
SCALE: 1"=300'
0 150' 300'



VICINITY MAP
LOVELAND, COLORADO
NOT TO SCALE

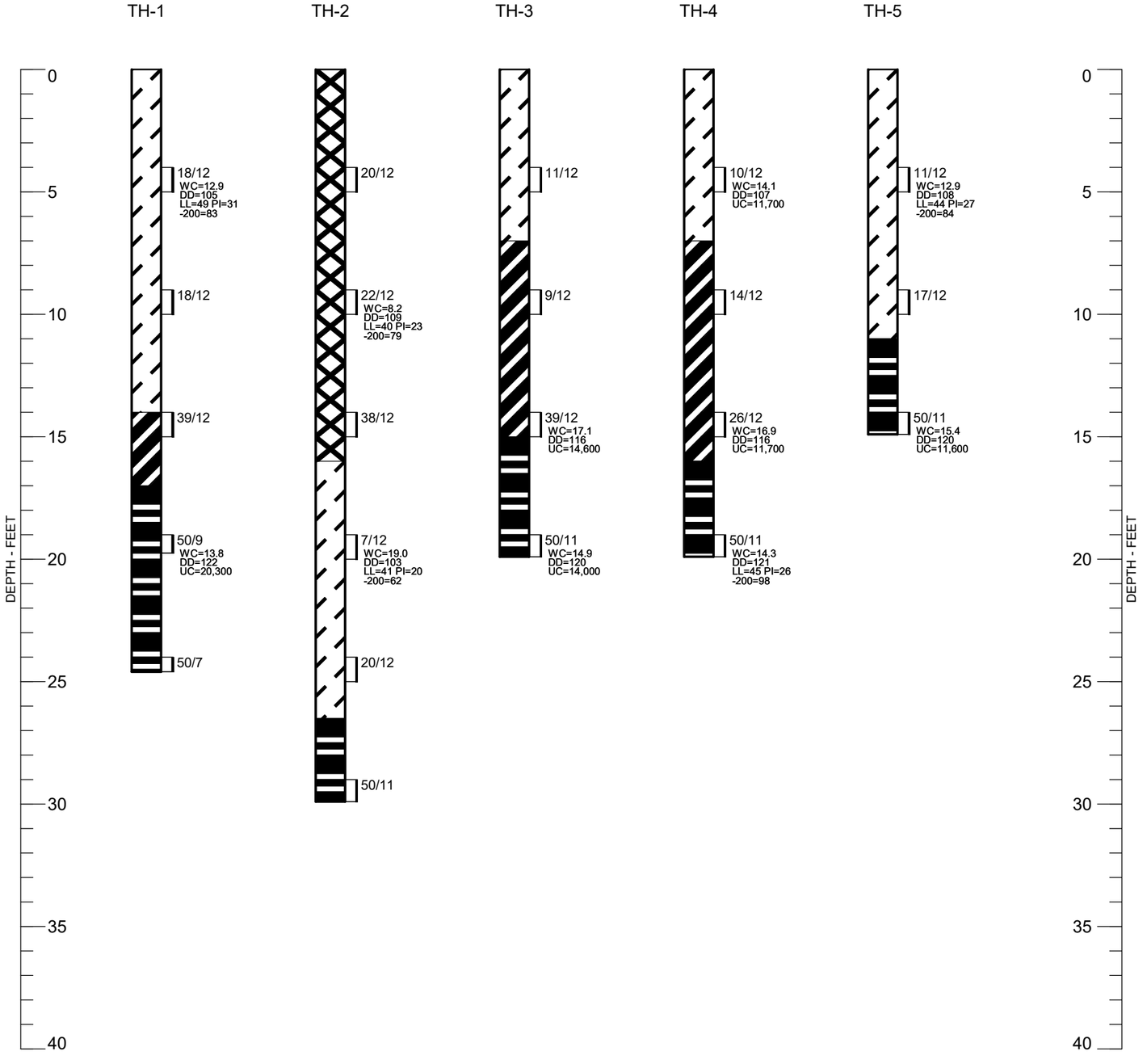
LEGEND:

TH-1 ● INDICATES APPROXIMATE LOCATION OF EXPLORATORY BORING

Locations of Exploratory Borings

FIGURE 1

CTLT FCA
50TH AND FLORENCE SITE - LOVELAND #5
CTL I T PROJECT NO. FC08094-125



CTLT FCA
50TH & FLORENCE DRIVE - LOVELAND #5
CTL | T PROJECT NO. FC08094-125

LEGEND:

FILL, CLAY, SANDY, MOIST, VERY STIFF, BROWN (CL)

CLAY, SANDY, MOIST, MEDIUM STIFF TO VERY STIFF, BROWN (CL)

WEATHERED CLAYSTONE BEDROCK, SANDY, MOIST, FIRM TO MEDIUM HARD, GRAY, BROWN

CLAYSTONE BEDROCK, SANDY, MOIST, HARD, GRAY, BROWN

DRIVE SAMPLE. THE SYMBOL 18/12 INDICATES 18 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

NOTES:

1. THE BORINGS WERE DRILLED ON JULY 29, 2020 USING 4-INCH DIAMETER CONTINUOUS-FLIGHT AUGERS AND A TRUCK-MOUNTED DRILL RIG.

2. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS IN THIS REPORT.

3. NO GROUNDWATER WAS ENCOUNTERED DURING THIS INVESTIGATION.

4. WC - INDICATES MOISTURE CONTENT (%).
   DD - INDICATES DRY DENSITY (PCF).
   SW - INDICATES SWELL WHEN WETTED UNDER OVERBURDEN PRESSURE (%).
   -200 - INDICATES PASSING NO. 200 SIEVE (%).
   LL - INDICATES LIQUID LIMIT.
   PI - INDICATES PLASTICITY INDEX.
   UC - INDICATES UNCONFINED COMPRESSIVE STRENGTH (PSF).
   SS - INDICATES SOLUBLE SULFATE CONTENT (%).

Summary Logs of Exploratory Borings

FIGURE 2

TABLE I

SUMMARY OF LABORATORY TESTING

BORING	DEPTH (FEET)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)	PASSING NO. 200 SIEVE (%)	DESCRIPTION
				LIQUID LIMIT	PLASTICITY INDEX			
TH-1	4	12.9	105	49	31		83	CLAY, SANDY (CL)
TH-1	19	13.8	122			20,300		CLAYSTONE, SANDY
TH-2	9	8.2	109	40	23		79	FILL, CLAY, SANDY (CL)
TH-2	19	19.0	103	41	20		62	CLAY, SANDY (CL)
TH-3	14	17.1	116			14,600		CLAYSTONE, WEATHERED
TH-3	19	14.9	120			14,000		CLAYSTONE, SANDY
TH-4	4	14.1	107			11,700		CLAY, SANDY (CL)
TH-4	14	16.9	116			11,700		CLAYSTONE, WEATHERED
TH-4	19	14.3	121	45	26		98	CLAYSTONE, SANDY
TH-5	4	12.9	108	44	27		84	CLAY, SANDY (CL)
TH-5	14	15.4	120			11,600		CLAYSTONE, SANDY

* NEGATIVE VALUE INDICATES COMPRESSION.

CTL|THOMPSON INCORPORATED

May 12, 2010

Attention: Mr. Chip Leadbetter
Director of IAS Testing, Lab #342

Subject: ICC Evaluation Testing
Helical Pier Testing Site – Platteville #1
Platteville, Colorado

CTL|Thompson, Inc., specifically the Fort Collins Geotechnical Engineering Group, performed a geotechnical investigation at 17998 County Road 32, Platteville, Colorado (Figure 1). Our helical pier testing Lab is performing full scale load tests at this site and is referring to this site as Platteville #1. Our scope of work included drilling one exploratory boring at the site, logging subsurface conditions encountered in our boring, collecting soil and bedrock samples at intervals of 5 feet, conducting a laboratory testing program, and providing our opinions and recommendations for soil and bedrock properties for this site. This letter summarizes the results of our investigation.

Site Description

The site is located east of the Spear Canal (Figure 1). The area is primarily unimproved with dirt access roads. Ground cover at the site consists of native grasses, weeds, brush, and cactus.

Geology

The site is located in the Colorado Piedmont Section of the Great Plains Physiographic Province. The Colorado Piedmont is an elongated trough where overlying sediments were eroded adjacent to the east flank of the Rocky Mountains during mountain building events. The South Platte River is located approximately 6 miles to the west and 8 miles, or more, to the northwest and north. Sediments from rivers and wind were deposited contemporaneous with the formation of the piedmont and afterwards. Structurally, the site lies in the Denver Basin, an accumulation of Mesozoic sediments which underlie the eolian soils at the site and are sources of fossil fuels in the region.

Surface soils at the site are mapped as Quaternary age eolian (wind-blown) soils (USGS Map I-855-G, Colton, 1978). The eolian soils are described as clay, silt and sand. Linear features of the eolian deposits appear to be arranged in a general northwesterly-to-southeasterly direction, which is consistent with the direction of the prevailing winds and a sediment source (South Platte River) from the northwest. The thickness of the eolian soils can range from 3 feet to 50 feet. The Natural Resource Conservation Service (NRCS) has mapped the site as the Valent sand and Vona sand. The Valent and Vona sands are described as fine-grained, eolian sand and loamy sand. NRCS soil data is limited to a depth of about 5 feet. The description of the Valent sand and Vona sand appears to be consistent with the soils encountered in the upper 10 to 20½ feet of our boring.

The near-surface bedrock that underlies the eolian soils in this area is interpolated from the map as the Cretaceous Laramie Formation. The Laramie Formation in the area consists of claystone, shale, sandstone and several beds of coal. The Laramie Formation typically dips to the southeast in this area. However, variations in dip direction and slope are anticipated at the site. The thickness of the Laramie Formation can range from about 700 to 800 feet. No outcrops of the Laramie Formation were observed at the site.

Subsurface Conditions

Subsurface conditions encountered in our boring at the site consisted of about 20 to 21 feet of silty sand over weathered and unweathered claystone bedrock (Figure 2). A sample of the clayey sand selected for laboratory testing was non-plastic and had 32 percent particles passing the No. 200 sieve (Figure 3). The results of laboratory tests are summarized in Table 1.

Soil and Bedrock Properties

We used the measured soil properties from the samples collected from this site to estimate appropriate strength parameters. Based on the laboratory test results and our experience with similar subsurface conditions, we believe the following ranges of properties can be used for the sand and claystone bedrock underlying this site.

Material	Friction Angle, Φ (deg)	Cohesion, c (psi)	Total Unit Weight (pcf)
Silty Sand	28 - 32	0	120 - 130
Weathered Claystone Bedrock	0	3,000 - 4,000	120 -125
Claystone Bedrock	0	4,000 – 6,000	125 - 135

If you have any questions regarding the information provided in this letter, please contact the undersigned.

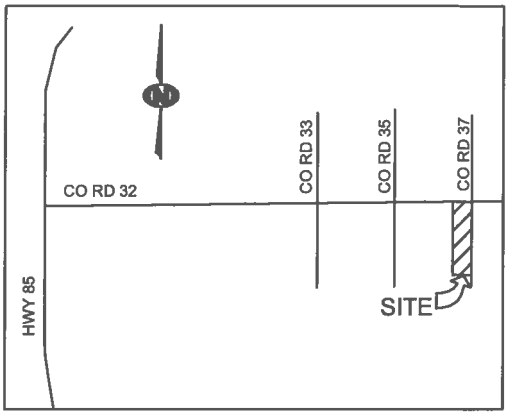
Sincerely,
CTL|THOMPSON, INC.

Thomas W. Finley, CPG
Senior Geologist

Reviewed by:

Eric D. Bernhardt, PE
Project Manager

APPROXIMATE
SCALE: 1" = 700'
0' 350' 700'



VICINITY MAP
PLATTEVILLE, CO AREA
NOT TO SCALE

LEGEND:

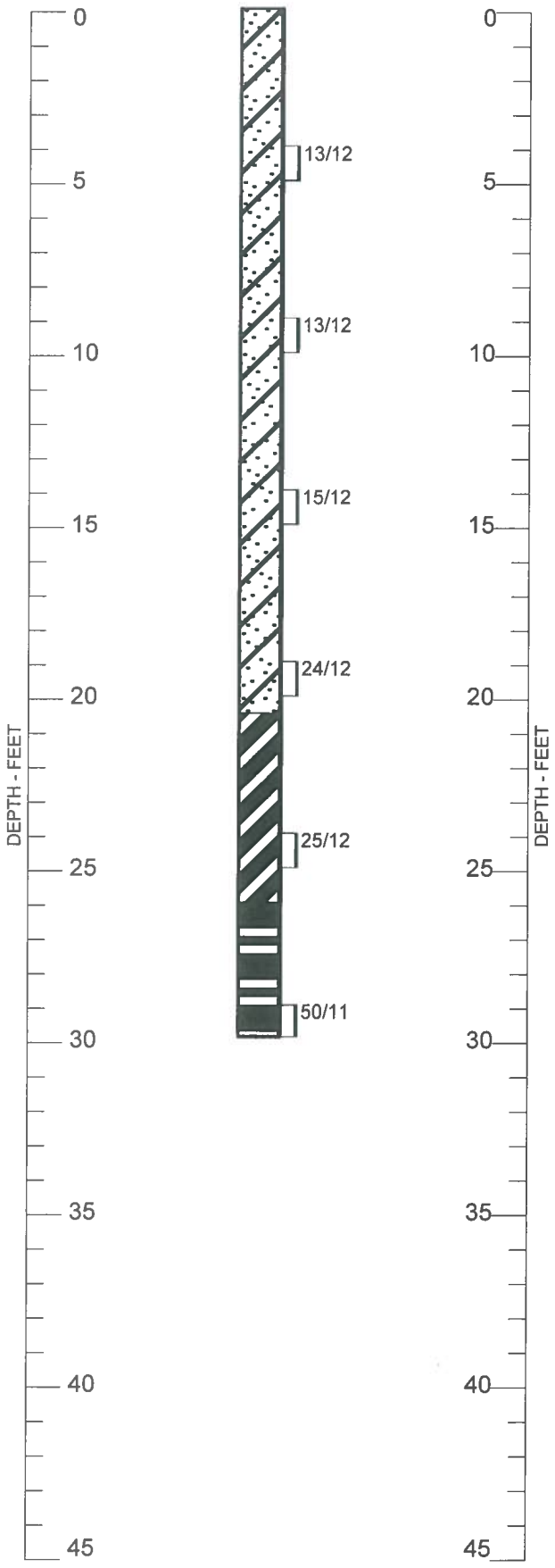
TH-1 INDICATES APPROXIMATE LOCATION OF EXPLORATORY BORING

Location of Exploratory Boring

ICC EVALUATION TESTING
PLATTEVILLE #1 SAND SITE

FIGURE 1

TH-1



LEGEND:

SAND, SILTY, MOIST, MEDIUM DENSE, BROWN (SM)

WEATHERED CLAYSTONE, MOIST, MEDIUM HARD, BROWN, GRAY

CLAYSTONE BEDROCK, MOIST, HARD, BROWN, GRAY, RUST

DRIVE SAMPLE. THE SYMBOL 13/12 INDICATES 13 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

NOTES:

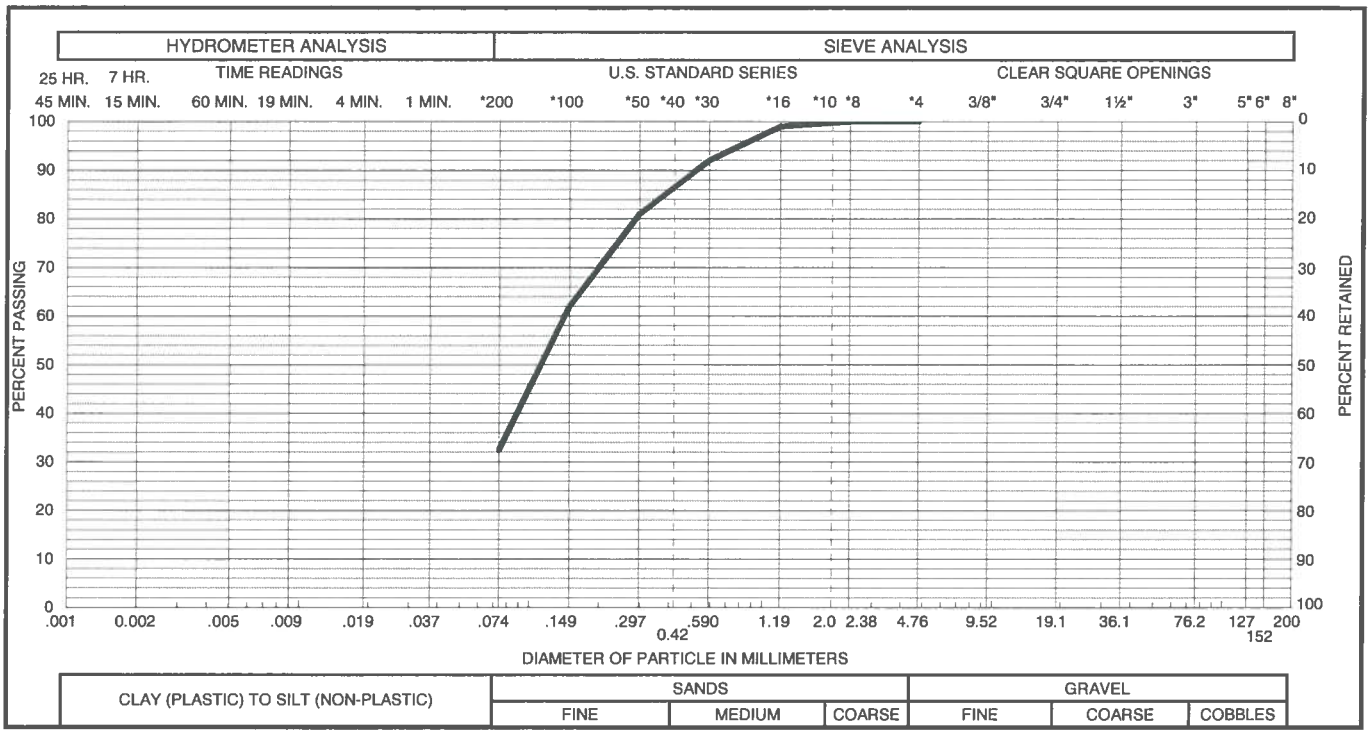
1. THE BORING WAS DRILLED ON OCTOBER 27, 2009 USING 4-INCH DIAMETER CONTINUOUS-FLIGHT AUGER AND A TRUCK-MOUNTED CME-55 DRILL RIG.
2. APPROXIMATE BORING LOCATION IS SHOWN ON FIGURE 1.
3. GROUND WATER WAS NOT ENCOUNTERED DURING THIS INVESTIGATION.
4. THIS LOG IS SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS IN THIS LETTER.

ICC EVALUATION TESTING
PLATTEVILLE #1 SAND SITE

Summary Log of Exploratory Boring

FIGURE 2

ONE LOG BY DEPTH WITH LEGEND FC05132 DATA LOGS.GPJ CTLMAIN.GDT 4/2/10



Sample of SAND, SILTY (SM)
From TH - 1 AT 4 FEET

GRAVEL	0 %	SAND	68 %
SILT & CLAY	32 %	LIQUID LIMIT	NL
PLASTICITY INDEX			NP

ICC EVALUATION TESTING
PLATTEVILLE #1 SAND SITE

Gradation Test Results

FIGURE 3

TABLE I

SUMMARY OF LABORATORY TESTING

BORING	DEPTH (FEET)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS		PASSING NO. 200 SIEVE (%)	DESCRIPTION
				LIQUID LIMIT	PLASTICITY INDEX		
TH-1	4	7.9		NL	NP	32.4	SAND, SILTY (SM)

SECTION 3:

IAS ACCREDITATION CERTIFICATE

IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

SCOPE OF ACCREDITATION

IAS Accreditation Number	TL-342
Company Name	CTL/Thompson, Inc.
Address	400 N. Link Lane Ft. Collins, CO 80524
Contact Name	Chip Leadbetter, Senior Engineer
Telephone	(970) 206-9455
Effective Date of Scope	April 8, 2019
Accreditation Standard	ISO/IEC 17025:2005

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 Method

Structural

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
ICC-ES AC237	Non-prestressed Deformed High Strength Steel Bars for concrete Reinforcement
ICC-ES AC336	Acceptance Criteria for Bearing Pin Piers
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 4.1.1 (side load), 4.2.2, 4.2.3 and 4.4.1))
ICC-ES AC443	Screw foundation systems (SFSs) (test methods referenced in sections 3.0 and 4.0)

APPENDIX A:

INSTALLATION INSTRUCTIONS

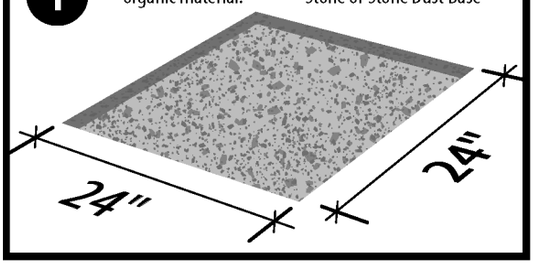
IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

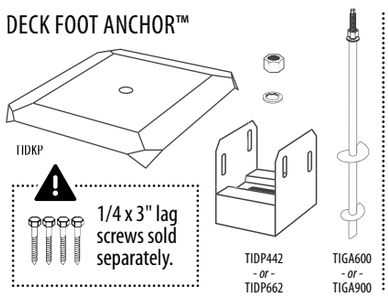
INSTALLATION | DECK FOOT ANCHOR™

IMPORTANT NOTE : CHECK YOUR LOCAL BUILDING DEPARTMENT FOR HEIGHT REQUIREMENTS REGARDING FREE STANDING STRUCTURES.

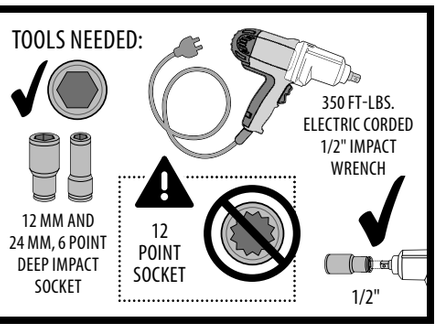
1 *Remove Sod* and any organic material. *Add* 2"– 3" of 1/2" Crushed Stone or Stone Dust Base



DECK FOOT ANCHOR™



TOOLS NEEDED:



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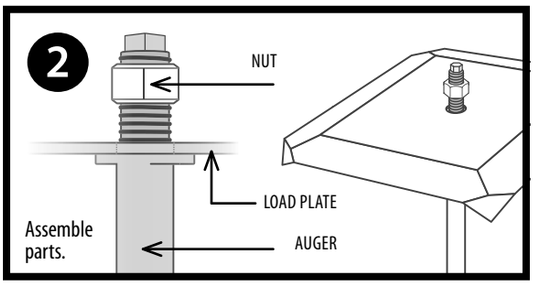

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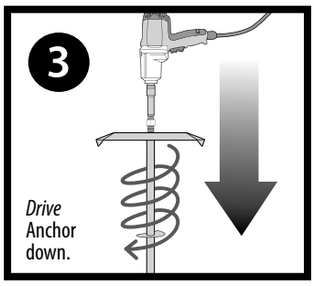

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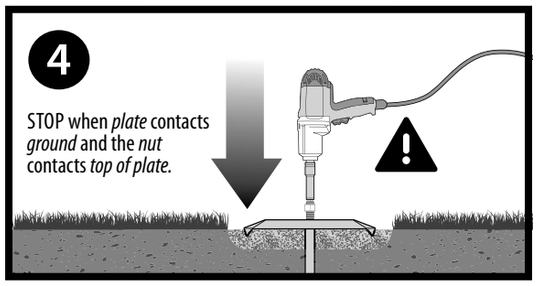

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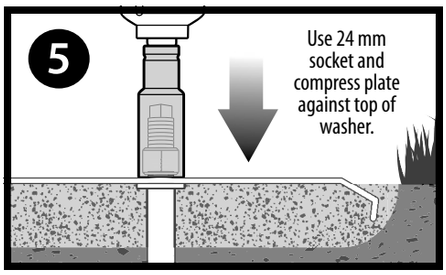

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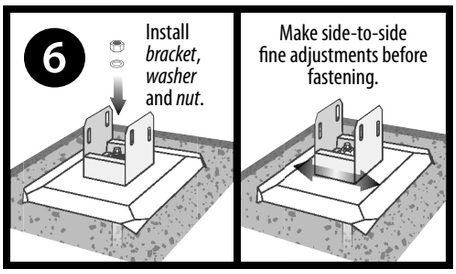

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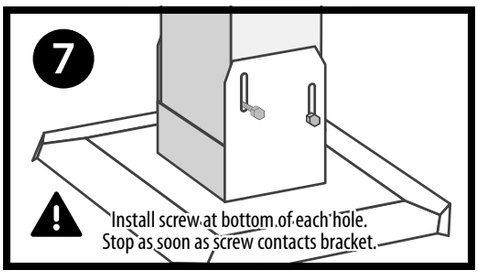

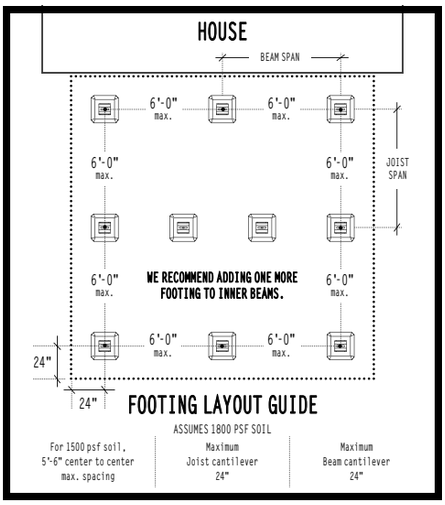

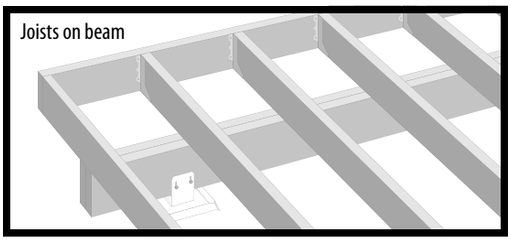

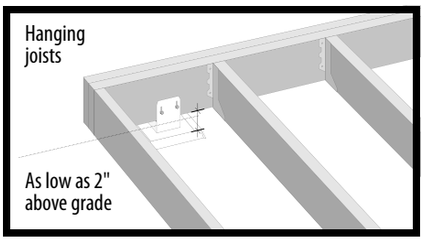

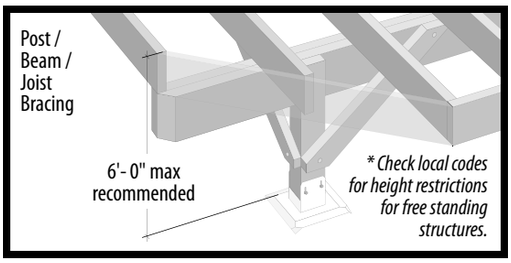

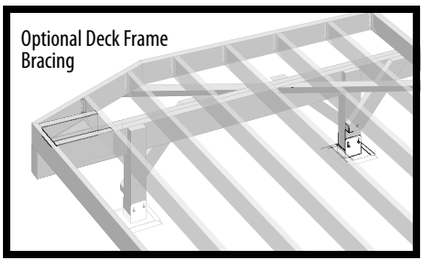

TITAN DECK FOOT ANCHOR ™ / TIDP442 / TIDP662 / TIDKP / TIGA600 / TIGA900

PATENT №	US 9,309,688

ATTENTION: Before beginning work, consult with local building officials or engage professionals to ensure that this product is appropriate for your intended use or help clarify if these warnings are unclear or if you do not understand any of the information in this installation guide. Always comply with applicable building codes and be advised that building codes may vary.

ADVERTENCIA : Antes de comenzar a trabajar, consulte con funcionarios de la construcción local o contrate profesionales para asegurarse de que este producto sea apropiado para la aplicación deseada o para para ayudar a clarificar en caso de que estes advertancias no sean claras o en caso de que usted no comprenda parte de la información de esta guia de instalación. Siempre cumpia con los códigos de construcción aplicables y sepa que los códigos de la construcción pueden variar.

ATTENTION : Avant de commencer le travail, consultez les autorités locales en construction ou embauchez des professionnels pour assure que ce produit est approprié pour l'application que vous avez en vue ou pour aider à clarifier ces instructions si elles ne sont pas claires ou si vous ne comprenez pas quelque information que ce soit dans ce guide d'ínstallation. Conformez vous toujours aux codes du bâtiment qui s'appliquent à sachez que les codes du bâtiment peuvent varier d'un endroit à un autre.

QUESTIONS? CONTACT US TOLL FREE
1-866-577-8868

TITAN BUILDING PRODUCTS THE ART OF BUILDING™

PRO

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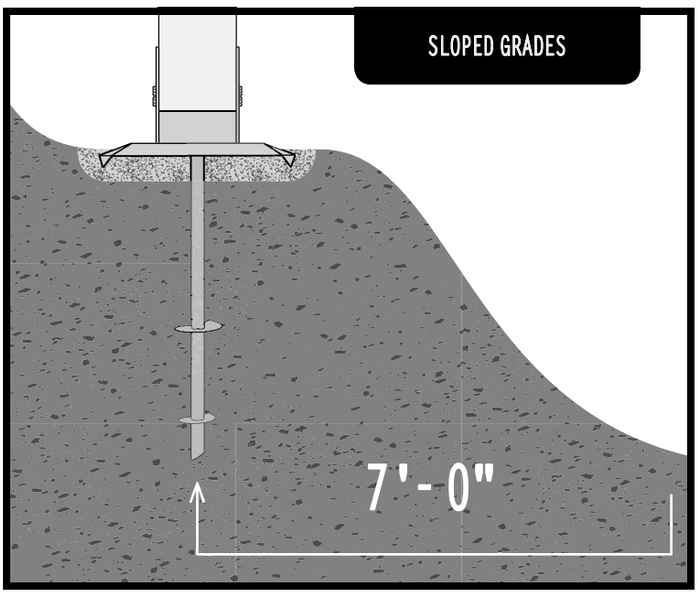
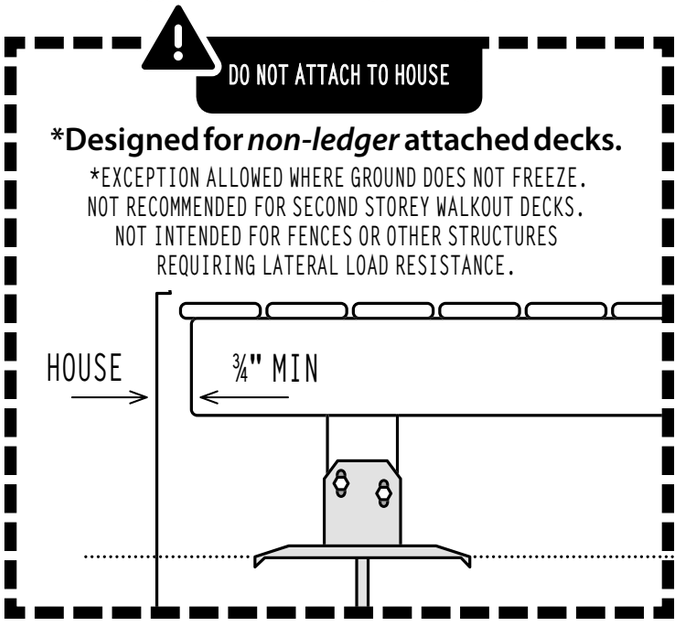
INSTALLATION | DECK FOOT ANCHOR™





Introducing *Terra-Shift*™

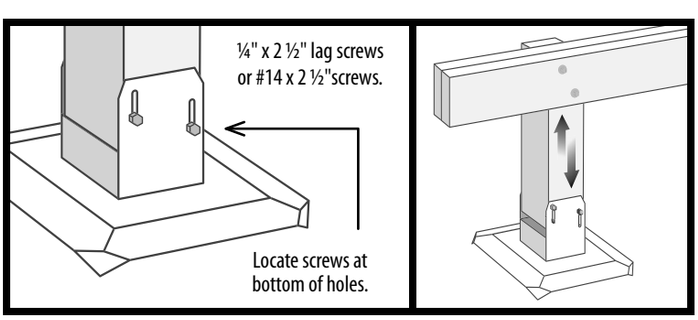
"A SHOCK ABSORBER SYSTEM FOR YOUR DECK"

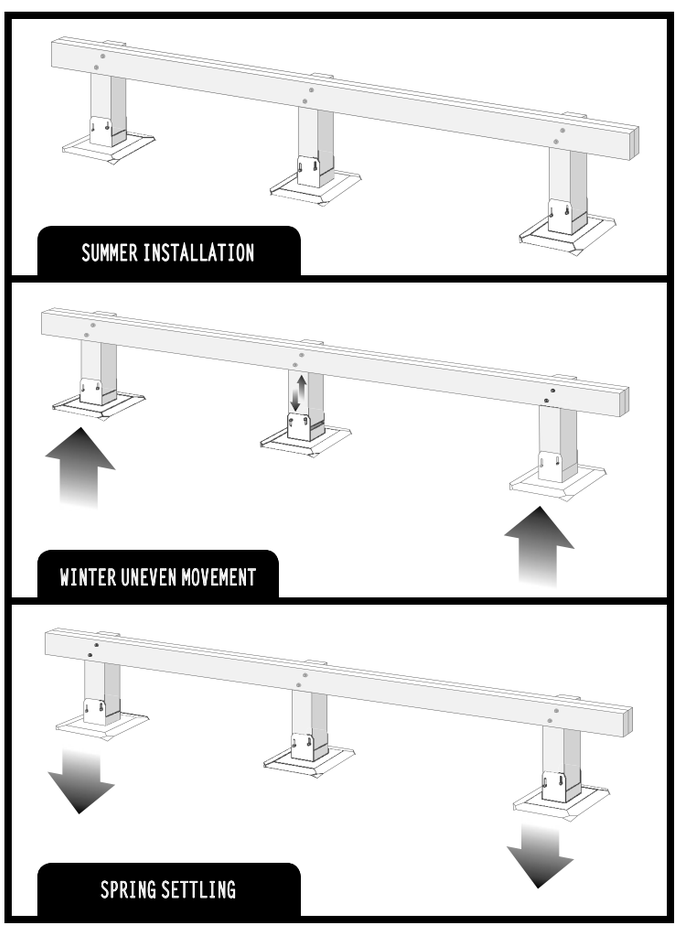
The Titan Deck Foot Anchor™ uses our patented ***Terra-Shift***™ ***post bracket system*** to help keep soil around the anchor undisturbed and prevent damage to all post and beam and other structural connections.

TERRA-SHIFT™ Technology

Here is how it works:

The fastener slide holes reduce friction between the post and bracket just enough so that if the soil shifts or expands unevenly along a series of footings under a beam, the post is free to slide vertically and then settle back to normal. It's like a shock absorbing system for your deck.





TITAN DECK FOOT ANCHOR™ / TIDP442 / TIDP662 / TIDKP / TIGA600 / TIGA900

PATENT Nº	US 9,309,688

ATTENTION: Before beginning work, consult with local building officials or engage professionals to ensure that this product is appropriate for your intended use or help clarify if these warnings are unclear or if you do not understand any of the information in this installation guide. Always comply with applicable building codes and be advised that building codes may vary.

ADVERTENCIA : Antes de comenzar a trabajar, consulte con funcionarios de la construcción local o contrate profesionales para asegurarse de que este producto sea apropiado para la aplicación deseada o para para ayudar a clarificar en caso de que estes advertancias no sean claras o en caso de que usted no comprenda parte de la información de esta guia de instalación. Siempre cumpia con los códigos de construcción aplicables y sepa que los códigos de la construcción pueden variar.

ATTENTION : Avant de commencer le travail, consultez les autorités locales en construction ou embauchez des professionnels pour assure que ce produit est approprié pour l'application que vous avez en vue ou pour aider à clarifier ces instructions si elles ne sont pas claires ou si vous ne comprenez pas quelque information que ce soit dans ce guide d'installation. Conformez vous toujours aux codes du bâtiment qui s'appliquent à sachez que les codes du bâtiment peuvent varier d'un endroit à un autre.

QUESTIONS? CONTACT US AT 1-866-577-8868 IN NO EVENT SHALL TITAN BUILDING PRODUCTS BE LIABLE FOR ANY LOSS OR DAMAGE, DIRECT OR OTHERWISE, WHICH RESULTS FROM THE IMPROPER INSTALLATION OR USE OF THIS PRODUCT. IF FOR ANY REASON TITAN BUILDING PRODUCTS BECOMES LIABLE FOR LOSS OR DAMAGE, DIRECT OR OTHERWISE, THE AGGREGATE LIABILITY OF TITAN BUILDING PRODUCTS SHALL BE LIMITED TO THE RETAIL PURCHASE PRICE OF THE PRODUCTS.

APPENDIX B:

SUPPLIED DOCUMENTATION

IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

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TITAN DECK FOOT ANCHOR
EVALUATION PLAN

PRODUCT EVALUATED
TITAN DECK FOOT ANCHOR

EVALUATION PROPERTY
2018 IRC - STRUCTURAL

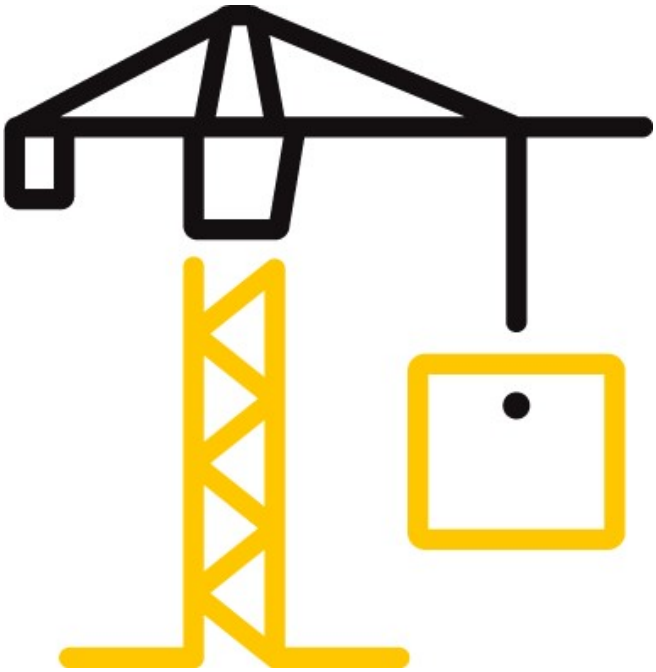
REPORT NUMBER
104057475-YRK-01

ORIGINAL ISSUE DATE
04/23/20

LAST REVISED DATE
ORIGINAL

PAGES
16

DOCUMENT CONTROL NUMBER
SFT-BC-OP-19A



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EVALUATION PLAN FOR TITAN DECK FOOT ANCHOR

Report No.: 104057475-YRK-01
Date: 04/23/20

TEST PLAN RENDERED TO:	
Company Name:	Titan Building Products
Address:	5450 Canotek Rd Unit 71
	Ottawa, ON K1J 9G6
	Canada
Contact Person:	Richard Bergman
Tel:	President
Email:	rbergman@Titanbuildingproducts.com

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EVALUATION PLAN FOR TITAN DECK FOOT ANCHOR

Report No.: 104057475-YRK-01
Date: 04/23/20

1 Introduction

Intertek Testing Services NA Inc. (Intertek) is preparing this evaluation plan for Titan Building Products (TBP), on Titan Deck Foot Anchors. The evaluation plan will outline the requirements to obtain an Intertek Code Compliance Research Report (CCRR) in accordance with the 2018 International Residential Code (IRC).

2 Product and Assembly Description

2.1. PRODUCT DESCRIPTION:

The Titan Deck Foot Anchor is a fabricated steel surface footing plate with an integral auger anchor for use as footings supporting exterior residential decks. The Titan Deck Foot Anchor is comprised of three primary components:

1. A steel bearing plate (footing). One size; nominally 12”x12”
2. A post base anchor bracket fixed to the top side of the footing plate to accommodate either a 4x4 or 6x6 wood deck post.
3. An auger style anchor beneath the footing plate for anchorage into foundation soils. Two lengths; nominally 24” and 36”

The three components are mechanically connected (bolted) at the footing plate.
See Appendix for component drawings

2.2. MANUFACTURER’S INFORMATION

	Owner/Listee of Product and Listing	Manufacturing Plant (If Different from Applicant/Listee)
Company Name:	Titan Building Products	Mai Van Dang Co., Ltd
Address:	5450 Canotek Rd Unit 71 Ottawa, ON K1J 9G6 Canada	Hoa Xa Industrial Zone Nam Dinh City - Nam Dinh Province Viet Nam
Contact Person:	Richard Bergman	Ms. Tam
Alternate Contact:		
Tel:	613-224-9477	84-28.3671811
Fax:	613-224-9713	84-28.3861550
Email:	rbergman@Titanbuildingproducts.com	madavuexport@gmail.com

3 Reference Documents

As part of this evaluation, Intertek has directly or indirectly used the following referenced documents:

- 2018 Residential Building Code (IRC)
- ICC-ES Acceptance Criteria for Precast Concrete Pier Foundation Assemblies, AC336

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- ICC-ES Acceptance Criteria for Helical Pile Systems and Devices, AC358
- ASTM D1143 Standard Test Method for Piles Under Static Axial Compressive Load
- ASTM D3689 Standard Test Method for Induvial Piles under Static Axial Tensile Load
- ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices, AC13
- AISI S100-16, North American Standard for the Design of Cold-Formed Steel Structural Members
- National Design Specification for Wood Construction, NDS-2015

4 Certification Requirements

To obtain certification, the following steps will need to be conducted after this test plan has been reviewed and approved by all parties:

1. Applicant, and manufacturer, if different, will need to sign the Client Information Sheet (CIS), and Certification Agreement.
2. Specimens for testing must be sampled by Intertek at the manufacturing location, or otherwise shown to be of normal manufacture.
3. An Intertek representative will conduct an audit of the manufacturing process and quality control program (usually at the same time as the sampling visit) to develop a Factory Audit Manual (FAM). The FAM will be used during follow-up inspections after the product is Listed with Intertek to ensure that the product is made the same as during the qualification period.
4. The FAM will be developed in accordance with ICC-ES AC10 from documentation supplied by the manufacturer and from documentation collected during the audit. The Applicant, and manufacturer, if different, must sign the FAM.
5. Successful completion of engineering and/or testing outlined in this Evaluation Plan will qualify the product for an Intertek certification in compliance with the 2018 international Residential Code (IRC) after the below steps are completed. A complete set of installation instructions are required for any assembly configurations.
6. During the testing phase, you will be provided with Intertek's labeling procedure which will outline the minimum marking requirements. This will need to be drafted by you, and then approved by Intertek.
7. On completion of a successful test program, a Listing Report will be created and include all the test reports and/or evaluations, FAM, and approved Label.
8. An Initial Factory Assessment (IFA) must be conducted after the Listing is published, and before receiving the Authorization to Mark (ATM). The IFA ensures that all provisions of the FAM have been implemented at the manufacturing location.

5 Evaluation Method

5.1. Scope and General Overview: Evaluation scope includes evaluation of code requirements for materials used and structural performance of the footing system to establish design capacities. For use under the IRC, allowable compressive loads will be used to draw equivalence to conventional footing sizes for given soil bearing capacities specified in IRC Table 507.3.1 for residential decks. The scope of evaluation shall include:

- Configurations listed in Section 2.1
- Two loading directions:

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- Load-bearing (compression)
- Uplift (Pull-out)
- Lateral loads are not included within the scope of this evaluation.

- Soil types TBD. TBP shall specify the soil types to include in the evaluation in accordance with the class of materials listed in IRC Table R401.4.1. For planning purposes, it is assumed at this time that two soil classes will be evaluated. Examples include:
  1. Non-expansive stiff clays (CL, CH)
  2. Silty Sand (SM, SP)

Where the conditions to be evaluated require in-situ load testing, the evaluation method shall be in accordance with ICC-ES AC336. For uplift (pull out) loading. test method ASTM D3689 shall be used in lieu of ASTM D1143 specified by AC336 for compressive loads. Use of ASTM D1143 and D3689 for compressive and uplift loads is consistent with IBC Chapter 18 foundation design. AC336 is chosen based on its limited scope (residential decks) and applicable foundation design principles (mini piles).

Where the conditions to be evaluated require the helix of the auger anchor to act as a structural component for load bearing, relative provisions of AC358 for helical piles are employed.

5.2. Sampling and Prequalification Audit

5.2.1. A prequalification audit (PQA) shall be conducted at the manufacturing plant to document and verify material specifications, manufacturing process and quality control procedures. Witnessing and/or selection of samples for testing can be conducted in conjunction with the PQA. Samples provided for testing prior to the PQA may be used only if there is product marking sufficient to facilitate traceability to production records and material certs for subsequent verification.

5.3. Materials

Detailed material specifications including steel grades and corrosion protection shall be provided for review and shall conform with minimum requirements of the code and code referenced standards.

5.4. Design Calculations

Where evaluation methods require engineering calculations, the calculations shall be in accordance with code referenced design standards and shall be signed and sealed by a licensed design professional.

5.5. Torsion Resistance

Installation torque capacity of the helix and shaft shall be evaluated in accordance with AC358 Section 3.12.4 and 4.2.2. Specified installation methods shall ensure that forces imposed during installation do not exceed design limits of the assembly either by limits of equipment used or torque measurement devices.

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5.6. In-Situ Testing

5.6.1. A soils investigation and report by a licensed geotechnical engineer shall be provided in accordance with AC336 Section 4.3.1 for each site to establish classification of the soils used in testing and a value within 10% of the values for which recognition is sought.

5.6.2. A minimum of three tests shall be conducted for each installation configuration and loading condition. Should any individual result vary by more than 15% from the average, the lowest of the three shall apply or, the proponent may run two additional tests and use the average value from the total of five.

5.6.3. Compressive load tests shall be conducted in accordance with AC336 Section 4.3.2. For uplift loading, the quick load test procedure of D3689 shall be used.

5.7. Load Bearing (Compression) Capacity

5.7.1. Installation Condition 1 – Footing plate is placed on undisturbed load-bearing soil in accordance with building code requirements as follows:

a. R403.1.4 Minimum Depth. Not less than 12 inches below undisturbed ground surface
b. R403.1.4.1 Frost protection. Not required for decks not supported by a dwelling. However, when the Titan Deck Foot Anchor is anchored below frost line, frost heave forces could be imposed on the footing plate. See uplift capacity for resistance to frost heave.

Bearing capacity shall be evaluated by engineering calculations for strength and stiffness of the footing plate in accordance with AISI S100 to resist the maximum specified soil bearing capacity using conventional shallow foundation design methodology.

5.7.2. Installation Condition 2 - Footing plate is not placed on undisturbed load-bearing soil in accordance with building code requirements. Plate is located on loose surface soils or noncompacted fill.

Under these conditions, load bearing capacity would rely on the auger anchor acting like a pile. Evaluation shall be in accordance with IBC Section 1810.3.3.1.9 and applicable provisions of AC358 requiring engineering calculations for the auger assembly (helix and shaft) and testing in accordance with ASTM D1143 (See 5.4).

Note: The TBP Deck Anchor system is a relatively shallow installation compared to traditional helical piles addressed in building code under deep foundations. As such, correlations of load capacity with installation torque referenced in IBC Section 1810.3.3.1.9 and AC358 are not applicable. The TBP Deck Anchor system will be evaluated at a specified depth of installation as opposed to the required installation depth based on torque resistance and testing in accordance with AC336 is more appropriate.

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5.8. Uplift (Pull Out) Capacity

The auger anchor is installed in undisturbed soil and is evaluated for resistance to uplift forces from wind or frost heave. TBP shall specify the minimum depth below undisturbed soil for this evaluation.

Evaluation shall be in accordance with applicable provisions of AC358 requiring engineering calculations for the auger anchor assembly (helix and shaft) and testing in accordance with ASTM D3689 (See 5.4)

5.9. Post Base Bracket

The metal post base bracket shall be evaluated for vertical compression and uplift loading in accordance with AC13 requiring testing and fastening calculations in accordance with the NDS.

5.9.1. Load testing for load-bearing compression and uplift (tension) shall be conducted in accordance with ASTM D7147. Testing is required for each wood species (or group) based on specific gravity (G) for the wood species in accordance with the NDS. For planning purposes, two specific gravity values are proposed for testing.
   1) G=0.5 for DF and SYP
   2) G=0.42 for HF and SPF

5.9.2. Test specimen materials. The following properties shall be determined for the materials used in test specimens:
   3) Tensile strength of bracket steel
   4) Specific gravity of wood post
   5) Bending yield strength of fasteners

   Where material properties of test specimens exceed the minimum specified values, load test results must be adjusted in accordance with Section 13.5.

5.9.3. Allowable load bearing capacity shall not exceed the load bearing capacity of the wood post determined in accordance with the NDS including end bearing and lateral resistance of the plate to wood post fasteners.

5.9.4. Allowable uplift capacity shall not exceed the lateral resistance of the plate to wood post fasteners determined in accordance with the NDS.

Optional: A commercially available metal post base of similar design (single anchor bolt in center of base) that has been evaluated in accordance with AC13 and recognized in a valid product evaluation report, may be specified for use in the Titan Foot Anchor system.

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EVALUATION PLAN FOR TITAN DECK FOOT ANCHOR

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Tests for Helical System

Main Standard	Test	Referenced Standard	No. of Samples	Test Details/Comments	Test Laboratory
AC336	Compression Load Bearing	ASTM D1143	3 min. See 5.6.2	Required for each soil type (material classification)	Intertek-PSI
IBC	Tension (uplift/pull out)	ASTM D3689	3 min. See 5.6.2	Required for each soil type (material classification) Tested at minimum depth specified below undisturbed soil.	Intertek-PSI
AC358	Torsion	AC358, 3.11.3 and 4.2.2	3	Shaft and Helix Plate	TBD

Tests for Post Base Bracket – Tests specified are required for each bracket size (4x4, 6x6, etc.)

Main Standard	Test	Referenced Standard	No. of Samples	Test Details/Comments	Test Laboratory
AC13	Steel Tensile Strength	ASTM A370	5	Required for each steel material used to manufacture the test specimens. Traceability is required for each bracket tested.	TBD
AC13	Specific Gravity and Moisture Content	ASTM D2395 and ASTM D4442	3	Tests required for each wood member used in testing.	TBD
AC13	Bending Yield Strength of Fasteners	ASTM F1575	15	Tests required for each fastener from the same manufacturers lot.	TBD
AC13	Direct Load Capacity	ASTM D7147	3	Tests required for each size and wood species group (Specific Gravity) a) 4x4 w/G=0.42 b) 6x6w/G=0.42 c) 4x4 w/G=0.5 d) 6x6 w/G=0.5 Optionally, tests may be run for G=0.42 only and values can apply for wood with G=0.42 or greater.	TBD
AC13	Uplift Load Capacity	ASTM D7147	3		

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EVALUATION PLAN FOR TITAN DECK FOOT ANCHOR
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6 Conclusion

Intertek has prepared this evaluation plan for Titan Building Products, on titan Deck Foot Anchor systems. The plan as described in this report outlines the requirements for a Code Compliance Research Report (CCRR) for the 2018 International Residential Code (IRC). Once the test plan is accepted, a separate project will need to be initiated for testing, evaluation and issuance of the certification and CCRR.

This test plan specifies the minimum number of tests contingent on variation tolerances in test results. Should variation exceed the specified tolerances, additional testing may be required.

INTERTEK TESTING SERVICES NA INC.

Reported by: 

Craig H. Wagner, P.E.
Chief Engineer – Building & Construction

Reviewed by:

Michael Beaton, P.E.
Director, Special Projects

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7 APPENDIX - DRAWINGS

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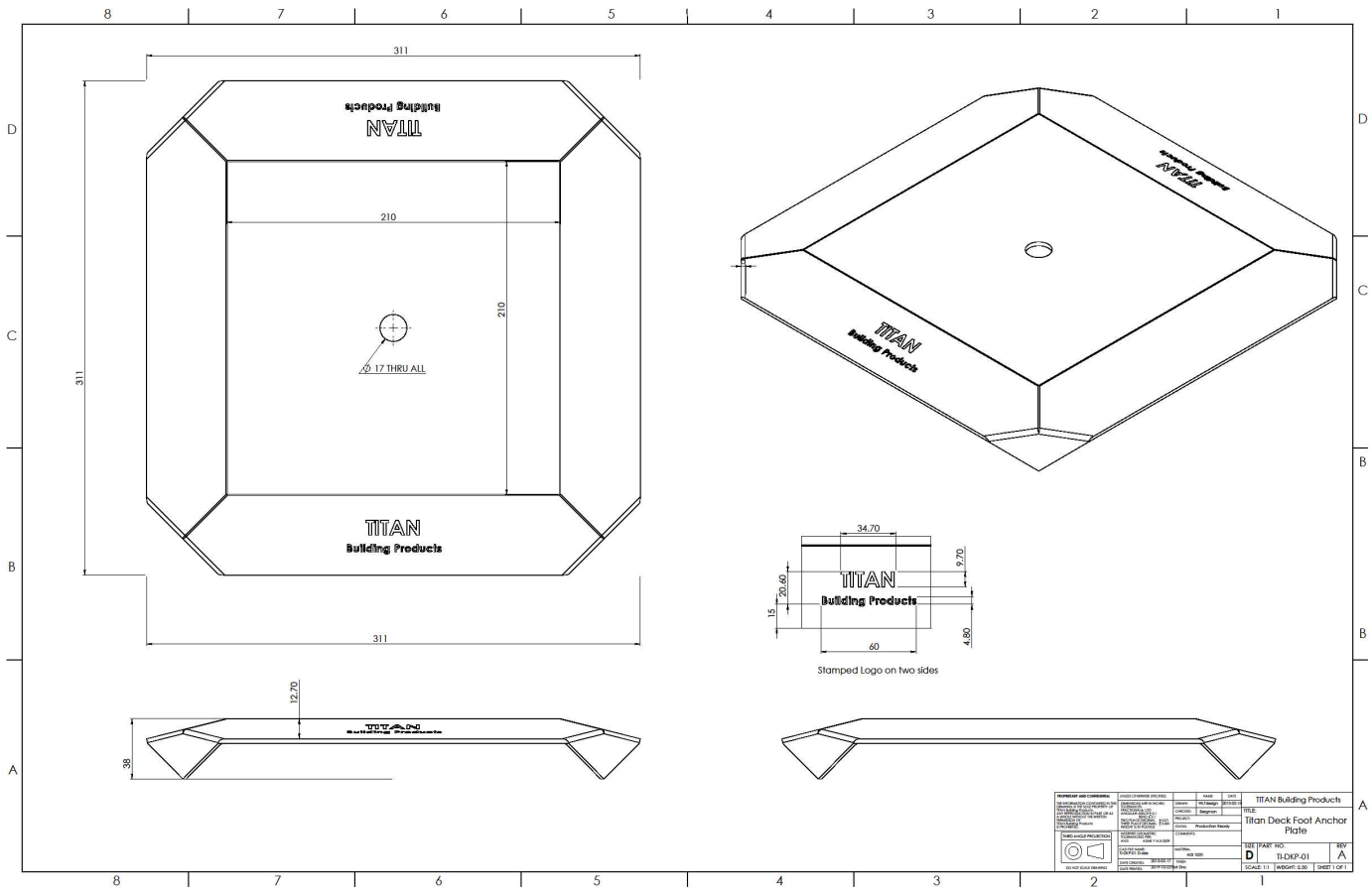

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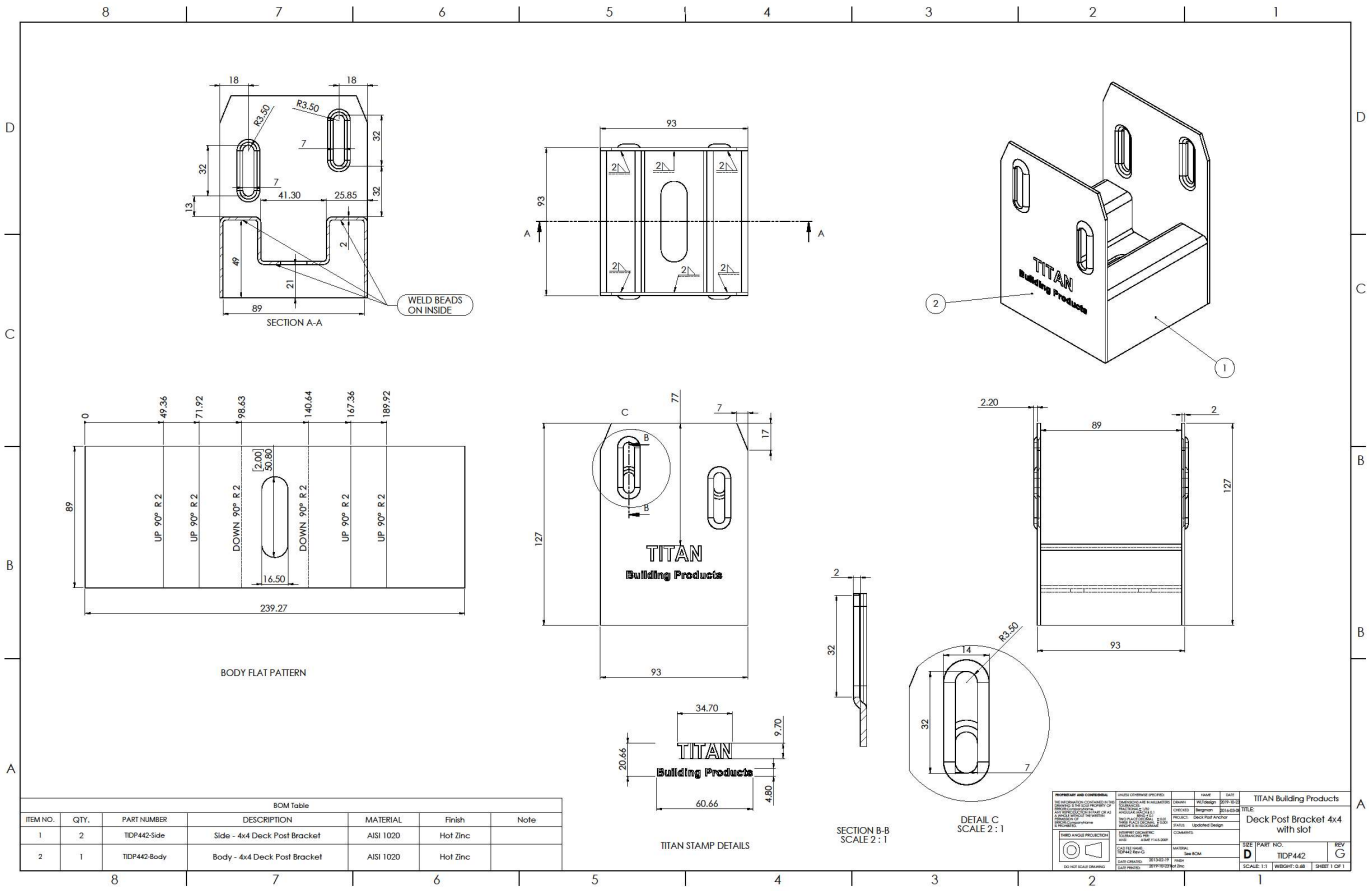

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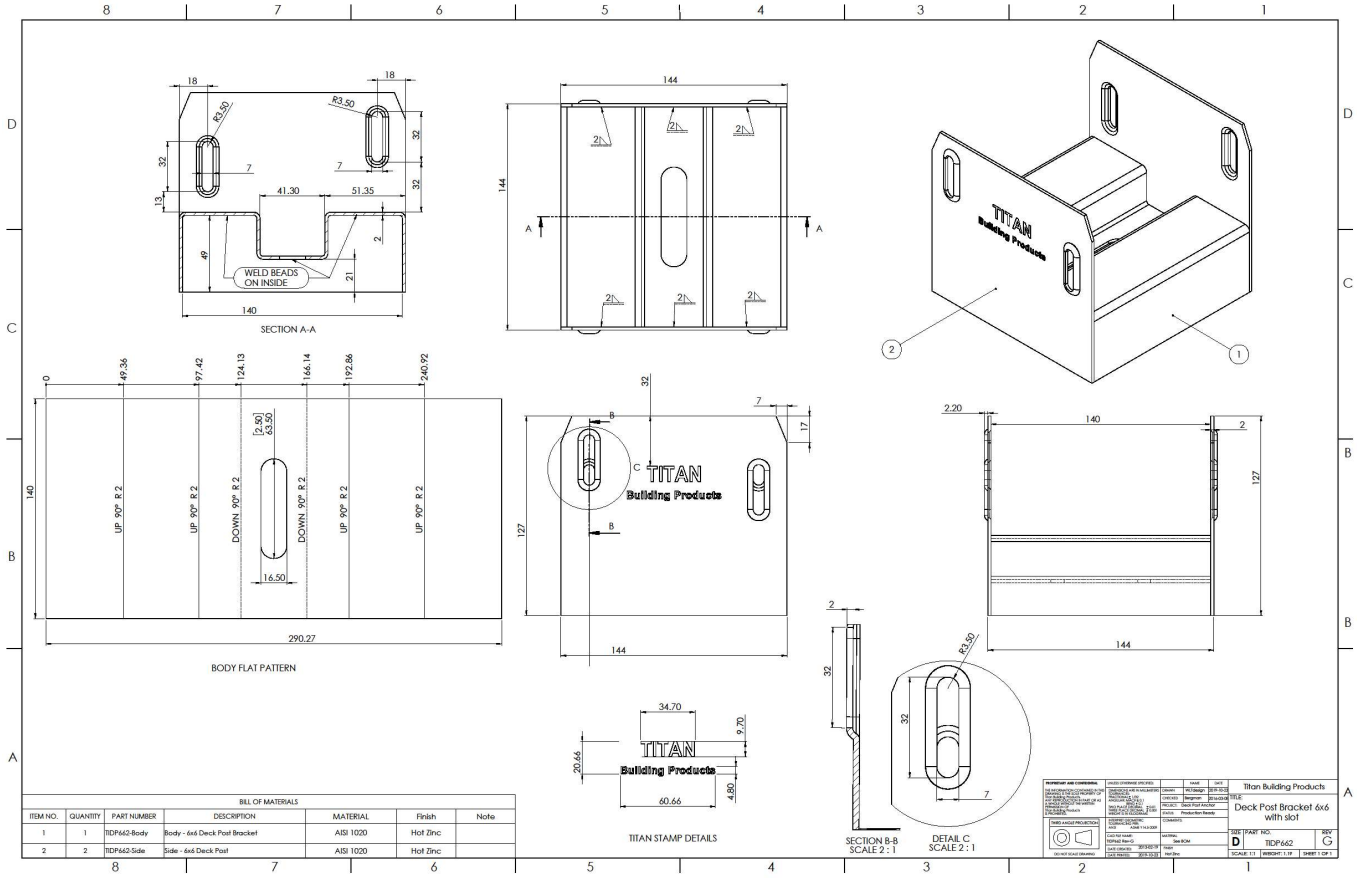

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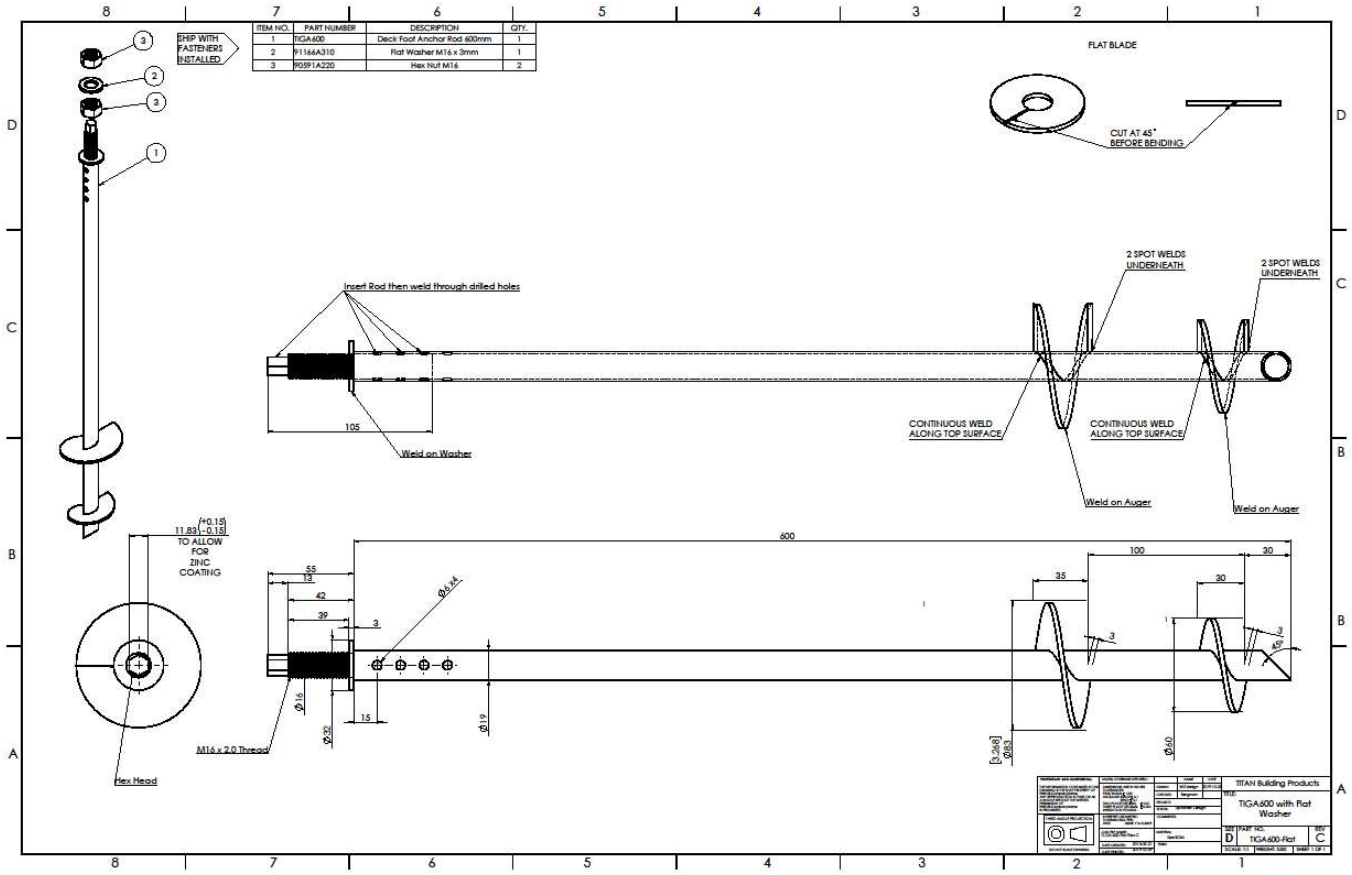

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TIGA-600	Deck Foot Anchor Rod 600mm	1
2	91166A310	Flat Washer M16 x 3mm	1
3	90591A220	Hex Nut M16	2

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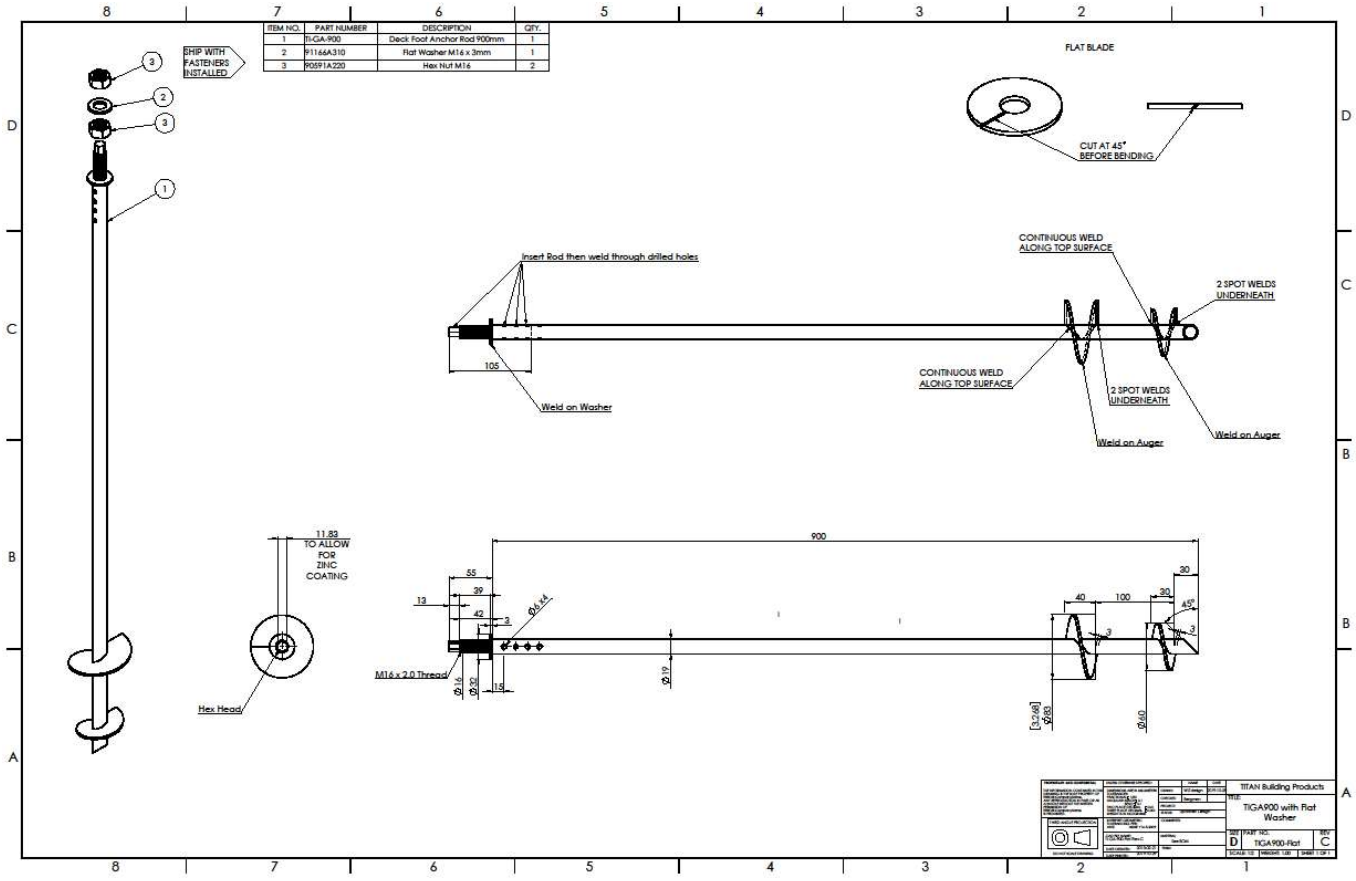

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8 LAST PAGE & REVISION SUMMARY

DATE	SUMMARY	REPORTER	REVIEWER
4/23/20	Original	C. Wagner	M. Beaton

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: [illegible]..PT/VC
Địa chỉ : Số 5 - Đường N1 — CCN An Xá - Tp. Nam Định — Nam Định
Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 15 tháng 03 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

AUGER TUBING

1. **Tên mẫu/Sample: Tôn 1.6mm**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** ***Chemical compositions*: %**	**Bruker Q4 Tasman**	
▸	Carbon (C)		**0.075**
▸	Silicon (Si)		**0.0041**
▸	Manganese (Mn)		**0.122**
▸	Phosphorus (P)		**0.0100**
▸	Sulfur (S)		**0.0038**
▸	Choromium (Cr)		**0.042**
▸	Molybdenum (Mo)		**<0.0010**
▸	Nickel (Ni)		**0.0049**
▸	Copper (Cu)		**0.0048**
▸	Aluminum (Al)		**0.036**
▸	Tungsten (W)		**0.019**
▸	Titanium (Ti)		**<0.0002**
▸	Cobalt (Co)		**0.0022**
▸	Vanadium (V)		**0.0011**
▸	Ferrum (Fe)		**99.67**
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỂN

PHÊ DUYỆT

CÔNG TY TNHH THẮNG LỢI

GIÁM ĐỐC
PHÙNG ĐÌNH THÔNG

CÔNG TY TNHH THẮNG LỢI

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: □□□..PT/VC
Địa chỉ : Số 5 - Đường N1 — CCN An Xá - Tp. Nam Định — Nam Định
Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 05 tháng 03 năm 2021.

AUGER TUBING

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

1. **Tên mẫu/Sample: MẪU TÔN 1.6mm (04-03-2021)**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** *Chemical compositions*: %	**Bruker Q4 Tasman**	
▸	Carbon (C)		0.050
▸	Silicon (Si)		0.0095
▸	Manganese (Mn)		0.172
▸	Phosphorus (P)		0.0090
▸	Sulfur (S)		0.0014
▸	Choromium (Cr)		0.018
▸	Molybdenum (Mo)		0.0010
▸	Nickel (Ni)		0.012
▸	Copper (Cu)		0.023
▸	Aluminum (Al)		0.020
▸	Tungsten (W)		<0.0050
▸	Titanium (Ti)		<0.0002
▸	Cobalt (Co)		0.0029
▸	Vanadium (V)		<0.0005
▸	Ferrum (Fe)		99.68
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIẾN

PHÊ DUYỆT

CÔNG TY TNHH THẮNG LỢI

GIÁM ĐỐC
PHÙNG ĐÌNH THÔNG

CÔNG TY TNHH THẮNG LỢI

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: [illegible] /PT/VC

Địa chỉ : Số 5 - Đường N1 — CCN An Xá - Tp. Nam Định — Nam Định

Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978.564.468

Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 9 tháng 01 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

AUGERS - TIGA900

1. **Tên mẫu/Sample: MẪU ỐNG 19.1x2.3**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** ***Chemical compositions*: %**	**Bruker Q4 Tasman**	
•	Carbon (C)		**0.060**
•	Silicon (Si)		**0.0051**
•	Manganese (Mn)		**0.158**
•	Phosphorus (P)		**0.012**
•	Sulfur (S)		**0.0042**
•	Choromium (Cr)		**0.015**
•	Molybdenum (Mo)		**0.0022**
•	Nickel (Ni)		**0.0064**
•	Copper (Cu)		**0.0061**
•	Aluminum (Al)		**0.024**
•	Tungsten (W)		**0.010**
•	Titanium (Ti)		**0.0002**
•	Cobalt (Co)		**0.0012**
•	Vanadium (V)		**0.0009**
•	Ferrum (Fe)		**99.70**
Kết luận: Thành phần hóa học tương ứng mác thép SS400			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỂN

PHÊ DUYỆT

M.S.D.N: 0600005112-C.T.T.N.H.H
CÔNG TY TNHH THẮNG LỢI
TP. NAM ĐỊNH - T. NAM ĐỊNH

GIÁM ĐỐC

NHA MAY ĐUC THEP HỢP KIM CAO VICO

Số: ....PT/VC
Địa chỉ : Số 5 - Đường N1 — CCN An Xá - Tp. Nam Định — Nam Định
Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 9 tháng 01 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

TIDKP - PLATES

1. **Tên mẫu/Sample: MẪU TÔN 3.0mm**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** *Chemical compositions*: %	Bruker Q4 Tasman	
▸	Carbon (C)		0.068
▸	Silicon (Si)		0.0088
▸	Manganese (Mn)		0.187
▸	Phosphorus (P)		0.0088
▸	Sulfur (S)		0.0033
▸	Choromium (Cr)		0.020
▸	Molybdenum (Mo)		0.0030
▸	Nickel (Ni)		0.0076
▸	Copper (Cu)		0.018
▸	Aluminum (Al)		0.031
▸	Tungsten (W)		0.013
▸	Titanium (Ti)		0.0007
▸	Cobalt (Co)		0.0018
▸	Vanadium (V)		0.0009
▸	Ferrum (Fe)		99.63
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỂN

PHÊ DUYỆT

M.S.D.N: 0600005112-C.T.T.N.H.H
CÔNG TY TNHH THẮNG LỢI
TP NAM ĐỊNH - T. NAM ĐỊNH

GIÁM ĐỐC

CÔNG TY TNHH THẮNG LỢI

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: □□□..PT/VC
Địa chỉ : Số 5 - Đường N1 — CCN An Xá - Tp. Nam Định — Nam Định
Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 16 tháng 01 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

TIDKP - PLATES

1. **Tên mẫu/Sample: MẪU TÔN 3.0mm**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** *Chemical compositions*: %	**Bruker Q4 Tasman**	
▸	Carbon (C)		**0.053**
▸	Silicon (Si)		**0.044**
▸	Manganese (Mn)		**0.165**
▸	Phosphorus (P)		**0.014**
▸	Sulfur (S)		**0.0070**
▸	Choromium (Cr)		**0.054**
▸	Molybdenum (Mo)		**<0.0010**
▸	Nickel (Ni)		**0.028**
▸	Copper (Cu)		**0.0093**
▸	Aluminum (Al)		**0.014**
▸	Tungsten (W)		**0.0054**
▸	Titanium (Ti)		**0.0012**
▸	Cobalt (Co)		**0.0081**
▸	Vanadium (V)		**0.0011**
▸	Ferrum (Fe)		**99.60**
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỂN

PHÊ DUYỆT

M.S.D.N: 0600005112-C.T.T.N.H.H
CÔNG TY TNHH THẮNG LỢI
TP. NAM ĐỊNH - T. NAM ĐỊNH

GIÁM ĐỐC
PHÙNG ĐÌNH THÔNG

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: ...PT/VC
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Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 9 tháng 01 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

POST SADDLE

1. **Tên mẫu/Sample: MẪU TÔN 2.0mm**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** ***Chemical compositions*: %**	**Bruker Q4 Tasman**	
▸	Carbon (C)		**0.068**
▸	Silicon (Si)		**0.0052**
▸	Manganese (Mn)		**0.181**
▸	Phosphorus (P)		**0.017**
▸	Sulfur (S)		**0.0036**
▸	Choromium (Cr)		**0.030**
▸	Molybdenum (Mo)		**0.0013**
▸	Nickel (Ni)		**0.0075**
▸	Copper (Cu)		**0.0039**
▸	Aluminum (Al)		**0.025**
▸	Tungsten (W)		**0.016**
▸	Titanium (Ti)		**0.0003**
▸	Cobalt (Co)		**0.0026**
▸	Vanadium (V)		**0.0007**
▸	Ferrum (Fe)		**99.64**
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỀN

PHÊ DUYỆT

M.S.D.N: 0600005112-C.T.T.N.H.H
CÔNG TY TNHH THẮNG LỢI
TP. NAM ĐỊNH - T. NAM ĐỊNH

GIÁM ĐỐC

CÔNG TY TNHH THẮNG LỢI

NHÀ MÁY ĐÚC THÉP HỢP KIM CAO VICO

Số: .....PT/VC
Địa chỉ : Số 5 - Đường N1 – CCN An Xá - Tp. Nam Định – Nam Định
Tel: 0228.8606088 * Fax: 0228.3660671 * Mobi: 0978 564 468
Website: http://luyenkim.net * Email: thangloind@gmail.com

Nam Định, ngày 27 tháng 01 năm 2021.

KẾT QUẢ THỬ NGHIỆM
TEST RESULT

1. **Tên mẫu/Sample: MẪU TÔN 2.0mm**
2. **Khách hàng/Customer: CÔNG TY MAI VĂN ĐÁNG**
3. **Kết quả/Results:**

POST SADDLE

TT Items	Tên chỉ tiêu *Specification*	Thiết bị kiểm tra *Test machine*	Kết quả *Results*
1	**Thành phần hóa học** *Chemical compositions*: %	**Bruker Q4 Tasman**	
□	Carbon (C)		**0.067**
□	Silicon (Si)		**0.040**
□	Manganese (Mn)		**0.274**
□	Phosphorus (P)		**0.0057**
□	Sulfur (S)		**0.0029**
□	Choromium (Cr)		**0.063**
□	Molybdenum (Mo)		**0.0026**
□	Nickel (Ni)		**0.016**
□	Copper (Cu)		**0.014**
□	Aluminum (Al)		**0.051**
□	Tungsten (W)		**0.016**
□	Titanium (Ti)		**0.0025**
□	Cobalt (Co)		**0.0022**
□	Vanadium (V)		**0.0016**
□	Ferrum (Fe)		**99.44**
Kết luận: Thành phần hóa học tương ứng mác thép SPHC			

KIỂM ĐỊNH VIÊN

PHẠM QUANG HIỂN

PHÊ DUYỆT

M.S.D.N: 0600005112-C
CÔNG TY TNHH THẮNG LỢI
TP. NAM ĐỊNH - T. NAM ĐỊNH

GIÁM ĐỐC
PHÙNG ĐÌNH THÔNG

APPENDIX C:

EQUIPMENT CALIBRATON RECORDS

IAS ACCREDITED Testing Laboratory

CTL | THOMPSON INCORPORATED

Report and Certificate of Calibration

CAL-CERT CALIBRATION CERTIFICATION
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www.Cal-Cert.com

Toll Free 800-356-4662
Address 6709 SE Lake Road Milwaukie, OR 97222
Local 503-654-9620

A2LA ACCREDITED CERT #4986.01

Report #: 18579-82054-28 **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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-01315T / 01498 | Load Cell | Tovey Engineering | SN: 119831A | Cal: 02/09/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 291.00 - 10,000 lbf | Report #: 17942-72939-1595

Instrument Data

Calibration Date:	May 26, 2021	**Normative Reference:**	ASTM E4-16
Recommended Due Date:	May 26, 2022	**Cal-Cert Procedure:**	CP-001
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Optima Scale	**Temperature:**	75 °F
Type:	Load Cell	**Humidity:**	37% RH
Model Number:	OP-312	**Cal Factor:**	None
Serial #:	SVT2946	**Asset #:**	Accredited
Capacity:	10,000 lbf.	**Service Location:**	Service Address
Tolerance:	±1% of Applied Load	**As Found:**	FAIL
Method of Calibration:	Follow the Force	**As Left:**	PASS

Calibration Data

Calibrated Range: 1000 to 9500 lbf. **Range Resolution:** 1 lbf. **Mode Verified:** Tension

Unit Under Test Reading lbf.	Calibration Standard As Found lbf.	As Found Percentage Error	Verification Reading #1 lbf.	Error lbf.	Percentage Error	Verification Reading #2 lbf.	Error lbf.	Percentage Error	Algebraic Difference	Expanded Uncertainty lbf.
0	0	0.0%	0	0	0.0%	0	0	0.0%	0.0%	0.00
1,000	~~1011.4~~	1.14%	1002.3	2.3	0.23%	1001.4	1.4	0.14%	0.09%	4.00
2,000	~~2022.5~~	1.13%	2008.0	8.0	0.40%	2007.2	7.2	0.36%	0.04%	4.70
4,000	~~4044.4~~	1.11%	4017.3	17.3	0.43%	4016.8	16.8	0.42%	0.01%	6.80
6,000	~~6071.8~~	1.20%	6019.1	19.1	0.32%	6023.7	23.7	0.39%	-0.08%	9.40
8,000	~~8090.8~~	1.14%	8025.6	25.6	0.32%	8028.5	28.5	0.36%	-0.04%	12.10
9,500.0	~~9607.5~~	1.13%	9531.8	31.8	0.33%	9531.9	31.9	0.34%	0.00%	14.20
0	0	0.0%	0	0	0.0%	0	0	0.0%	0.0%	0.00

Bold and Strikethrough indicates a Failed Reading. **Max Range Permissible Error Percentage:** 0.43%

Manufacturer: Optima Scale **Type:** Load Cell **Serial #:** SVT2946

Remarks:

All force measurement standards utilized in this calibration are temperature compensated.

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 Z540.3, 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.

Service Engineer: Joe Borszich **Date:** May 26, 2021

Technical Manager: Marshall Doyle **Signature:** 

Report #: 18579-82054-28

Report and Certificate of Calibration

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800-356-4662

Address
6709 SE Lake Road
Milwaukie, OR 97222

Local
503-654-9620

A2LA ACCREDITED
CERT #4986.01

Report #:	18579-82053-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-01315C / 01498 | Load Cell | Tovey Engineering | SN: 119831A | Cal: 02/09/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 200.00 - 10,000 lbf | Report #: 17942-64237-1595

Instrument Data

Calibration Date:	May 26, 2021	**Reference:**	ASTM E-4
Recommended Due Date:	May 26, 2022	**Cal-Cert Procedure:**	CP-001
Calibration Frequency:	12 Months	**Indicating System:**	Computer
Manufacturer:	Tinius Olsen	**Temperature:**	64 °F
Type:	Torsion Testing Machine	**Humidity:**	51% 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: 750,000 **in. lbf.** **Resolution:** 1 **in. 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	50290	500.0	50290	290	500.0	49990	-10	500.0	140
100000	100390	1000.0	100390	390	1000.0	100140	140	1000.0	265
200000	200720	2000.0	200720	720	2000.0	200640	640	2000.0	680
300000	301690	3000.0	301690	1690	3000.0	301550	1550	3000.0	1620
400000	402550	4000.0	402550	2550	4000.0	402640	2640	4000.0	2595
500000	503610	5000.0	503610	3610	5000.0	503650	3650	5000.0	3630
600000	605310	6000.0	605310	5310	6000.0	605000	5000	6000.0	5155
750000	756990	7000.0	756990	6990	7000.0	756960	6960	7000.0	6975
0	0	0	0	0	0	0	0	0	0

Expanded Uncertainty ± 288.6876 in. lbf.

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

Remarks:

Beam weight correction is 728.4 pounds at 100 inches mounted to the machine. Moment arm is 100 inches, sn: 46287. The machine reads torsion in both directions, the readings were taken in a clockwise rotation woth the machine starting at the natural zero.
Tolerance is 1% of the reading taken.

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.

Service Engineer: Joe Borszich **Date:** May 26, 2021

Technical Manager: Marshall Doyle **Signature:** 

Report #: 18579-82053-28

Report and Certificate of Calibration

CAL-CERT CALIBRATION CERTIFICATION
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Address 6709 SE Lake Road Milwaukie, OR 97222

Local 503-654-9620

A2LA ACCREDITED CERT #4986.01

Report #:	18579-17117-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-01094C / 01498 | Load Cell | Tovey Engineering | SN: 114638A | Cal: 02/08/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 1,000.00 - 50,000 lbf | Report #: 17942-32501-1595

Instrument Data

Calibration Date:	May 25, 2021	**Reference:**	ASTM E-4
Calibration Due Date:	May 25, 2022	**Cal-Cert Procedure:**	CP-001
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Bva	**Temperature:**	75 °F
Model Number:	H1006	**Humidity:**	23% RH
Type:	Hydraulic Ram	**Cal Factor:**	None
Serial #:	R0707000630/Pump P80	**Asset #:**	Accredited
Capacity:	5,000 PSI	**Service Location:**	Service Address
Resolution:	1 PSI	**As Found:**	Pass
Standard Units:	Lbf.	**As Left:**	Pass

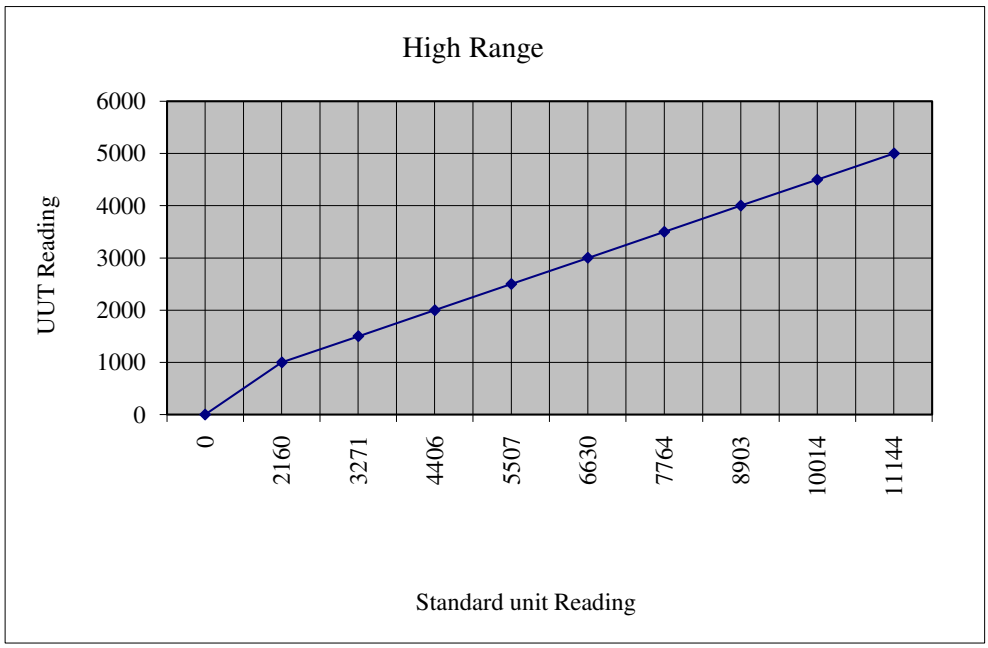
		Range		**Mode**	
Instrument Range:	5,000	**Resolution:**	2.206	**Verified:**	Compression

High Range

UUT Reading PSI	As Found Reading Lbf.	Verification Reading #1 Lbf.	Verification Reading #2 Lbf.	Average Readings Lbf.
0	0	0	0	0
1000	2138	2138	2182	2160
1500	3241	3241	3300	3271
2000	4369	4369	4442	4406
2500	5473	5473	5541	5507
3000	6600	6600	6660	6630
3500	7732	7732	7796	7764
4000	8876	8876	8930	8903
4500	9976	9976	10051	10014
5000	11121	11121	11166	11144

Expanded Uncertainty ± 2.8909 Lbf.

Manufacturer: Bva **Type:** Hydraulic Ram **Serial #:** R0707000630/Pump P80



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.

Service Engineer: Joe Borszich **Date:** May 25, 2021

Technical Manager: Marshall Doyle **Signature:** MDoyle

Report #: 18579-17117-28

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Local 503-654-9620

A2LA ACCREDITED CERT #4986.01

Report #:	18579-17118-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-00136C / 01498 | Load Cell | Revere | SN: 50379023 | Cal: 02/16/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 14370.00 - 600,000 lbf | Report #: 17942-32480-1595
01094C / 01498 | Load Cell | Tovey Engineering | SN: 114638A | Cal: 02/08/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 1,000.00 - 50,000 lbf | Report #: 17942-32501-15

Instrument Data

Calibration Date:	May 25, 2021	**Reference:**	ASTM E-4
Calibration Due Date:	May 25, 2022	**Cal-Cert Procedure:**	CP-001
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Bva	**Temperature:**	77 °F
Model Number:	HC6003T	**Humidity:**	24% RH
Type:	Hydraulic Ram	**Cal Factor:**	None
Serial #:	S1112000056-1/Pump P80	**Asset #:**	Accredited
Capacity:	10,000 PSI	**Service Location:**	Service Address
Resolution:	1 PSI	**As Found:**	Pass
Standard Units:	Lbf.	**As Left:**	Pass

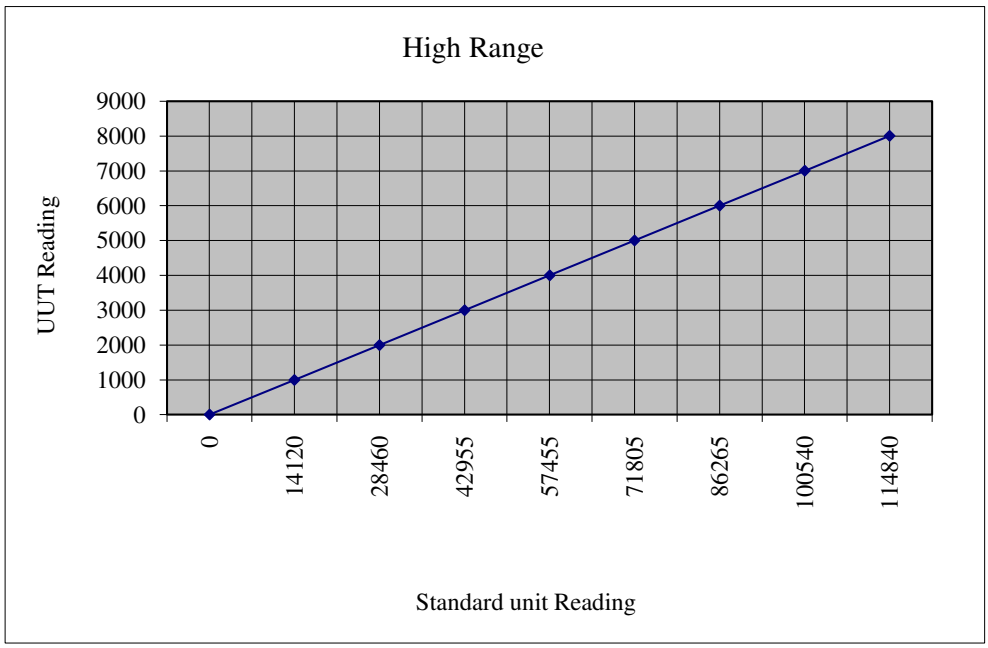
Instrument Range:	10,000	**Range Resolution:**	14.311	**Mode Verified:**	Compression

High Range

UUT Reading PSI	As Found Reading Lbf.	Verification Reading #1 Lbf.	Verification Reading #2 Lbf.	Average Readings Lbf.
0	0	0	0	0
1000	14330	14330	13910	14120
2000	28690	28690	28230	28460
3000	43050	43050	42860	42955
4000	57690	57690	57220	57455
5000	71950	71950	71660	71805
6000	86450	86450	86080	86265
7000	100870	100870	100210	100540
8000	115020	115020	114660	114840

Expanded Uncertainty ± 4.6215 Lbf.

Manufacturer: Bva **Type:** Hydraulic Ram **Serial #:** S1112000056-1/Pump P80



Remarks:

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Cleaning and preventative maintenance were performed as part of this service.

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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.

Service Engineer: Joe Borszich **Date:** May 25, 2021

Technical Manager: Marshall Doyle **Signature:**

Report #: 18579-17118-28

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Local 503-654-9620

A2LA ACCREDITED CERT #4986.01

Report #:	18579-17114-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-00969 | Gage Block Set | SPI | SN: 7323 | Cal: 02/19/2021 | Due: 01/31/2023 | Vendor: Precision Gage | Report #: 17942-6105-5

Instrument Data

Calibration Date:	May 27, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 27, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	71 °F
Type:	Digital Dial Indicator	**Humidity:**	36% RH
Model Number:	Q2820-0-16	**Asset #:**	Accredited
Serial #:	140958038	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.8001	0.8001	0.8001	0.7997	0.8003
1.5000	1.5000	1.5000	1.5001	1.4997	1.5003
2.4000	2.4001	2.4001	2.4000	2.3997	2.4003
3.2000	3.1998	3.1998	3.1998	3.1997	3.2003
4.0000	3.9997	3.9997	3.9998	3.9997	4.0003
3.2000	3.1999	3.1999	3.1999	3.1997	3.1999
2.4000	2.4000	2.4000	2.4000	2.4000	2.4002
1.5000	1.4999	1.4999	1.4999	1.4999	1.5001
0.8000	0.8001	0.8001	0.8000	0.8000	0.8002
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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Service Engineer: Joe Borszich **Date:** May 27, 2021

Technical Manager: Marshall Doyle **Signature:** MDoyle

Digital Dial Indicator CF-009-02

Revision 7 **2/18/2020**

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Report #:	18579-182945-2874	**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

7-00664 | Gage Block Set | SPI | SN: 7252 / A1447 / A1502 / A1513 | Cal: 09/29/2020 | Due: 08/31/2022 | Vendor: Cal-Cert | Report #: 16037-32572-5

7-01450 | Thermo-Hygrometer | Comark | SN: 06210350182 | Cal: 10/01/2020 | Due: 08/31/2021 | Vendor: Cal-Cert | Range: 122°F 95%RH | Report #: 16037-86413-2363

Instrument Data

Calibration Date:	May 26, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 26, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	74 °F
Type:	Digital Dial Indicator	**Humidity:**	36% RH
Model Number:	Q2820-0-16	**Asset #:**	Accredited
Serial #:	200063407	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.8001	0.8001	0.8000	0.7997	0.8003
1.5000	1.5000	1.5000	1.5000	1.4997	1.5003
2.4000	2.4000	2.4000	2.4000	2.3997	2.4003
3.2000	3.2000	3.2000	3.2000	3.1997	3.2003
4.0000	4.0000	4.0000	4.0000	3.9997	4.0003
3.2000	3.2000	3.2000	3.2000	3.1999	3.2001
2.4000	2.4000	2.4000	2.4000	2.3999	2.4001
1.5000	1.5000	1.5000	1.5000	1.4999	1.5001
0.8000	0.8000	0.8000	0.8000	0.8000	0.8002
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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Service Engineer:	Samuel Fritkin	**Date:**	May 26, 2021
Technical Manager:	Marshall Doyle	**Signature:**	MDoyle

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Report #:	18579-182946-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318
1-00969 | Gage Block Set | SPI | SN: 7323 | Cal: 02/19/2021 | Due: 01/31/2023 | Vendor: Precision Gage | Report #: 17942-6105-5

Instrument Data

Calibration Date:	May 27, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 27, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	71 °F
Type:	Digital Dial Indicator	**Humidity:**	30% RH
Model Number:	Q2820-0-16	**Asset #:**	Accredited
Serial #:	200063410	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.8002	0.8002	0.8001	0.7997	0.8003
1.5000	1.4999	1.4999	1.5000	1.4997	1.5003
2.4000	2.3998	2.3998	2.3999	2.3997	2.4003
3.2000	3.1997	3.1997	3.1998	3.1997	3.2003
4.0000	3.9998	3.9998	3.9997	3.9997	4.0003
3.2000	3.1998	3.1998	3.1997	3.1996	3.1998
2.4000	2.3997	2.3997	2.3998	2.3997	2.3999
1.5000	1.4999	1.4999	1.4999	1.4999	1.5001
0.8000	0.8001	0.8001	0.8002	0.8001	0.8003
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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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.

Service Engineer: Joe Borszich **Date:** May 27, 2021

Technical Manager: Marshall Doyle **Signature:** MDoyle

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A2LA ACCREDITED CERT #4986.01

Report #:	18579-22274-28	**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: 02/12/2021 | Due: 01/31/2022 | Vendor: Cal-Cert | Range: 95 %RH 122 °F | Report #: 17942-32477-318

1-00969 | Gage Block Set | SPI | SN: 7323 | Cal: 02/19/2021 | Due: 01/31/2023 | Vendor: Precision Gage | Report #: 17942-6105-5

Instrument Data

Calibration Date:	May 27, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 27, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	71 °F
Type:	Digital Dial Indicator	**Humidity:**	36% RH
Model Number:	02820-0-16	**Asset #:**	Accredited
Serial #:	122416189	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.7999	0.7999	0.8000	0.7997	0.8003
1.5000	1.4998	1.4998	1.4999	1.4997	1.5003
2.4000	2.4000	2.4000	2.3999	2.3997	2.4003
3.2000	3.1999	3.1999	3.2000	3.1997	3.2003
4.0000	4.0000	4.0000	3.9999	3.9997	4.0003
3.2000	3.2000	3.2000	3.1999	3.1999	3.2001
2.4000	2.3999	2.3999	2.3999	2.3999	2.4001
1.5000	1.4999	1.4999	1.4998	1.4997	1.4999
0.8000	0.8000	0.8000	0.7999	0.7999	0.8001
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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Service Engineer: Joe Borszich **Date:** May 27, 2021

Technical Manager: Marshall Doyle **Signature:** MDoyle

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Report #:	18579-81546-2874	**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

7-00664 | Gage Block Set | SPI | SN: 7252 / A1447 / A1502 / A1513 | Cal: 09/29/2020 | Due: 08/31/2022 | Vendor: Cal-Cert | Report #: 16037-32572-5

7-01450 | Thermo-Hygrometer | Comark | SN: 06210350182 | Cal: 10/01/2020 | Due: 08/31/2021 | Vendor: Cal-Cert | Range: 122°F 95%RH | Report #: 16037-86413-2363

Instrument Data

Calibration Date:	May 26, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 26, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	71 °F
Type:	Digital Dial Indicator	**Humidity:**	38% RH
Model Number:	Q2820-0-16	**Asset #:**	Accredited
Serial #:	172194728	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.8000	0.8000	0.8000	0.7997	0.8003
1.5000	1.5000	1.5000	1.5000	1.4997	1.5003
2.4000	2.4001	2.4001	2.4001	2.3997	2.4003
3.2000	3.2000	3.2000	3.2000	3.1997	3.2003
4.0000	4.0000	4.0000	4.0000	3.9997	4.0003
3.2000	3.2000	3.2000	3.2000	3.1999	3.2001
2.4000	2.4001	2.4001	2.4001	2.4000	2.4002
1.5000	1.5000	1.5000	1.5000	1.4999	1.5001
0.8000	0.8000	0.8000	0.8000	0.7999	0.8001
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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Service Engineer:	Samuel Fritkin	**Date:**	May 26, 2021
Technical Manager:	Marshall Doyle	**Signature:**	MDoyle

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A2LA ACCREDITED CERT #4986.01

Report #:	18579-182947-2874	**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

7-00664 | Gage Block Set | SPI | SN: 7252 / A1447 / A1502 / A1513 | Cal: 09/29/2020 | Due: 08/31/2022 | Vendor: Cal-Cert | Report #: 16037-32572-5

7-01450 | Thermo-Hygrometer | Comark | SN: 06210350182 | Cal: 10/01/2020 | Due: 08/31/2021 | Vendor: Cal-Cert | Range: 122°F 95%RH | Report #: 16037-86413-2363

Instrument Data

Calibration Date:	May 26, 2021	**Reference:**	ASME B89.1.10M
Calibration Due Date:	May 26, 2022	**Cal-Cert Procedure:**	CP-009
Calibration Frequency:	12 Months	**Indicating System:**	Digital
Manufacturer:	Humboldt	**Temperature:**	72 °F
Type:	Digital Dial Indicator	**Humidity:**	38% RH
Model Number:	Q2820-0-16	**Asset #:**	Accredited
Serial #:	200063409	**Service Location:**	Service Address
Capacity:	4 Inches	**As Found:**	PASS
Resolution:	0.0001 Inches	**As Left:**	PASS

Instrument Range: 4.0000 Inches **Range Resolution:** 0.0001 Inches

Calibration Standard Inches	As Found Inches	As Left Reading 1 Inches	As Left Reading 2 Inches	Tolerance Low Inches	Tolerance High Inches
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.8000	0.8000	0.8000	0.8000	0.7997	0.8003
1.5000	1.5000	1.5000	1.5000	1.4997	1.5003
2.4000	2.4000	2.4000	2.4000	2.3997	2.4003
3.2000	3.2000	3.2000	3.2000	3.1997	3.2003
4.0000	4.0000	4.0000	4.0000	3.9997	4.0003
3.2000	3.2000	3.2000	3.2000	3.1999	3.2001
2.4000	2.4000	2.4000	2.4000	2.3999	2.4001
1.5000	1.5000	1.5000	1.5000	1.4999	1.5001
0.8000	0.8000	0.8000	0.8000	0.7999	0.8001
0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001

Expanded Uncertainty ± 0.00014 Inches

Remarks:

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Service Engineer:	Samuel Fritkin	**Date:**	May 26, 2021
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