

TEST REPORT



Intertek

REPORT NUMBER: 100390597TOR-103A

ISSUE DATE: November 5, 2014

EVALUATION CENTER

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RENDERED TO
Titan Building Products
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Ottawa, Ontario K1J 9G6

PRODUCT EVALUATED:
Primus 4x4 post anchors

EVALUATION PROPERTY:
Load Tests on Guards

Report of load testing for Titan Building Products of the 4x4 Primus post anchors to be used with guardrail systems for compliance with the applicable requirements of AC273 "Acceptance Criteria For Handrails And Guards", Approved February 2008."

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2 Introduction

Intertek Testing Systems NA Ltd. (Intertek) has conducted testing for Titan Building Products on the 4×4 Primus post anchor to be used in a guardrail system. This test report covers load tests performed on a guard (rail) system utilizing 4×4 Primus post anchors anchored to an SPF (spruce, pine, fir) substrate. Based on the guardrail construction as noted in this report, it serves to qualify the 4×4 Primus post anchor as a method of securement to the SPF substrate. The guard rail is destined to be used in or on one- and two-family dwellings under the IBC and IRC.

Testing was conducted in accordance with Section 4.2 of ICC-ES AC 273 "*Acceptance Criteria for Handrails and Guards*". The scope of this project includes the evaluation of only the post anchor of the guardrail system. This evaluation was conducted on August 24, 2011.

3 Test Sample

3.1. Sample Selection

The Primus post anchor was randomly selected at the manufacturer's facility located at 71-5450 Canotek Road, Ottawa, Ontario, Canada by qualified Intertek representative Teresa Jiang. During the sampling, the products selected were verified to be of standard manufacturing procedures and documented formulations. The products were considered selected in accordance with the requirements of Section 3.1 of ICC-ES AC 85 as required by ICC-ES AC 273.

The 4×4 Primus post anchors were received at the Intertek laboratory in Mississauga, Ontario, Canada on July 26, 2011.

3.2. Sample and Assembly Description

In order to qualify the 4×4 Primus post anchors as a suitable component in a guard rail system conforming to ICC-ES AC 273, it is required that a mockup guard system (assembled with 4×4 Primus post anchors) satisfy the requirements that pertain to the anchoring system set out in ICC-ES AC 273. The applicant wishes to establish conformance to ICC-ES AC 273 with respect to the post anchor system (fastened into pressure-treated SPF) only. The scope of this evaluation is limited for use in one- and two-family dwellings under the IBC and IRC.

The description below outlines the components and construction of the post anchor system assembled with 4×4 Primus post anchors and 4×4 SPF wood posts. A guardrail assembly with a centre-to-centre post spacing measuring 1829 mm (72") long was tested.

It is deemed by Intertek that the load requirements for a guard rail system with 4×4 Primus post anchors spaced 1.83 m (6') apart on centre will satisfy load requirements for any guardrail system with a lesser post anchor spacing.

A steel top and bottom rail was affixed to the posts. The top side of the top rail measured 36" (914 mm) from the deck floor. The bottom side of the bottom rail measured 4" (102 mm) from the deck floor. A vertical steel member spanning the top and bottom rail was also fastened at the centre of the guard rail. This represented the baluster of a guard rail system.

Posts

Each post was assembled with a 4×4 Primus post anchor. Each post anchor was assembled to the post as per the packaging instructions. Each pressure-treated SPF post measured 89 mm by 89 mm by 1016 mm (3.5" × 3.5" by 40") long.

A 1-1/4" diameter hole saw was used to cut a circular pilot cut identical to the diameter of the tube in the centre of the 4×4 post about 42-48 mm (1-5/8" to 1-7/8") deep. The inner wood core of the cut remained and the sharp edge of the tube was aligned and set into the pilot cut at a vertical attitude and driven with force into the solid core of the post until the base of the anchor was flush against the post bottom. Four pilot holes measuring 1/4" diameter were drilled a minimum of 51 mm (2") deep into the post. Then, four 3/8"×5" lags screws fastened the anchor to the post.

Each post was fastened into an SPF base that measured 76 mm (3") thick (fastened perpendicular to the wood grain) with eight #14×3" screws.

3.3. Drawings

Post Anchor Drawing: Titan Post Anchor System – Titan 4X4 01 dated Feb 24, 08 (4 pages)

4 Test and Evaluation Methods

4.1. SPECIMEN PREPARATION

The post anchor specimens were shipped to the Intertek laboratory in Mississauga, Ontario. The guard system was assembled by the client.

4.2. CONDITIONING

The guardrail specimens were tested in the laboratory under ambient conditions. No specific conditioning parameters were required before testing. After purchase, the SPF wood was allowed to be acclimatized to the test environment for a minimum of two weeks.

4.3. TEST PROCEDURES

Since the post anchor system was symmetrical, it is Intertek's professional opinion that the loads applied from one side would achieve results that are equal to loads applied to the other side.

A simple two-post guard rail system was also evaluated for the following tests:

- horizontal load on infill. This was evaluated only for its effect on the post anchor.
- concentrated horizontal load at top rail at midspan (to qualify the requirement for a guard system with 1.83 m (6') post spacing on center.
- concentrated horizontal load at top of end post (to qualify the horizontal concentrated load on the post).

The test loads applied were as set forth in the following:

- ICC-ES AC273 "*Acceptance Criteria for Handrails and Guards*", Approved February 2008, Section 4.2.2 and 4.2.4. The posts anchors are destined to be used in or on one- and two-family dwellings under the IBC and IRC.

4.3.1 Horizontal Infill Load Test (Section 4.2.2)

The horizontal load on the infill units was conducted only to evaluate its effect on the post anchor. A concentrated load of 125 lbf (556 N) (delivered with a 12 in. by 12 in. platen) was applied to the baluster at the top by means of a calibrated load cell/single ram/pump system and held for 1 minute. The load was then released. After release of the load, post anchor was evaluated for failure, evidence of disengagement or visible cracks in any component.

The load was applied at the top of the baluster adjacent the top rail. This location is deemed to produce the greatest to moment at the post base and hence the most severe assessment of the post anchors.

4.3.2 Horizontal Concentrated Load at Top Rail at Midspan (Section 4.2.4)

The initial positions of the top rail (at mid-span) and the end posts were measured. A concentrated horizontal load of 200 lbf (0.89 kN) (delivered with a 100 mm by 100 mm platen) was applied to mid span of the top rail by means of a calibrated load cell/single ram/pump system and held for 1 minute. The positions of the top rail and the end posts were again measured and recorded. The load was then increased to 500 lbf (2.22 kN) and held for 1 minute. The load was then released. After release of the load, post anchor was evaluated for failure, evidence of disengagement or visible cracks in any component.

The load was applied at a height of 36 inches (914 mm) from the deck floor.

4.3.3 Horizontal Concentrated Load on Post (Section 4.2.4)

The initial position of the top of the post was measured. A concentrated horizontal load of 200 lbf (0.89 kN) (delivered with a 100 mm by 100 mm platen) was applied to the top of the post by means of a calibrated load cell/single ram/pump system and held for 1 minute. The position of the post was again measured and recorded. The load was then increased to 500 lbf (2.22 kN) and held for 1 minute. The load was then released. After release of the load, post anchor was evaluated for failure, evidence of disengagement or visible cracks in any component.

The load was applied at a height of 36 inches (914 mm) from the deck floor.

5 Test and Evaluation Results

5.1. Horizontal Load on the Infill

| Table 1. Infill Load Test on balusters (Section 4.2.2) | | |
|--|---|---------|
| Sample | Test Results at 125 lbf load | Results |
| 1 | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 2 | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 3 | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |

The guardrail system (anchored to a SPF substrate) satisfied the requirements for the Infill Load tests specified in Section 4.2.2 of ICC-ES AC273 Issued:2008/03/01 *Acceptance Criteria for Handrails and Guards*. The posts are destined to be used in or on one- and two-family dwellings under the IBC and IRC.

5.2. Horizontal Concentrated Load at Top Rail at Midspan

| Table 2. Horizontal Concentrated Load at Top Rail at Midspan (Section 4.2.4) | | | | |
|--|--|--|---|---------|
| Sample | Measured Net Deflection at 200 lbf (in.) | Allowable Deflection at 200 lbf (h/12) (in.) | Test Results at 500 lbf load | Results |
| 1 | 0.35 | 3.00 | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 2 | 0.94 | | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 3 | 0.16 | | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |

The guardrail system (anchored to a SPF substrate) satisfied the requirements for the Concentrated Load Test (the midspan of the top rail) specified in Section 4.2.4 of ICC-ES AC273 Issued:2008/03/01 *Acceptance Criteria for Handrails and Guards*. The posts are destined to be used in or on one- and two-family dwellings under the IBC and IRC.

5.3. Horizontal Concentrated Load on Post

| Table 3. Horizontal Concentrated Load at Top of Post (perpendicular to rail) (Section 4.2.4) | | | | |
|--|--|--|---|---------|
| Sample | Measured Net Deflection at 200 lbf (in.) | Allowable Deflection at 200 lbf (h/12) (in.) | Test Results at 500 lbf load | Results |
| 1 | 1.46 | 3.00 | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 2 | 1.34 | | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |
| 3 | 1.61 | | After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system | PASS |

The guardrail system (anchored to a SPF substrate) satisfied the requirements for the Concentrated Load Test (the midspan of the top rail) specified in Section 4.2.4 of ICC-ES AC273 Issued:2008/03/01 *Acceptance Criteria for Handrails and Guards*. The posts are destined to be used in or on one- and two-family dwellings under the IBC and IRC.

6 Test Equipment

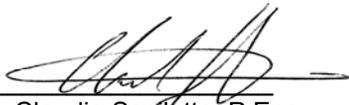
| Description | Inventory Number |
|-------------------------|------------------------------------|
| 24" hydraulic ram | - |
| Electric Hydraulic Pump | - |
| Artech Load Cell | 280-01-0713 Cal Due Nov 10/11 |
| Admet Read Out | 280-01-0696 Cal Due Nov 10/11 |
| Husky Tape Measure | 300-01-0956 Cal Due March 12, 2012 |
| Stop Watch | 300-01-0946 Cal Due Feb 2012 |

7 Conclusion

The subject guard system with a centre-to-centre post spacing measuring 1.83 m (72") long utilizing 4x4 Primus post anchors secured to an SPF substrate described herein satisfied requirements of ICC-ES AC273 "Acceptance Criteria for Handrails and Guards", Approved February 2008, Section 4.2.2 and 4.2.4. The posts anchors are destined to be used in a guardrail system with a rail height of 36" (914 mm) in or on one- and two-family dwellings under the IBC and IRC.

Tested by Gabriel Fernandes

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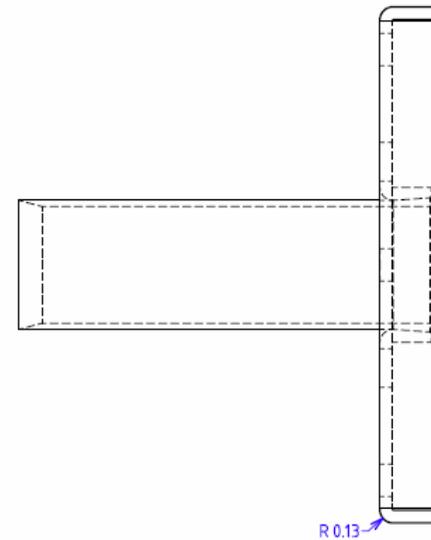
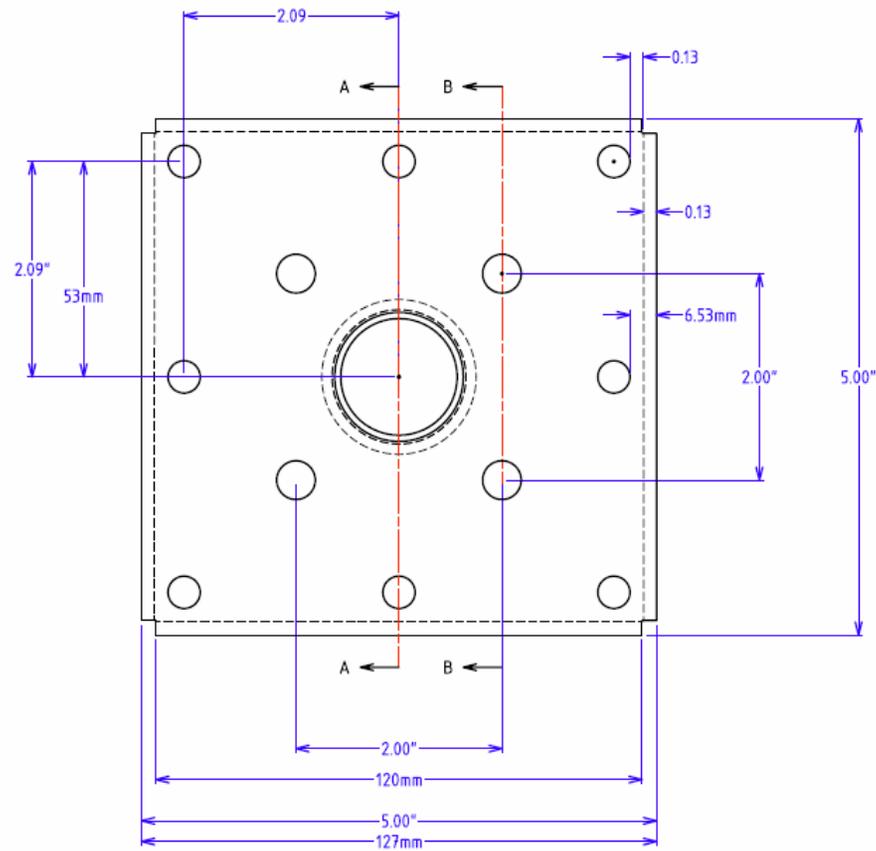
Reviewed by: 
Robert Giona
Manager – Building Products

8 Appendix A – Drawings

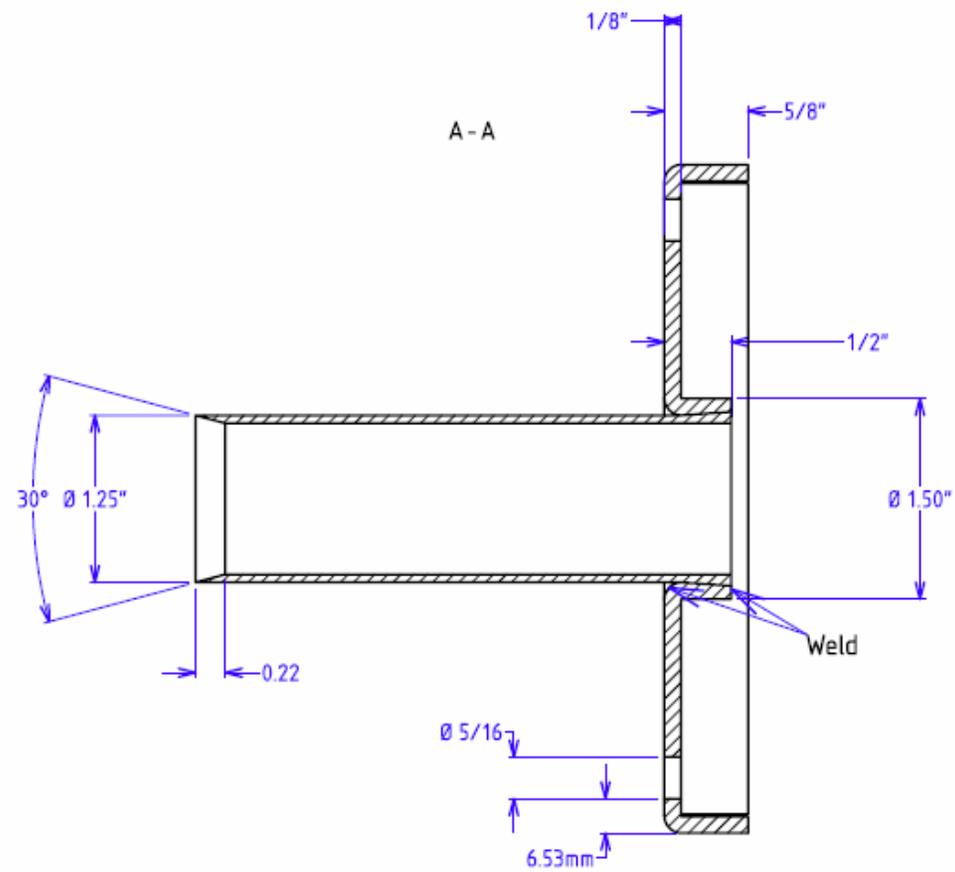
APPENDIX A

(Drawings – 4 pages)

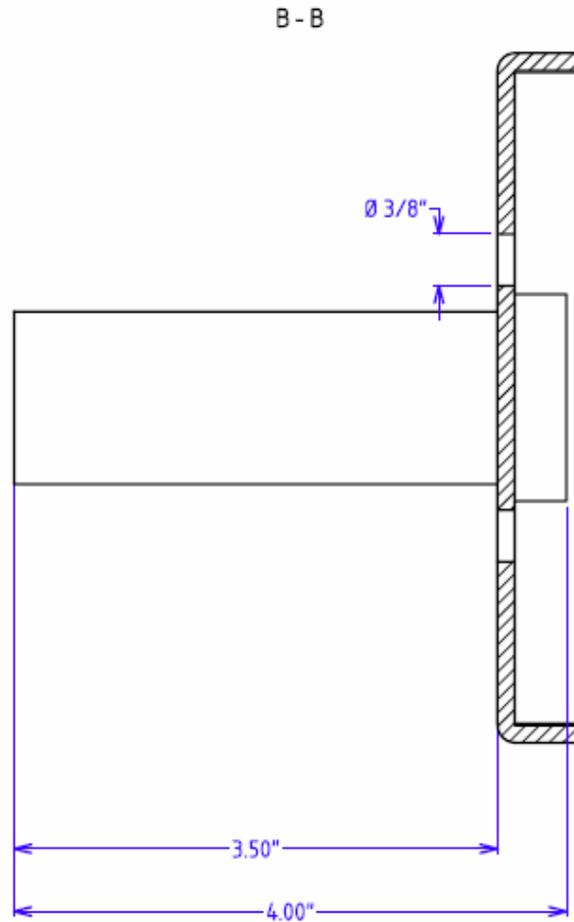
Drawing 2. – Zoomed in drawing of 4x4 Primus post anchor (top-and side view)



Drawing 3. – Zoomed in drawing of 4x4 Primus post anchor (side view)



Drawing 4. – Zoomed in drawing of 4x4 Primus post anchor (side view)



9 Appendix B – Revision Page

| Revision No. | Date | Changes | Author | Reviewer |
|---------------------|------------------|----------------|-------------------|-----------------|
| 0 | November 5, 2014 | First issue | Claudio Sacilotto | Robert Giona |
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