TEST REPORT: SELF-INSTALLED STEEL HELICAL PIER

January 12, 2025
Rev 0

Projection Name:	Self-Installed Steel Helical Pier Test Report
Owner:	Nolan Structural Products, LLC
Prepared by:	Richard Nolan, PE Nolan Structural Products, PLLC 333 Kinglsey Road Burnt Hills, NY 12027

REPORT DESCRIPTION

This report documents the test results for two types of self-installed, steel, helical piers and certifies their maximum load rating in different soil types.

PIER DESCRIPTION

The piers are constructed from SS400 steel that is hot dipped galvanized to ASTM A153 standards. SS400 having a minimum yield strength of 35 ksi. The two different piers tested are described in Table 1 below.

Table 1: Tested Pier Description

Value	Pier #1	Pier #2
Part #	TIGA12504	TIGA-10-14224
Auger Diameter	5”	5”
Shaft Diameter	0.75”	1”
Shaft Length	49.2”	56”
Shaft Thickness	0.09” min.	0.09” min.

The following items have been taken from the New York State Residential Code:

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the Building Code of New York State.

R301.1.3 Engineered design. Where a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design in accordance with the Building Code of New York State is permitted for buildings and structures, and parts thereof, included in the scope of this code.

TESTING

Testing was performed in substantial compliance with ASTM D1143/D1143M-20, Standard Test Method for Deep Foundation Elements Under Static Axial Compression Load. The soil that the pier was tested in was non-cohesive and consisted of fine sand with little silt/clay; trace amounts of fine gravel, the soil test report is included in this report. The piers were not tested in cohesive soil such as clay but the suggested safe design loads for cohesive soil is provided below.

Testing was performed by applying a static axial load to the piers and measuring their vertical downward displacement. The test setup is pictured in Figure 1. 75% of the load that would produce one (1) inch of displacement was considered to be the maximum permitted load. The test results can be used to determine the safe working load for projects that require vertical displacements less than one inch. Before the pier was tested, the pier was struck with five (5) blows using a sludge hammer. A block of wood was placed into the saddle connector and the sludge hammer was used to strike the block of wood. This striking action compacts the soil beneath the auger and reduces the amount of downward vertical deflection under load.

Figure 1 – Test Setup

Figure 2 below are the test results for the TIGA12504 pier. The maximum suggested installed load in non-cohesive soil (example, sandy soils) is 4350 pounds. The maximum suggested installed load in cohesive soil (example clay) is 2000 pounds.

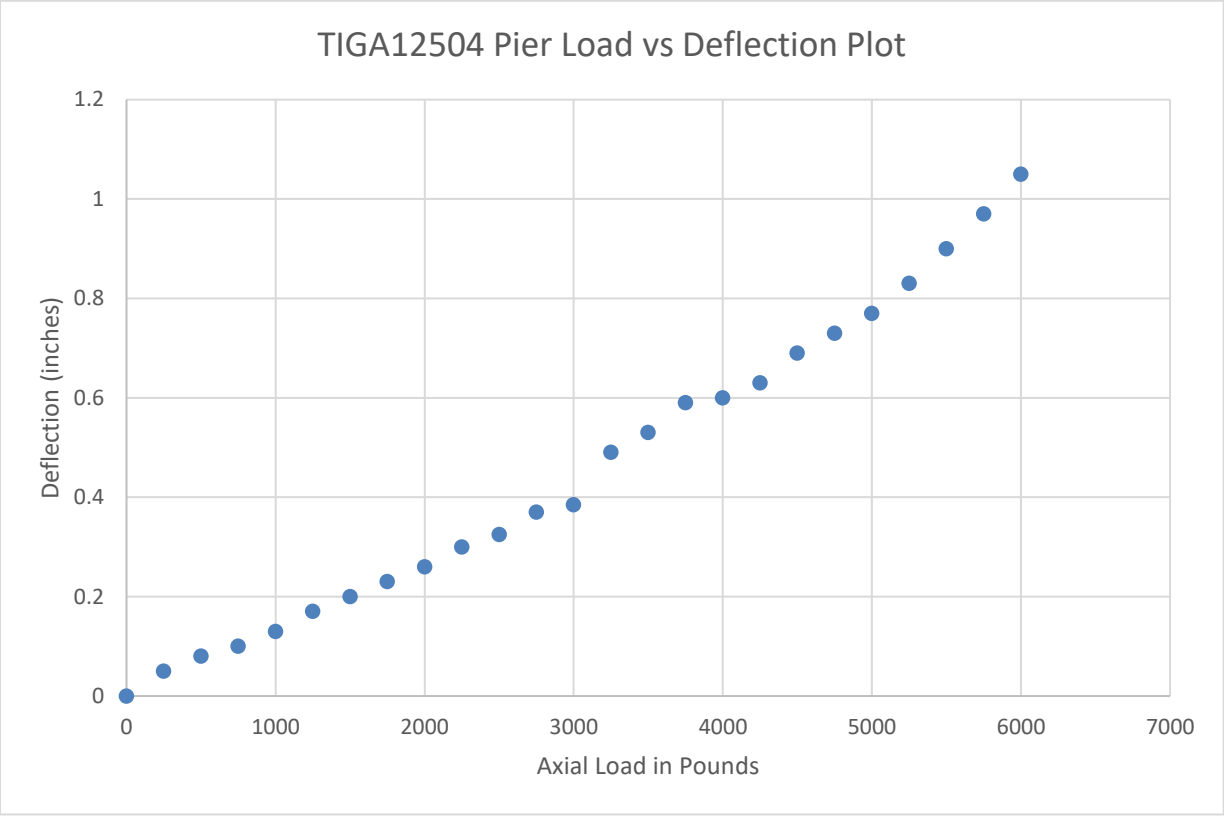


Figure 2 – TIGA12504 Pier Test Results

Figure 3 below are the test results for the TIGA-10-14224 pier. The maximum suggested installed load in non-cohesive (example sandy) soil is 5850 pounds. The maximum suggested installed load in cohesive (example clay) soil is 2500 pounds. Not shown in Figure 2 is that the maximum pier load was 8300# and not the 8500# shown; this was because the pier was able to sustain the 8500# for only a short period of time and decayed to 8300#.

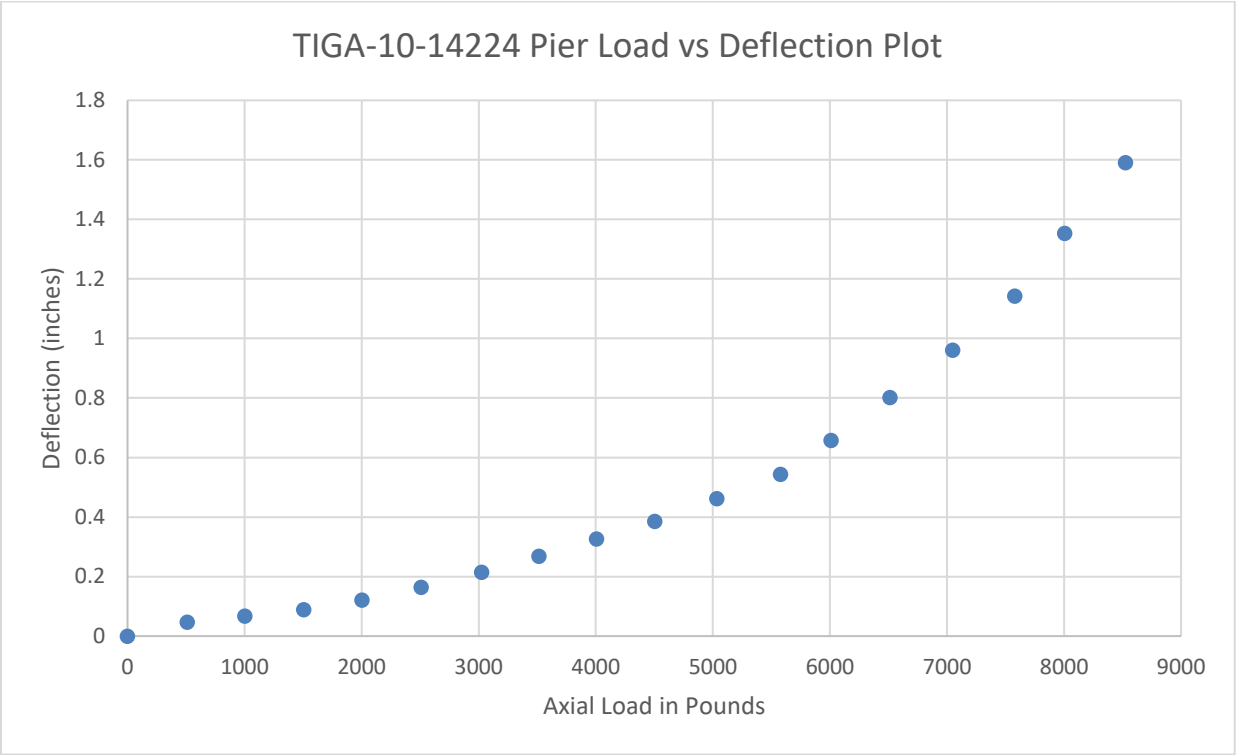


Figure 3 – TIGA-10-14224 Pier Test Results

Torque vs Capacity

It has been recognized that the load carrying capacity of a pier is linearly related to the installed torque through the following equation: Qu = Kt x T.

Where: Kt = Empirical Torque Factor
Qu = Ultimate Load Carrying Capacity of the Pier

The torque of the TIGA-10-14224 pier was measured to be 67.5 ft #. Inserting the measured torque and the maximum measure load of 8300# into the equation below results in a Kt of 123 / ft.

Kt = Qu/T = 8300# / 67.5 ft # = 123 / ft

Table 2 below are the tabulate values of the safe pier load versus the measured installed torque. Figure 4 below is a plot of the safe pier load versus the measured pier torque. The allowable safe pier load of an installed pier in either cohesive (clay like) or non-cohesive (example sandy) soil can be determined using Equation 1 below which requires the torque to be measured. The torque can be measured with a torque wrench by setting the torque wrench to a slightly higher value than the required torque and making sure the pier does not turn when toque is applied before the torque wrench "clicks." Either Equation 1, Table 2 or the chart in Figure 3 may be used to determine the safe pier capacity versus torque for the installed pier.

Qu = 0.75 x 123 x T = Installed Pier Load Carrying Capacity (Equation 1)

Table 2: Tabulated Values of Allowed Pier Load Versus Measured Torque in Non-Cohesive (example sandy) Soils. Linear Interpolation is Allowed.

Torque ***(ft lbs)***	***Ultimate Load (Pounds)***	**Safe Load (75% of Ultimate) (Pounds)**
0	0	0
10	1230	923
20	2460	1845
30	3690	2768
40	4920	3690
50	6150	4613
60	7380	5535
70	8610	6458

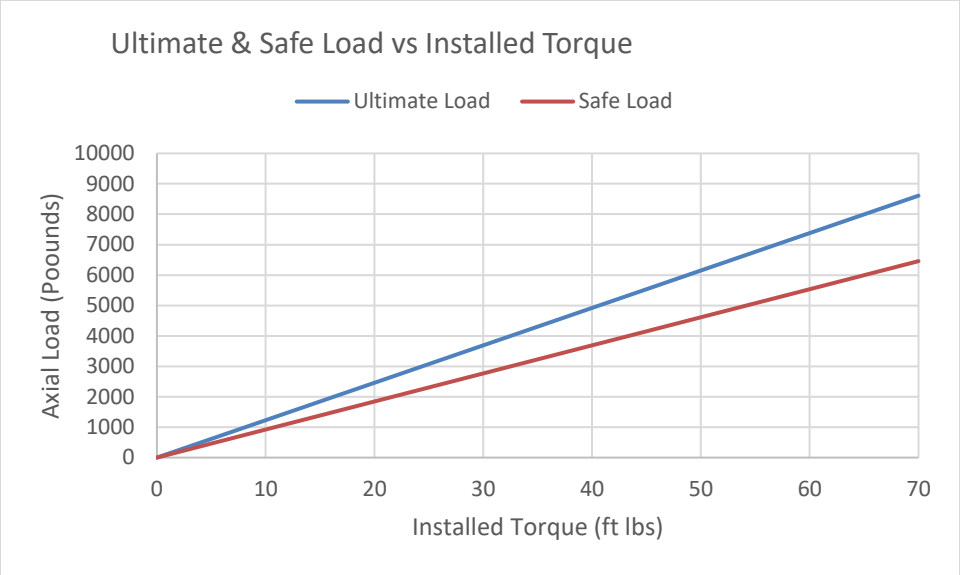


Figure 4: Plot of Allowed Pier Load Versus Measured Torque.

SUMMARY

The maximum suggested installed load in non-cohesive (example sandy) soil for the TIGA-10-14224 pier is 5850 pounds. The maximum suggested installed load in cohesive (example clay) soil for the TIGA-10-14224 pier is 2500 pounds. The maximum suggested installed load in non-cohesive soil (example, sandy soils) for the TIGA12504 pier is 4350 pounds. The maximum suggested installed load in cohesive soil (example clay) for the TIGA12504 pier is 2000 pounds. The maximum pier load can also be determined measuring the installed torque and using Equation 1, Table 2 or Figure 3. Finally, it should be noted that the TIGA-10-14224 pier will extend 48” below grade which is required in some areas of the country such as New York, in order to prevent frost heave which may occur. The TIGA12504 pier alone is shorter than 48” below grade so a tube extension may be required to achieve depths greater than 48”.

To achieve the maximum pier carrying capacity with the least amount of downward vertical displacement, the pier should be struck with five (5) blows using a sludge hammer. A block of wood should be placed into the saddle connector and a sludge hammer used to strike the block of wood five (5) times. This striking action compacts the soil beneath the auger and reduces the amount of downward vertical deflection under load.

CONSTRUCTION TECHNOLOGY

INSPECTION & TESTING DIVISION, P.D.& T.S., INC.
4 William Street, Ballston Lake, New York 12019
Phone: (518) 399-1848 Email: constructiontech@live.com

CLIENT: **NOLAN STRUCTURAL PRODUCTS**
333 KINGSLEY ROAD
BURNT HILLS, NEW YORK 12027

REPORT DATE: 09/30/24
SAMPLE NUMBER: 24772
OUR FILE NUMBER: 100.430
LAB TECHNICIAN: BOB BEHAN

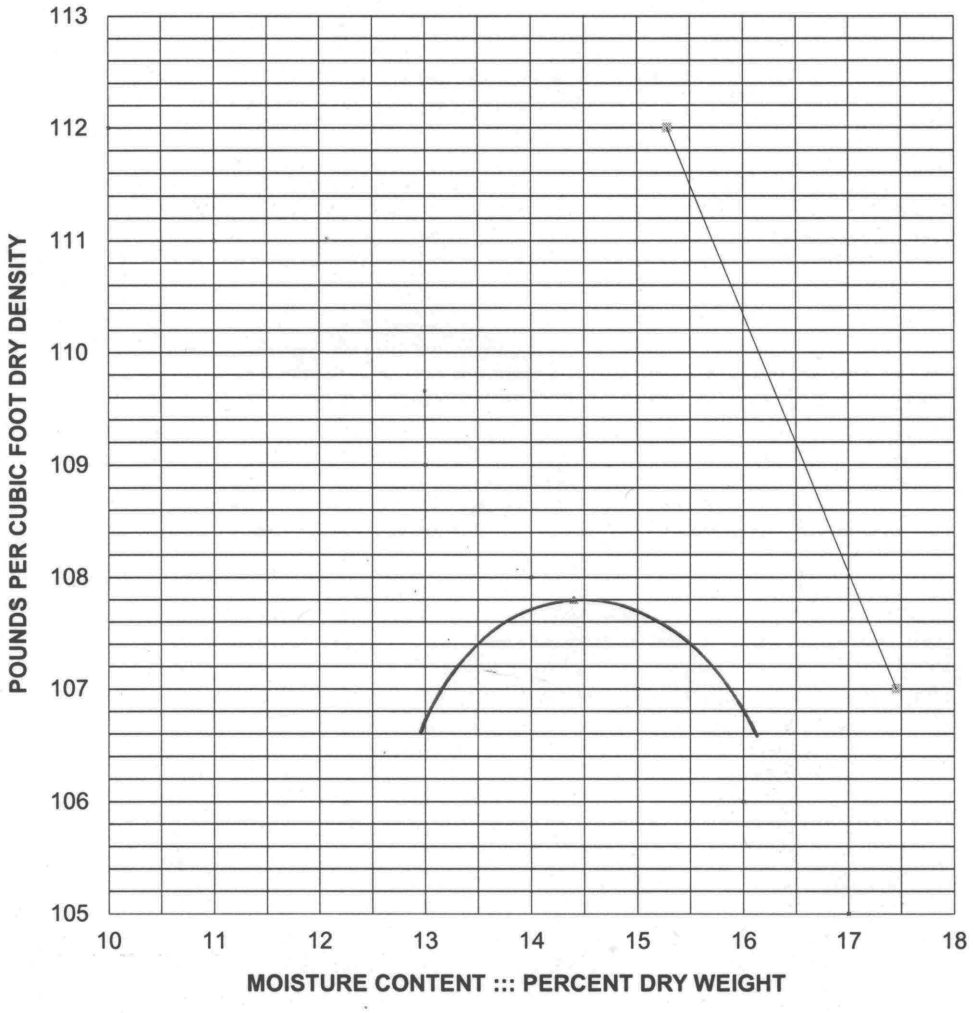
ATT'N: MR. RICHARD NOLAN
PROJECT: **2024 MATERIAL QUALIFICATIONS**

REPORT OF MOISTURE / DENSITY RELATION OF SOILS ::: PROCTOR

MATERIAL SOURCE: **YARD STOCKPILE**
MATERIAL DESCRIPTION: SAND, fine; little Silt/Clay; trace fine Gravel
PROCTOR METHOD: ASTM D-1557: MODIFIED EFFORT
GRADATION METHOD: ASTM D-1140 / D-422: WASHED

MAXIMUM DENSITY **107.8** PCF
OPTIMUM MOISTURE **14.4** %

ZERO AIR VOIDS CURVE: 2.47 SPECIFIC GRAVITY



GRADATION		
SIEVE SIZE	PERCENT PASSING	SPECIFICATION ALLOWANCE
4"		
3"		
2 1/2"		
2"		
1 1/2"		
1"		
3/4"		
1/2"		
3/8"		
1/4"	100.0	
#4	99.5	
1/8"		
#8	98.6	
#10		
#16	97.5	
#20		
#30	94.9	
#40	91.9	
#50	85.0	
#60		
#80		
#100	44.5	
#140		
#200	19.4	

REPORT DISTRIBUTION:
1:
2:
3:
4:
5:

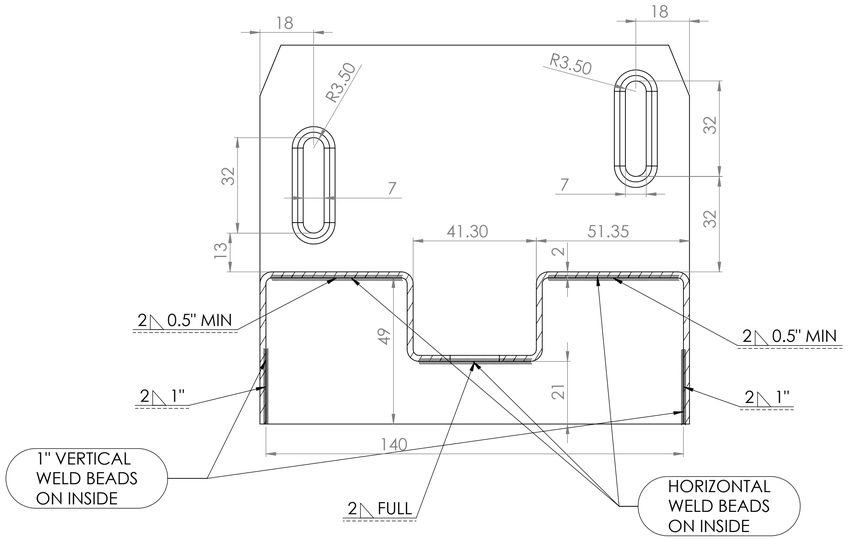
GENERAL NOTES:

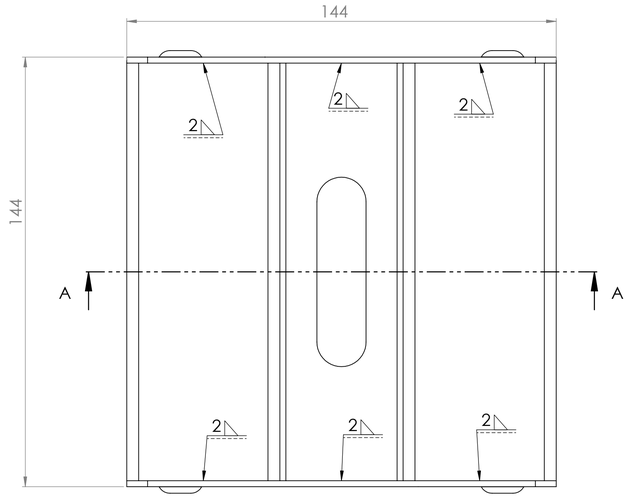
Respectfully,
CONSTRUCTION TECHNOLOGY

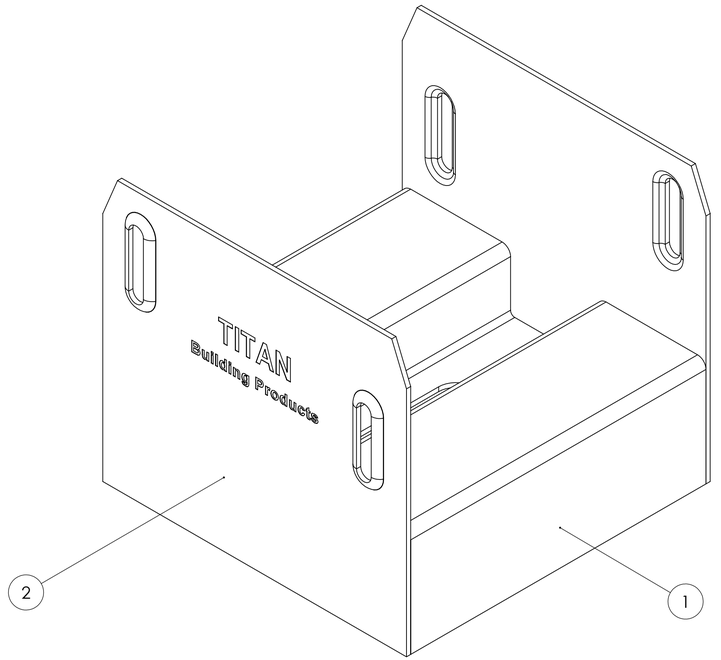
Robert Behan

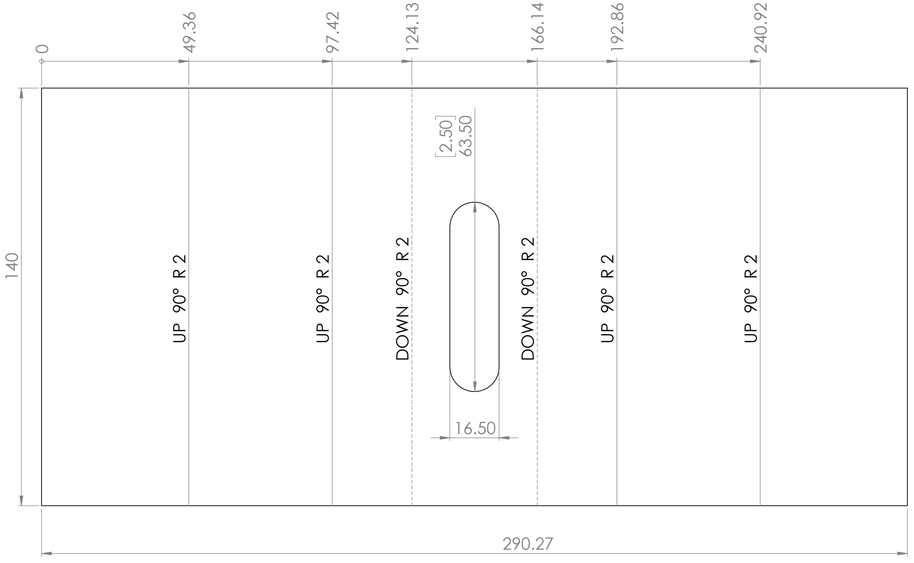
ROBERT BEHAN, (NICET)
MANAGER TECHNICAL SERVICES

SECTION A-A

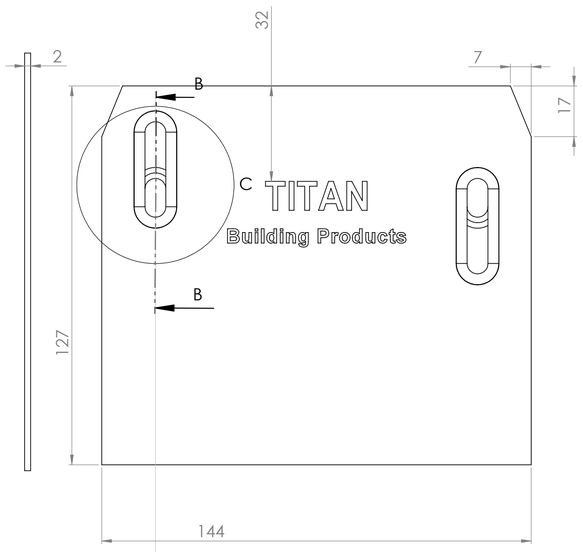


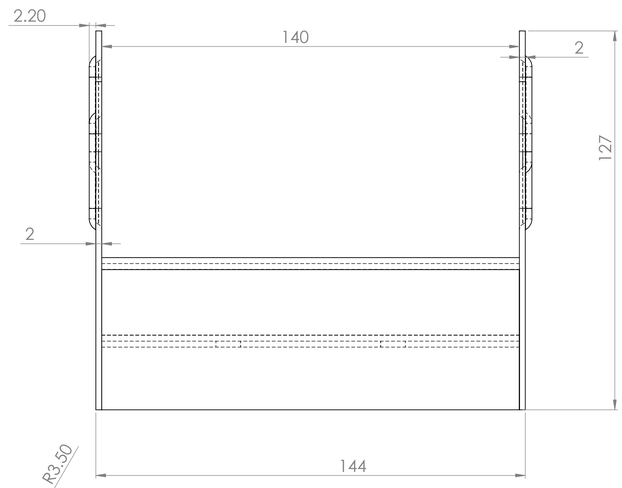


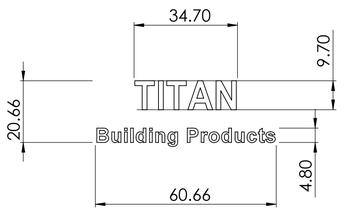




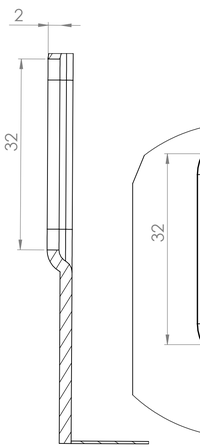
BODY FLAT PATTERN



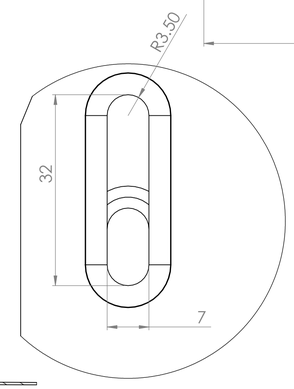




TITAN STAMP DETAILS



SECTION B-B
SCALE 2 : 1



DETAIL C
SCALE 2 : 1

BILL OF MATERIALS						
ITEM NO.	QUANTITY	PART NUMBER	DESCRIPTION	MATERIAL	Finish	Note
1	1	TIDP662-Body	Body - 6x6 Deck Post Bracket	AISI 1020	Hot Zinc	
2	2	TIDP662-Side	Side - 6x6 Deck Post	AISI 1020	Hot Zinc	

PROPERTY	VALUE
Coating: Hot Galvanized	ASTM A153 (Minimum 66 um thickness)
Steel Thickness	2mm minimum
Steel Properties	SS400 (equivalent to ASTM A36)
Yield	30 ksi / 206.8 MPa
Tensile	47.8 ksi / 330 MPa
Chemical Properties	ASTM E415:2014

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
TOLERANCES:
FRACTIONAL ± 1/32
ANGULAR: MACH ± 0.1
BEND ± 0.1
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ± 0.001
WEIGHT IS IN KILOGRAMS
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009
CAD FILE NAME: TIDP662 Rev-H
DATE CREATED: 2013-02-19
DATE PRINTED: 2023-05-31

	NAME	DATE
DRAWN	WLTdesign	2023-05-13
CHECKED	Bergman	2023-05-30
PROJECT:	Deck Post Anchor	
STATUS:	Production Ready	
COMMENTS:	Properties Table added	
MATERIAL	See BOM	
FINISH	Hot Zinc	

THIRD ANGLE PROJECTION
DO NOT SCALE DRAWING

Titan Building Products

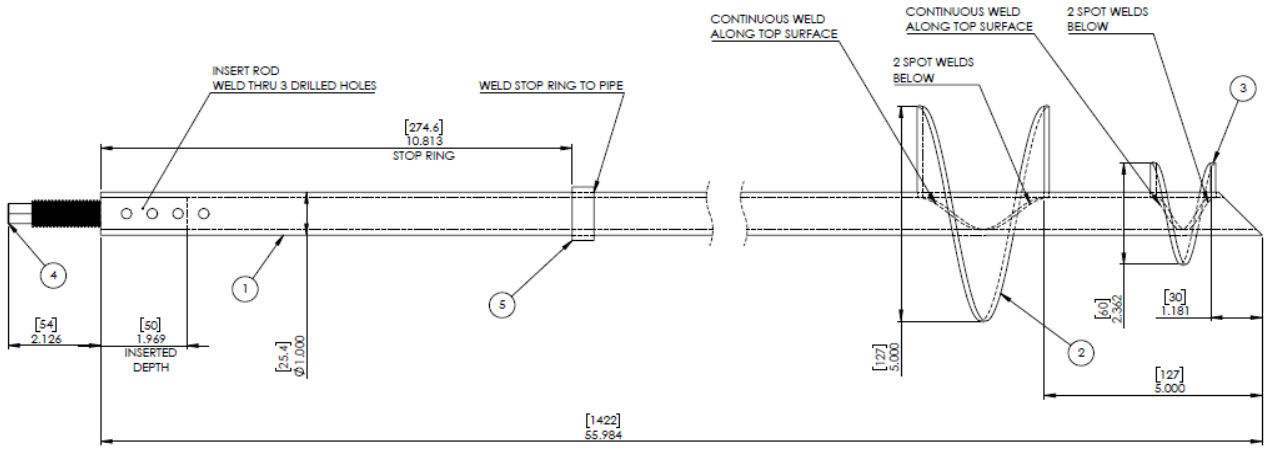
TITLE: Deck Post Bracket 6x6 with slot

SIZE D | PART NO. TIDP662 | REV D

SCALE: 1:1 | WEIGHT: 1.19 | SHEET 1 OF 1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TIGA10P1422	Deck Foot Anchor 1" Pipe 1422mm	1
2	TIGA10A2127	Deck Foot Anchor 1" Auger 127Dx74P	1
3	TIGA10A160	Deck Foot Anchor 1" Auger 60Dx35P	1
4	TIGA TR10M16	Deck Foot Anchor 1" Threaded Rod M16x2.0	1
5	TIGA 10SR	Deck Foot Anchor 1" Stop Ring	1

SPACER STACK (TIGA-STK)



PROPERTY	VALUE
Coating: Hot Galvanized	ASTM A153 (Minimum 66 um thickness)
Steel Thickness	2.3mm minimum
Steel Grade	SS400 (equivalent to ASTM A36)
Yield	30 ksi / 206.8 Mpa
Tensile	47.8 ksi / 330 MPa

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/32
ANGULAR: MACH ± 0.1 BEND ± 0.1
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ± 0.001
WEIGHT IS IN POUNDS
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009 AND

CAD FILE NAME: TIGA-B-1422 Family
DATE CREATED: 2023-08-13
DATE PRINTED: 2024-04-13

	NAME	DATE
DRAWN	WLTdesign	2023-09-24
CHECKED	Bergman	2023-09-24

PROJECT:
STATUS: New design
COMMENTS: Blade pitch changed; Table updated
MATERIAL: See BOM
FINISH

TITAN Building Products

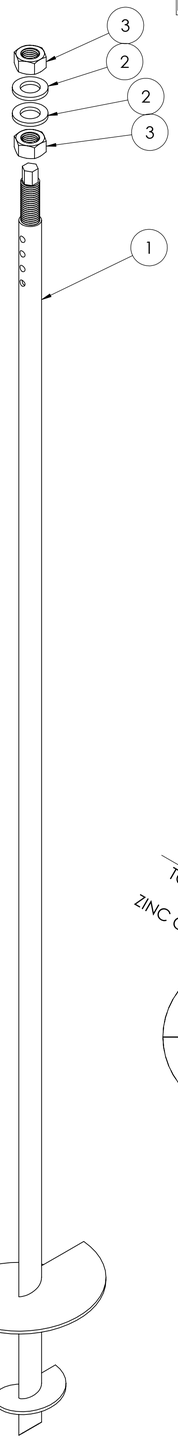
TITLE: Deck Foot Anchor 1" 1422mm w/ 127mm Auger

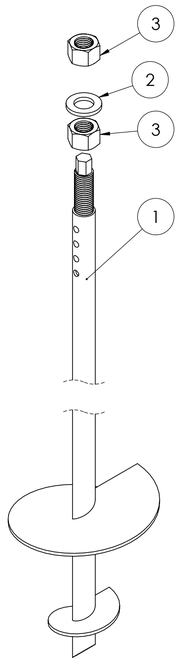
SIZE	PART NO.	REV
B	TIGA-10-14224	B

SCALE: 1:10 | WEIGHT: 6.67 | SHEET 4 OF 4

SHIP WITH FASTENERS INSTALLED

ITEM NO.	PartNo	DESCRIPTION	QTY
1	91166A310	Flat Washer M16 x 3mm	2
2	90591A220	Hex Nut M16 x 13mm	2
3	TIGA12504	Deck Foot Anchor Rod 1250mm	1

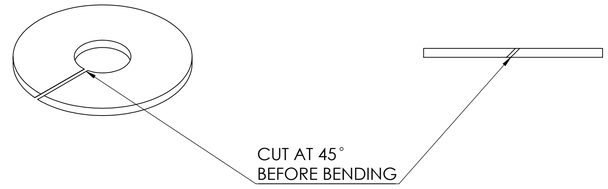


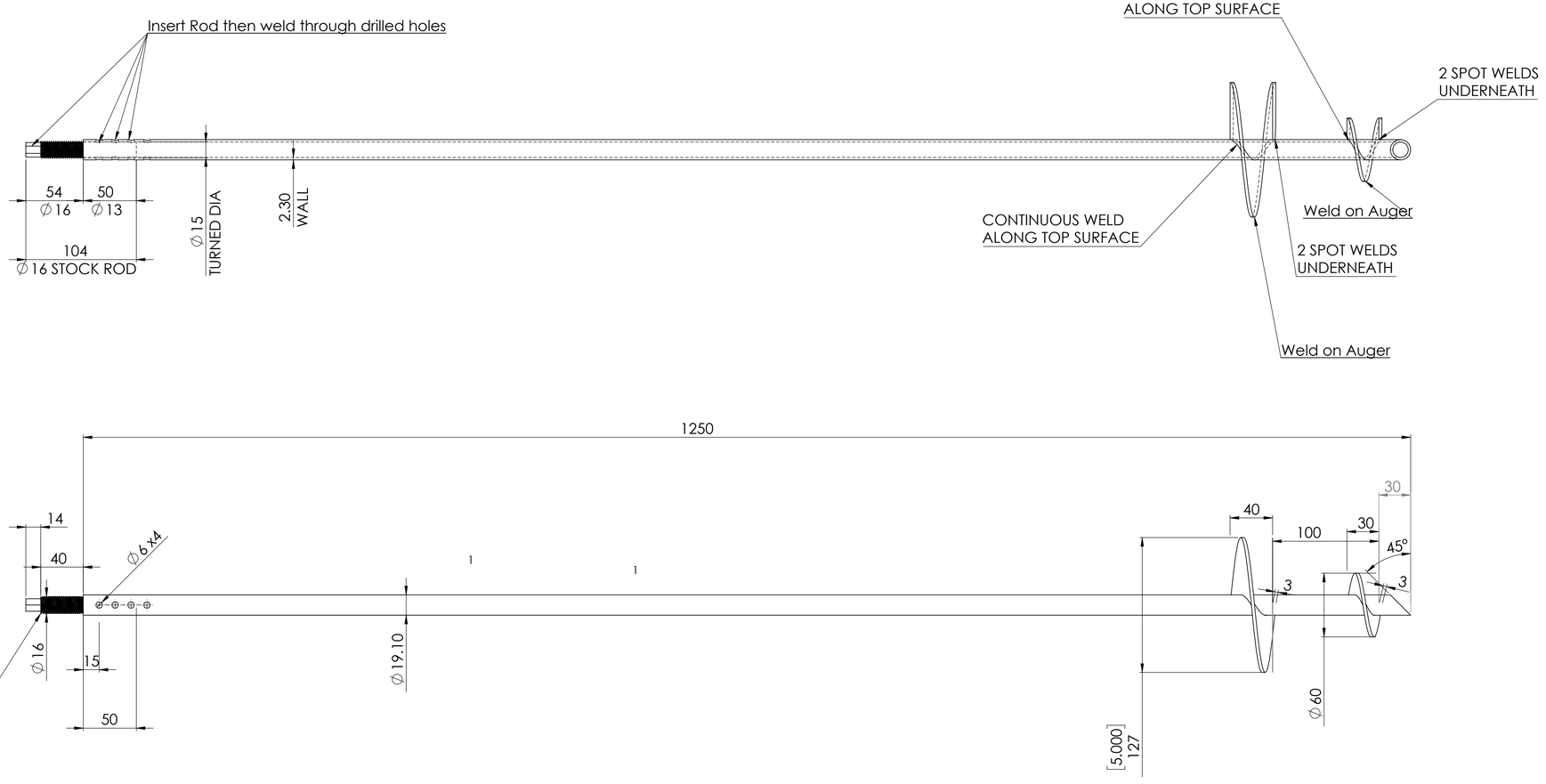


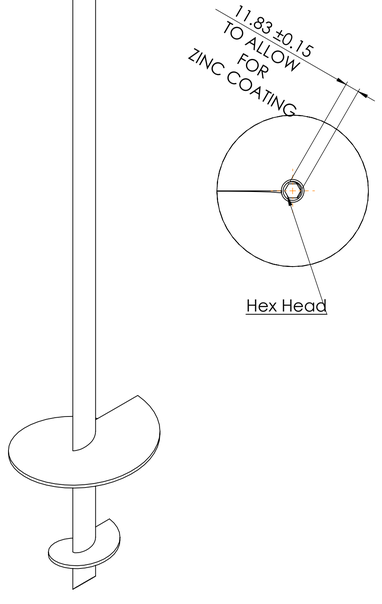
SHIP WITH FASTENERS INSTALLED

ITEM NO.	PartNo	DESCRIPTION	QTY
1	TIGA12504	Deck Foot Anchor Rod 1250mm	1
2	91166A310	Flat Washer M16 x 3mm	1
3	90591A220	Hex Nut M16 x 16mm	2

FLAT BLADE







PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF IS PROHIBITED.	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: FRACTIONAL ± 1/32 ANGULAR ± 0.05 BEND ± 0.1 TWO PLACE DECIMAL ± 0.01 THREE PLACE DECIMAL ± 0.001 WEIGHT IS IN KILOGRAMS		NAME / DATE	TITAN Building Products
		DRAWN	WLTdesign 2023-05-04	
		CHECKED	Bergman 2023-05-04	TITLE: TIGA12504 (no washer)
		PROJECT:		
		STATUS:	Updated Design	
THIRD ANGLE PROJECTION DO NOT SCALE DRAWING	INTERPRET GEOMETRIC TOLERANCING PER: ANSI ASME Y14.5-2009	COMMENTS:	Blade dia. now 5"	
	CAD FILE NAME: TIGA12504 Rev_A	MATERIAL	See BOM	SIZE D / PART NO. TIGA12504 / REV A
	DATE CREATED: 2013-02-21 DATE PRINTED: 2023-05-04	FINISH	Hot Galvanized	SCALE: 1:2.5 / WEIGHT: 1.78 / SHEET 1 OF 1