

# TITAN BUILDING PRODUCTS PRODUCT EVALUATION

**PRODUCT EVALUATED**  
DECK FOOT ANCHOR™

**EVALUATION PROPERTY**  
IRC 2021, AC336, AC358, AC13, ASTM D1143, ASTM D3689,

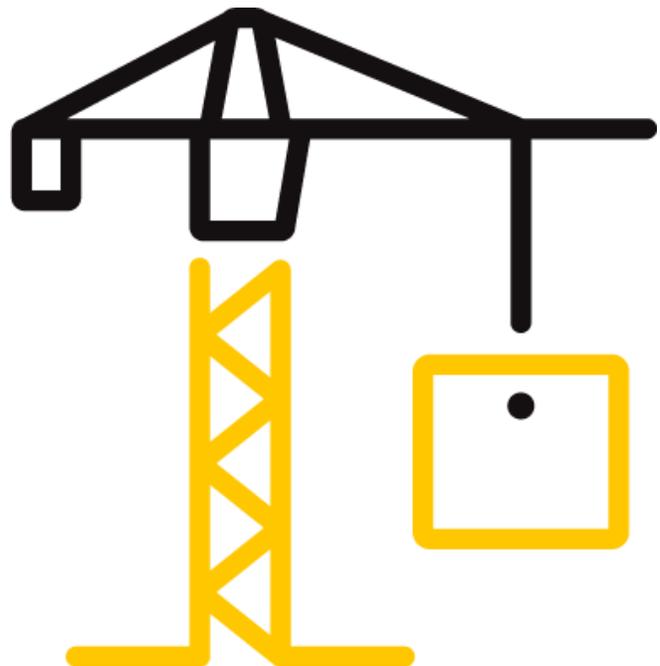
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## PRODUCT EVALUATION FOR TITAN BUILDING PRODUCTS

Report No.: G104499343YRK-001

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PRODUCT EVALUATION RENDERED TO:	
Company Name:	2049905 Ontario Inc., o/a Titan Building Products
Address:	14-5390 Canotek Road Ottawa, ON K1J1H8 Canada
Contact Person:	Richard Bergman
Tel:	613-224-9477
Email:	rbergman@titanbuildingproducts.com

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### 1 Introduction

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Intertek Testing Services NA Inc. (Intertek) is conducting a product evaluation for Titan Building Products (TBP) on Titan Deck Foot Anchors, to evaluate structural performance as an alternative footing for residential free standing exterior decks under the International Residential Code (IRC). The evaluation is being conducted for a Code Compliance Research Report.

### 2 Product and Assembly Description

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#### Product Description:

The Titan Deck Foot Anchor™ is a fabricated steel surface footing plate with an integral post bracket and 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.

#### Product Traceability:

The products used in testing were sampled by Intertek personnel. Sampling report titled "2021-07014 Titan Building Products Sampling Witnessing Form-Copy" as found in OASIS job L4064.01 is the record of Titan Deck Foot Anchor items sampled for testing.

*Authorities Having Jurisdiction (AHJ) should be consulted in all cases as to the particular requirements covering the installation and use of Intertek certified products, equipment, systems, devices and materials. The AHJ should be consulted before construction. Fire resistance assemblies and products are developed by the design submitter and have been investigated by Intertek for compliance with specific requirements. The published information (product and design listings) cannot always address every construction nuance encountered in the field. When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the test standard referenced for each Intertek certified product. The test standard includes specifics concerning alternate materials and alternate methods of construction. Only products which bear Intertek's Mark are considered as certified. The appearance of a company's name or product in Intertek Directory of Listed Building Products does not in itself assure that products so identified have been manufactured under Intertek's Follow-Up Service. Only those products bearing the Intertek Mark should be considered to be Listed and covered under Intertek's Follow-Up Service. Always verify the Mark on the product before using it.*

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**3 Reference Documents**

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

- 2021 International Residential Code (IRC)
- ICC-ES Acceptance Criteria for Precast Concrete Pier Foundation Assemblies, AC336
- 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 Individual 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
- Intertek Evaluation Plan, *Titan Deck Foot Anchor Evaluation Plan*, Intertek report number 10405745-YRK-01, dated April 23, 2020.
- Intertek Product Sampling/Witnessing Form dated July 14, 2021 performed by Jason Yuan
- CTL|Thompson, Inc., *Product Testing reports Titan Deck Foot Anchors TIGA600 and TIGA900*, Prepared for Intertek, Report Number 1605 (rev. 2), dated October 29, 2021
- CTL|Thompson, Inc, *Letter Report with Subject: Product Test Report - Titan Deck Foot Anchors, Project Number: FC09763.00 – 470, Report Number: 1605 (Rev.2)*, Attention Intertek, dated August 9, 2023.
- Intertek Test Report, *Titan Building Products Test Report ASTM A370/ ASTM E8 Tensile Strength and ASTM F1575 Bending Yield of Fasteners Evaluation of Post Base and Lag Screws*, Intertek report Number L4912.01-106-31-R0, dated July 12, 2022.
- Intertek Test Report, *Titan Building Products Test Report ASTM D2395 Specific Gravity (Method A) and ASTM D4442 Moisture Content of Treated SYP #2 Lumber*, Intertek report number L4912.02-106-31 R1, Dated July 14, 2022, revised May 9, 2023
- Intertek Test Report, *Titan Building Products Test Report ASTM D7147 Uplift and Direct Downward Load Testing on Titan Deck Foot Anchors*, Intertek report number L4175.01-119-16 R0, dated August 25, 2022.
- Intertek Engineering Analysis, *Anchorage Analysis Titan Deck Foot Anchor Calcs for Uplift and Downward Capacities*, Intertek report number L6799.01-122-34 R1, dated December 18, 2020, revised June 5, 2023
- Intertek Engineering Analysis, *Deck Foot Anchor*, Intertek report number L5971.01-119-26, dated July 25, 2023.
- Intertek Engineering Calculation Spread Sheet, *Deck Foot Anchor Calculations*, dated 2023-08-26.

**4 Evaluation Method**

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**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. Additional product evaluation was provided in the Titan Deck Foot Anchor – Preliminary review dated October 7, 2019. The Evaluation Plan provide the scope of evaluation and it shall

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include:

- Two loading directions:
  - Load bearing (compression)
  - Uplift (Pull-out)
  - Lateral loads are not included within the scope of this evaluation.
- Soil types included in the evaluation are:
  1. Non-expansive stiff clays (CL)
  2. Silty Sand (SM)

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.

Soil types of Stiff Clays and Silty Sand were tested and confirmed to be the design values as noted in the IRC. See CTL|Thompson letter report. These are 1,500 psf for Stiff Clays and 2,000 psf for Silty Sand.

Materials data used in fabrication of the Deck Foot Anchor was gathered during a plant qualification audit (PQA) by Intertek. Grades of steel and fabrication drawings have been reviewed. Fabrication Drawings are found at the end of this report. Minimum Yield Strengths for components shall be 205 MPa (30 KSI). The type of steel is JIS G3101 SS400. SS400 is the equivalent to ASTM A36 steel. Coatings for corrosion resistance have been reviewed. Minimum requirement for corrosion protection for steel in contact with treated wood is ASTM A653 G185 per section 2304.10.6.1 of the IBC. The approximate thickness per side for G185 continuous galvanization is 42 microns. The deck foot anchor components are postproduction hot dipped galvanized per ASTM A153 with an Average Coating Thickness of specimen tested of 70 microns.

Minimum coating protection for ground contact has not been considered in this evaluation. Installation in highly corrosive soils with potential to corrode the Deck Foot Anchor is not in the scope of this evaluation report.

Installation torque capacity of the helix and shaft shall be evaluated in accordance with AC358 Section 3.12.4 and 4.2.2. for Torsional Resistance. 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.

The average torque capacity from CTL|Tomposn test report was 128.3 ft-lbs with a standard deviation of 3.56. Per AC358, the maximum installation torque is 2 standard deviations below the average. Considering the small sample size (3 specimens), a reasonably safe assumption of variation (10% CoV) based on the materials and manufacturing QC involved is applied. The standard deviation correlating with a 10% coefficient of variation is 12.83 and the maximum installation torque would be  $128.3 - 2 \times 12.83 = 102.6$ . Review of CTL|Tomposn reports confirms that maximum installation torque from all test specimens was

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101.3 in silty sand. Installation torque in clay were substantially less. Based upon this analysis, the maximum installation torque shall be 102 ft\*lbs.

In-Situ testing of the Deck Foot Anchor was performed for the TIGA600 and TIGA900 for compression and load bearing. A minimum of three tests was performed in accordance with AC336, Section 4.3.2 for compression load bearing for the following loading condition:

- TIGA900 for soil with an allowable bearing capacity of 1,500 psf (non-expansive stiff clay)
- TIGA900 for soil with an allowable bearing capacity of 2,000 psf (silty sand)
- TIGA600 for soil with an allowable bearing capacity of 1,500 psf (non-expansive stiff clay)

In-Situ testing of the Deck Foot Anchor was performance for the TIGA600 and TIGA900 for Uplift (Pull Out) capacity. Testing and evaluation is in accordance with AC358 and testing in accordance with ASTM D3689 for the following loading conditions:

- TIGA900 for soil with an allowable bearing capacity of 1,500 psf (non-expansive stiff clay)
- TIGA900 for soil with an allowable bearing capacity of 2,000 psf (silty sand)
- TIGA600 for soil with an allowable bearing capacity of 1,500 psf (non-expansive stiff clay)
- TIGA600 for soil with an allowable bearing capacity of 2,000 psf (silty sand)

Post Base Bracket Testing was completed to evaluate the vertical compression and uplift loading in accordance with AC13. Testing was completed using wood posts with an average specific gravity of 0.40. Testing of fasteners and steel used in the fabrication of the post base were completed. Calculations for allowable load capacity based on AC13 and in accordance with the NDS were completed. Vertical downward or uplift capacity of the calculated tested product shall not exceed values calculated by NDS.

Final allowable loads were evaluated for two different installation conditions:

- Condition 1 – Footing plate is placed on undisturbed load-bearing soil in accordance with building code requirements as follows:
  - Per IRC R403.1.4 Minimum Depth. Minimum depth shall be not less than 12 inches below undisturbed ground surface.
  - Per IRC R403.1.4.1 Frost Protection. Frost Protection not required for decks not supported by a dwellings. However, when the Titan Deck Foot Anchor is anchored below the frost line, frost heave forces could be imposed on the footing plate. See uplift capacity for frost heave.
- 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 on noncompacted fill.
  - Under theses conditions load bearing capacity would rely on the auger anchors acting like a pile. Evaluation shall be in accordance with IBC Section 1810.3.3.1.9 and applicable provision of AC358 requiring engineering calculation for the auger assembly (helical and shaft) and testing in accordance with ASTM D1143.

The data from the in-situ testing, laboratory testing and engineering analysis were used to evaluate bearing capacities and uplift capacities the deck foot anchor assemblies. They are summarized in the tables below.

For the downward allowable pressure of the TIGA600 in Sandy Soil (2000 psf) the data for TIGA900 was used. This was the only helical tested in Sandy Soil. For the downward pressure of the TIGA 900 in Clay Soil

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(1500 psf) the data for the TIGA600 was used. The T900 data set had too high of variation between test set ups and was not used in this evaluation.

Table 1: Allowable Loads for Titan Deck Foot Anchor in Non-Expansive Stiff Clay, Minimum 1,500 PSF Soil Bearing Capacity with TIGA600 Helical

Installation Condition	Allowable Bearing Capacity (pounds)	Equivalent side of a square footing (inches)	Equivalent Diameter of Round Footing (inches)	Allowable Uplift Capacity 0.42 Sg (pounds)	Allowable Uplift Capacity 0.50 Sg (pounds)
Condition 1	1500	12	14	312	319
Condition 2	627	8	9	312	319

Table 2: Allowable Loads for Titan Deck Foot Anchor in Non-Expansive Stiff Clay, Minimum 1,500 PSF Soil Bearing Capacity with TIGA900 Helical

Installation Condition	Allowable Bearing Capacity (pounds)	Equivalent side of a square footing (inches)	Equivalent Diameter of Round Footing (inches)	Allowable Uplift Capacity 0.42 Sg (pounds)	Allowable Uplift Capacity 0.50 Sg (pounds)
Condition 1	1500	12	14	319	336
Condition 2	627	8	9	312	336

Table 3: Allowable Loads for Titan Deck Foot Anchor in Silty Sand, Minimum 2,000 PSF Soil Bearing Capacity with TIGA900 Helical

Installation Condition	Allowable Bearing Capacity (pounds)	Equivalent side of a square footing (inches)	Equivalent Diameter of Round Footing (inches)	Allowable Uplift Capacity 0.42 Sg (pounds)	Allowable Uplift Capacity 0.50 Sg (pounds)
Condition 1	1500	10	12	312	336
Condition 2	1140	9	10	312	336

Table 4: Allowable Loads for Titan Deck Foot Anchor in Silty Sand, Minimum 2,000 PSF Soil Bearing Capacity with TIGA900 Helical

Installation Condition	Allowable Bearing Capacity (pounds)	Equivalent side of a square footing (inches)	Equivalent Diameter of Round Footing (inches)	Allowable Uplift Capacity 0.42 Sg (pounds)	Allowable Uplift Capacity 0.50 Sg (pounds)
Condition 1	1500	10	12	312	336
Condition 2	1140	9	10	312	336



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130 Derry Court  
York, Pennsylvania 17406

Telephone: 717-764-7700  
Facsimile: 717-764-4129  
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### Conclusion

Intertek has conducted this product evaluation for Titan on Titan Deck Foot Anchor to evaluate performance as a footing for free standing exterior decks.

Based on the information contained and referenced herein, it is Intertek's professional judgment based on sound engineering principles that Tables 1, 2, 3 and 4 in this report represent Allowable Bearing Capacity for the Titan Deck Foot Anchors in the listed configurations for bearing in Stiff clays with 1,500 psf allowable bearing capacity and Silty Sand with 2,000 psf allowable bearing capacity.

### INTERTEK TESTING SERVICES NA LTD.

Reported by:

\_\_\_\_\_  
Michael E. Weigner, P.E.  
Senior Project Engineer, Evaluation Services

Reviewed by:

\_\_\_\_\_  
Craig H. Wagner, P.E.  
Chief Engineer, Evaluation Services



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Facsimile: 717-764-4129  
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## 5 APPENDIX

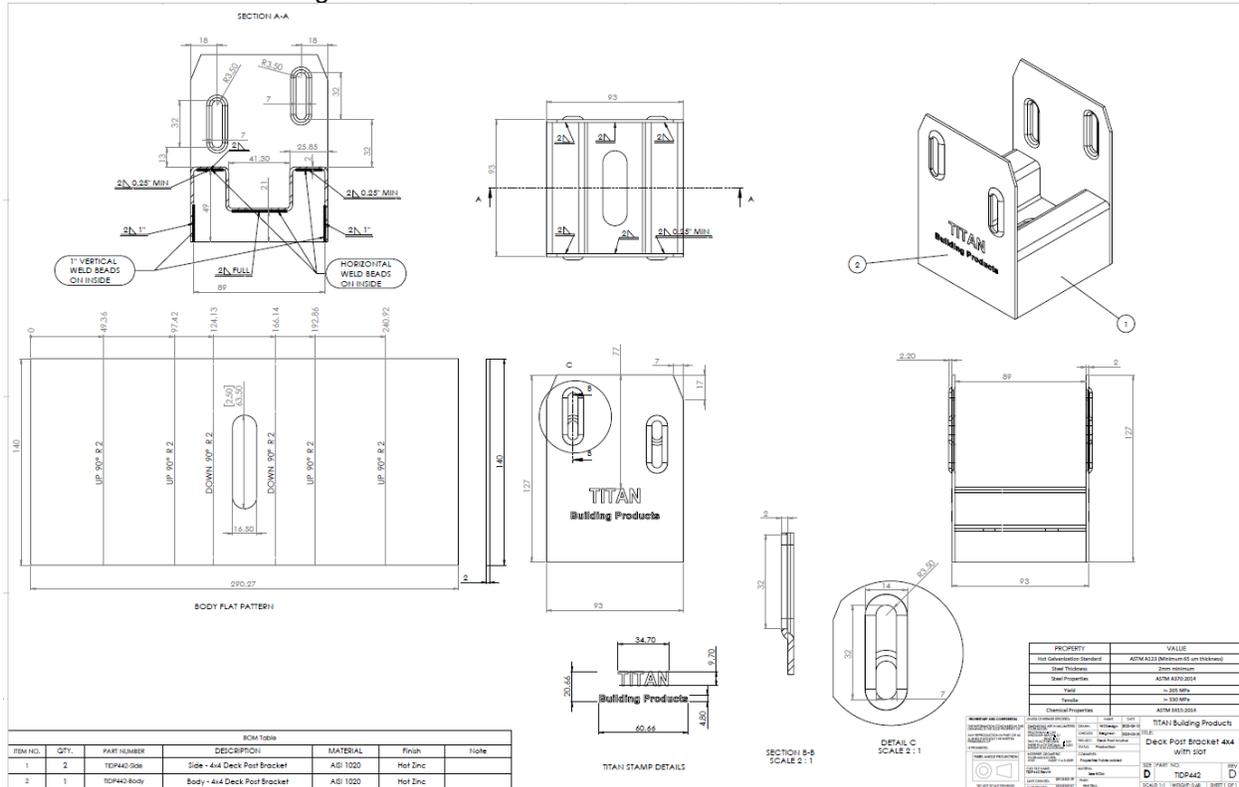
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Figure 1: Titan TIDP442 Deck Post Bracket 4x4 with slot

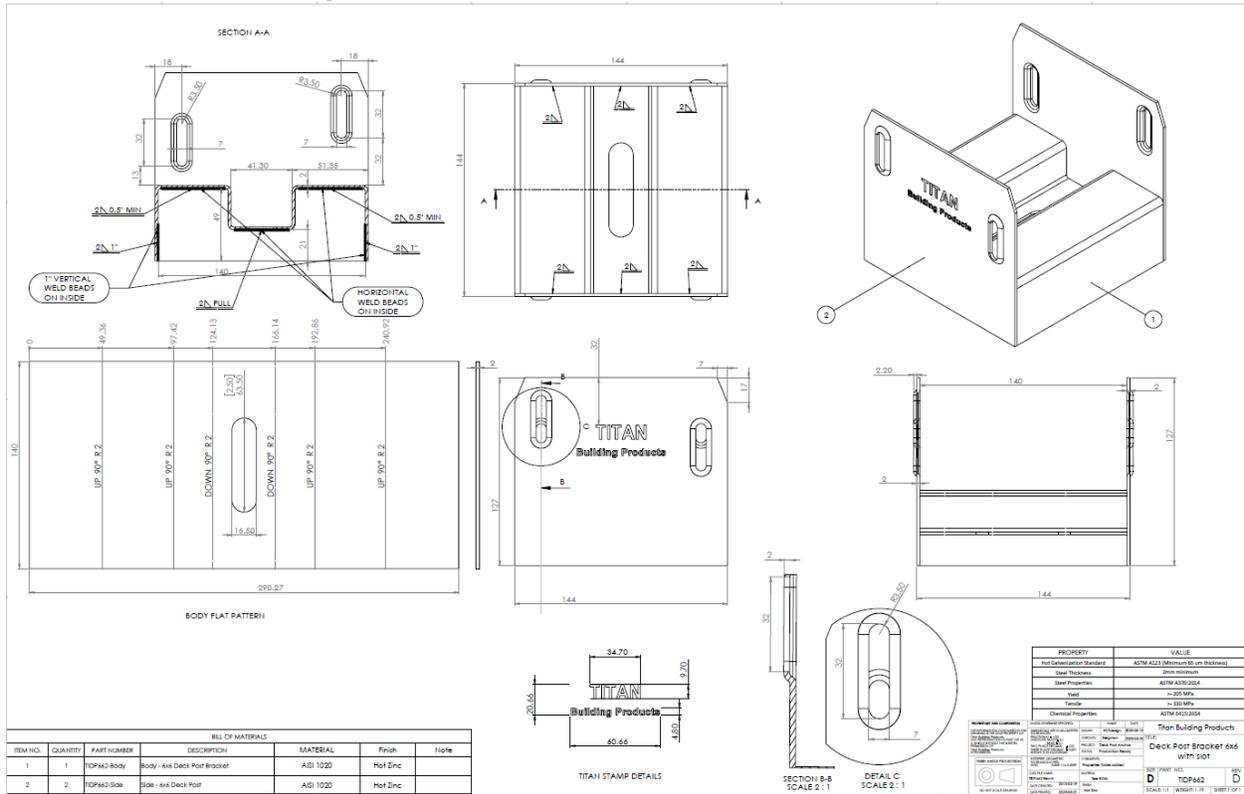


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Figure 2: Titan TIDP662 Deck Post Anchor 6x6 with slot

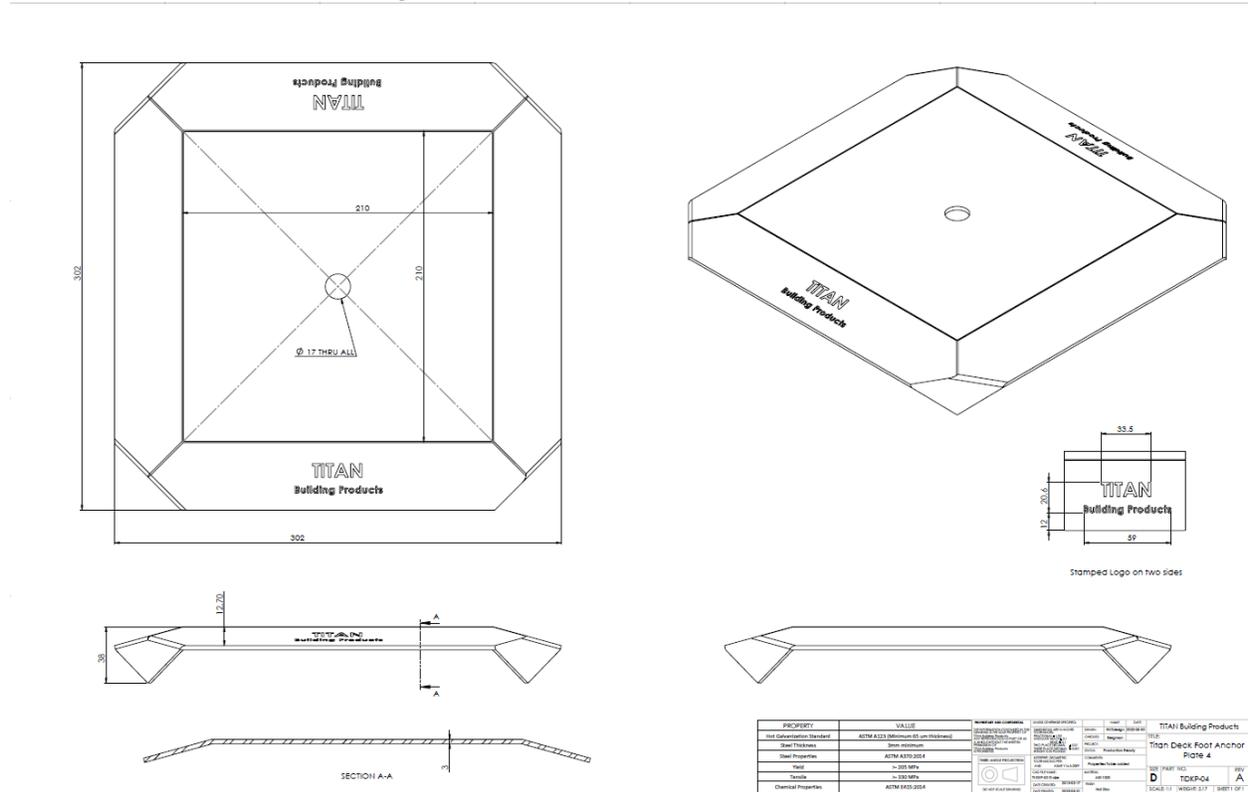


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Figure 3: Titan TI-DKP-03 Deck Foot Anchor

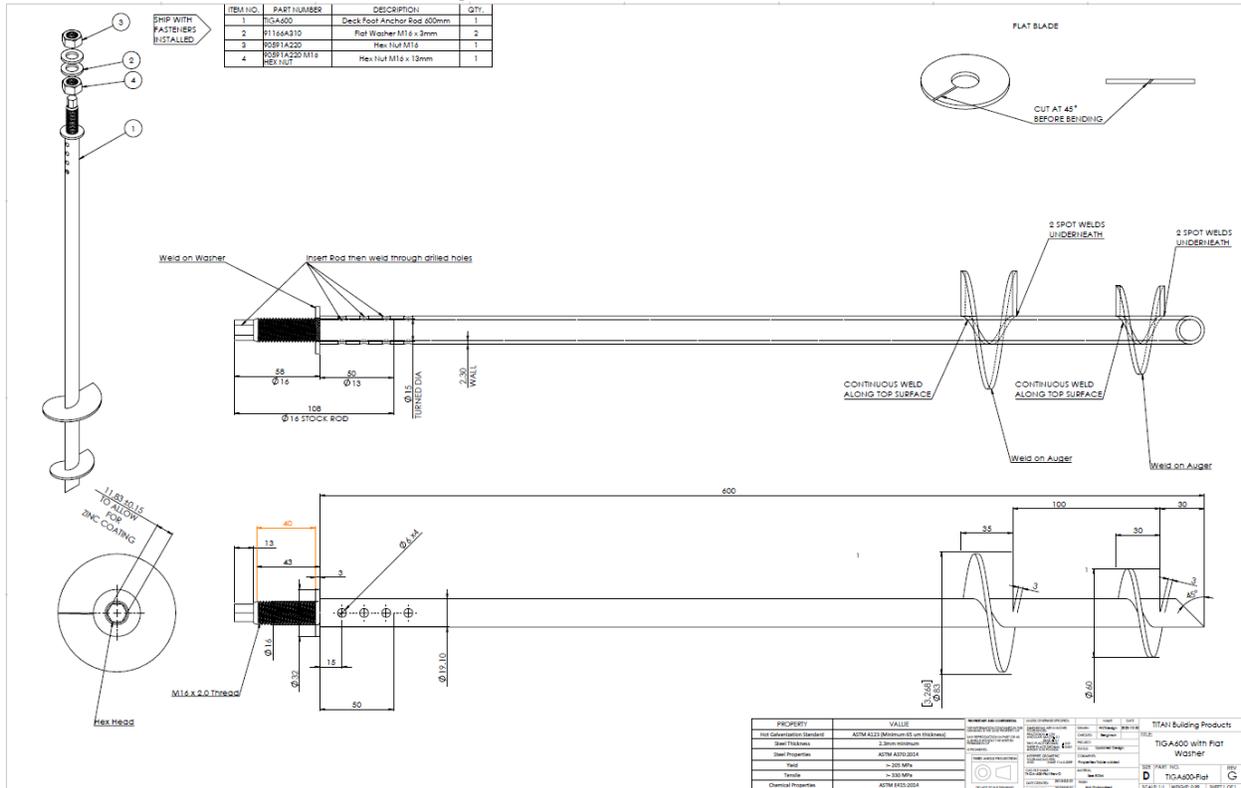


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Figure 4: Titan TI-GA-600 Helical

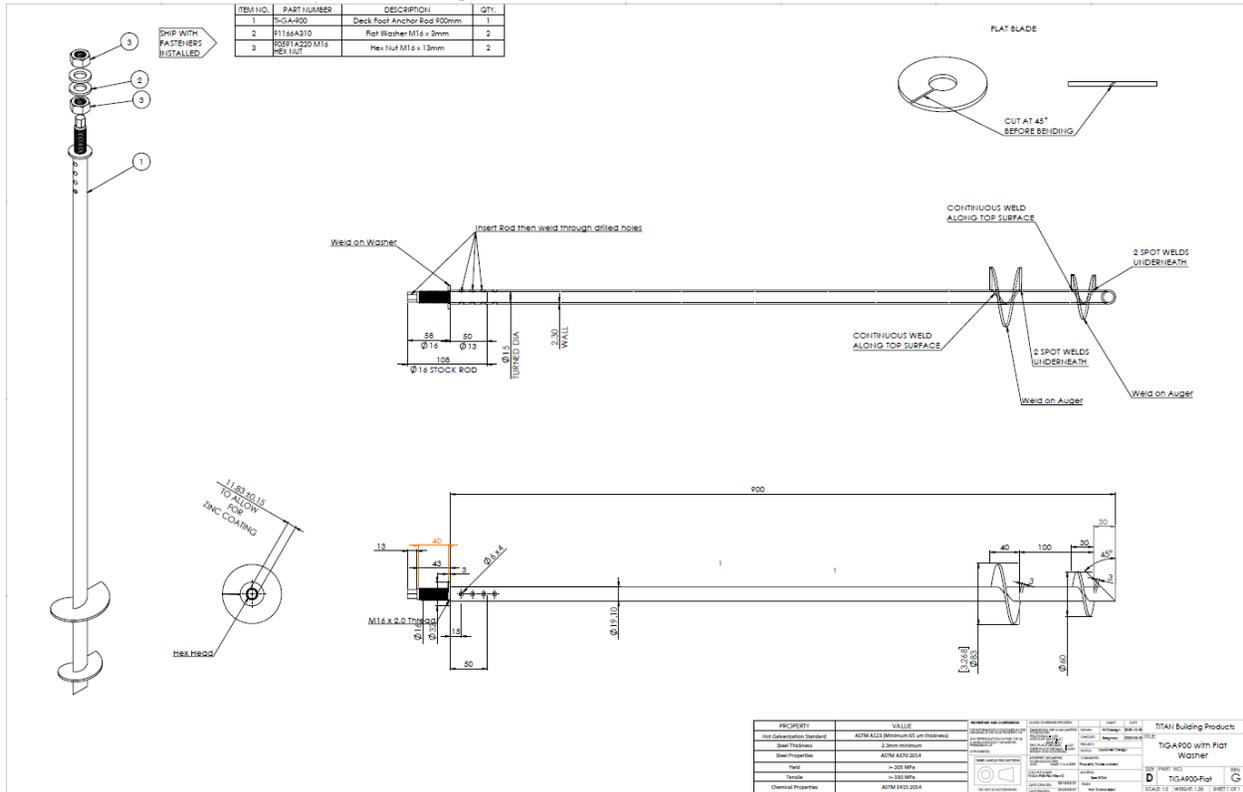


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Figure 4: Titan TI-GA-900 Helical





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<a href="#">8/29/2023</a>	Original	Michael Weigner	Craig Wagner