

# TEST REPORT

The Intertek logo consists of the word "Intertek" in white, sans-serif font, centered within a dark blue rounded rectangle.

**REPORT NUMBER: 100604363TOR-005c**  
ISSUE DATE: March 30, 2012

## **EVALUATION CENTER**

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**RENDERED TO**  
**Titan Building Products**  
**71-5450 Canotek Road**  
**Ottawa, Ontario K1J 9G6**

**PRODUCT EVALUATED:**  
Primus 4x4 post anchors with Chicago Bolt

**EVALUATION PROPERTY:**  
Load Tests on Guards

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

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## 2 Introduction

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Intertek Testing Systems NA Ltd. (Intertek) has conducted testing for Titan Building Products on the 4x4 Primus post anchor to be used in a guard rail system. This test report covers load tests performed on a guard (rail) system utilizing 4x4 Primus post anchors anchored to an SPF (spruce, pine, fir) substrate. The anchors were reinforced with a Chicago bolt through the post. Based on the guard rail construction as noted in this report, it serves to qualify the 4x4 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 began in February 2012 and was completed in March 2012.

## 3 Test Sample

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### 3.1. Sample Selection

The Primus post anchor and the Chicago bolt samples were 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 4x4 Primus post anchors and the Chicago bolts were received at the Intertek laboratory in Mississauga, Ontario, Canada on July 21, 2011.

### 3.2. Sample and Assembly Description

In order to qualify the 4x4 Primus post anchors reinforced with a Chicago bolt 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 4x4 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 4x4 Primus post anchors, a Chicago bolt and 4x4 SPF wood posts.

A steel top and bottom rail was affixed to the posts. The top side of the top rail measured 42" (1067 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.

A guard rail assembly with a centre-to-centre post spacing measuring 1829 mm (72") long was tested.

## Posts

Each post was assembled with a 4x4 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 1118 mm (3.5" x 3.5" by 44") 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 4x4 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 50mm (2") deep into the post. Then, four 3/8"x5" lags screws fastened the anchor to the post.

In addition, a Chicago bolt was utilized at the anchor to reinforce the post anchor. A 5/16" diameter hole was drilled through the post (and subsequently through the post anchor shaft). The hole was located 25 mm (1") o.c. from the bottom of the SPF post. The 5/16"x 3-1/2" Chicago bolt was oriented parallel to the load direction.

Each post was fastened into an SPF base that measured 76 mm (3") thick (fastened perpendicular to the wood grain) with eight #14x3" screws.

### 3.3. Drawings

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

## 4 Test and Evaluation Methods

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### 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 guard 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 accustomed 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 in-fill. 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 In-fill Load Test (Section 4.2.2)

The horizontal load on the in-fill 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 42 inches (1067 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 42 inches (1067 mm) from the deck floor.

## 5 Test and Evaluation Results

### 5.1. Horizontal Load on the In-Fill

Table 1. - Horizontal Load on the In-Fill		
Sample	Load	Test Result
1	125 lbf (0.56 N)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
2	125 lbf (0.56 N)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
3	125 lbf (0.56 N)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system

The guard system (anchored to SPF substrate) satisfied the requirements specified in ICC-ES AC273 "Acceptance Criteria for Handrails And Guards", Approved February 2008, Section 4.2.2. 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, 42" from deck surface					
Sample	Load	Net Deflection	Allowable Deflection	Load	Test Result
1	200 lbf (0.89 kN)	0.079" (2.0 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
2	500lbf (2.22 kN)*	0.138" (3.5 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
3	200 lbf 0.89 kN)	0.020" (0.5 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system

The guard system (anchored to SPF substrate) satisfied the requirements specified in ICC-ES AC273 "Acceptance Criteria for Handrails And Guards", Approved February 2008, Section 4.2.4. The posts are destined to be used in or on one- and two-family dwellings under the IBC and IRC.

\* The deflection of the top rail at the midspan was Inadvertently recorded at 500 lbf (2.22 kN) instead of 200 lbf (0.89 kN). The guard system and post anchor nevertheless passed the deflection requirements mentioned above.

### 5.3. Horizontal Concentrated Load on Post

Table 3 - Horizontal Concentrated Load on Post at 42" from deck surface					
Sample	Load	Net Deflection	Allowable Deflection	Load	Test Result
1	200 lbf (0.89 kN)	1.50" (38.0 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
2	200 lbf (0.89 kN)	1.46" (37.0 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system
3	200 lbf (0.89 kN)	2.36" (60 mm)	2.46" (62.6 mm)	500 lbf (2.22 kN)	After release of the load there was no evidence of disengagement or visible cracks in any component of the post anchor system

The guard system (anchored to SPF substrate) satisfied the requirements specified in ICC-ES AC273 "Acceptance Criteria for Handrails And Guards", Approved February 2008, Section 4.2.4. The posts are destined to be used in or on one- and two-family dwellings under the IBC and IRC.



## 6 Test Equipment

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Description	Inventory Number
24" hydraulic ram	-
Electric Hydraulic Pump	-
Artech Load Cell	280-01-0713 Cal Due Dec 1, 2012
Admet Read Out	280-01-0696 Cal Due Dec 1, 2012
Husky Tape Measure	300-01-0956 Cal Due March 12, 2012
Stop Watch	273 01 0923 (Stopwatch was calibrated after the test on March 7, 2012 and was verified to be in tolerance)

## 7 Conclusion

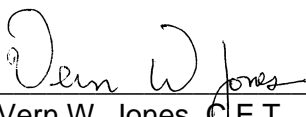
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The subject guard system with a centre-to-centre post spacing measuring 1.83 m (72") long utilizing 4x4 Primus post anchors and a Chicago bolt secured to an SPF substrate described herein satisfied requirements of ICC-ES AC273 "Acceptance Criteria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

Tested by Gabriel Fernandes

### INTERTEK TESTING SERVICES NA LTD

Reported by:   
Claudio Sacilotto, P.Eng  
Senior Project Engineer

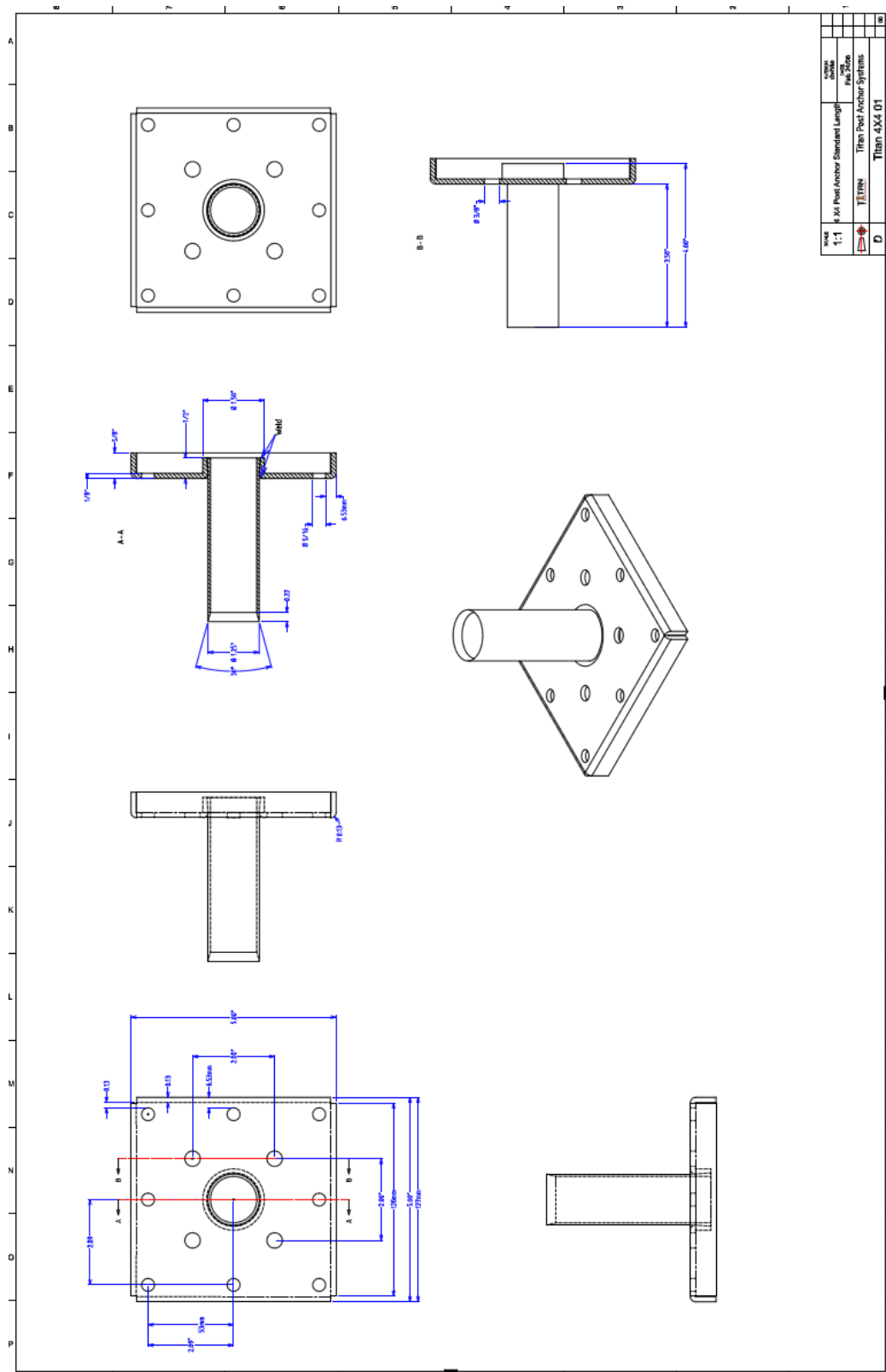
Reviewed by:   
Vern W. Jones, C.E.T.  
Laboratory Technologist

## **8 Appendix A – Drawings**

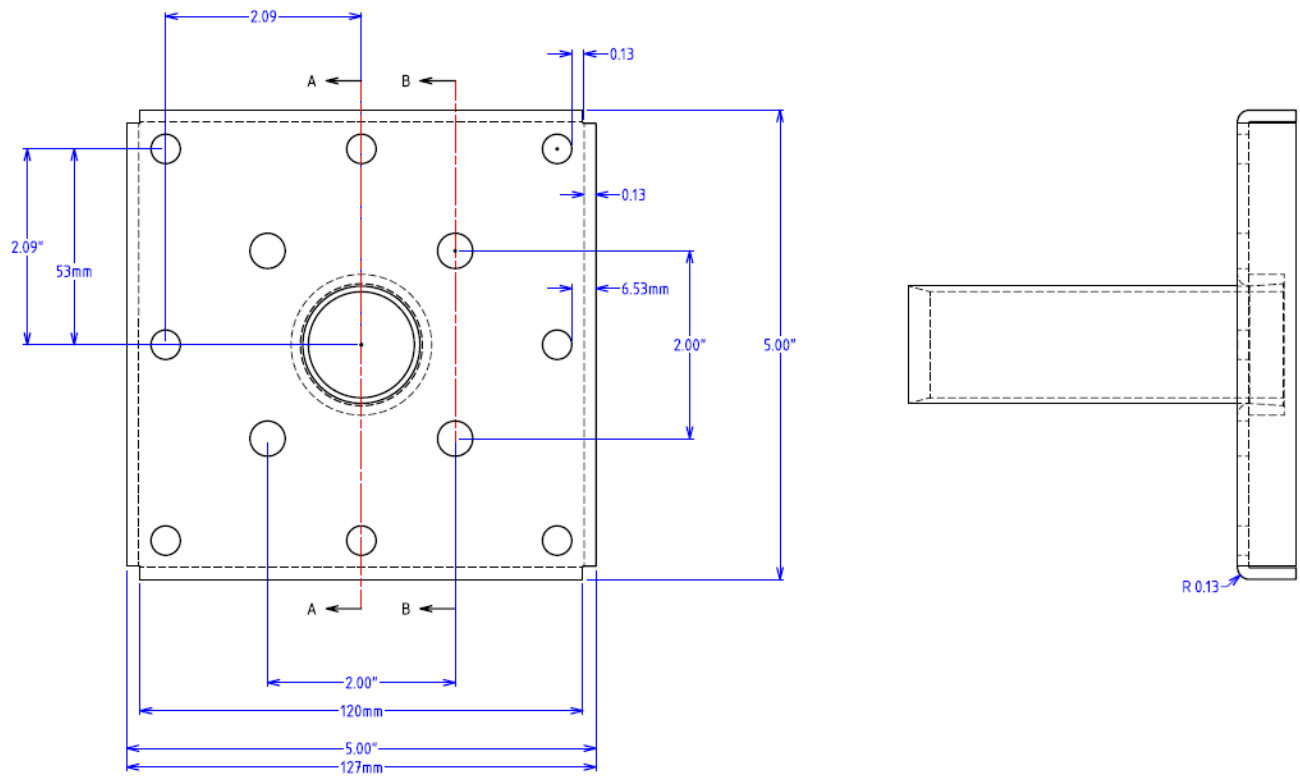
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### **APPENDIX A**

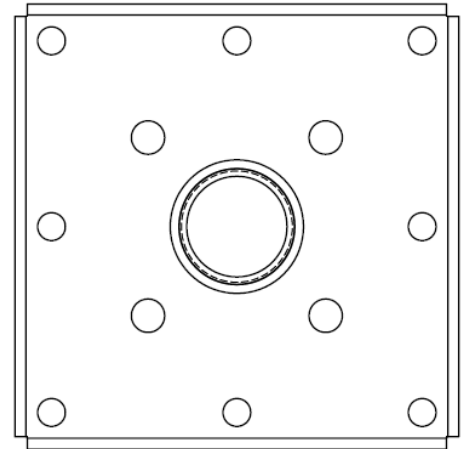
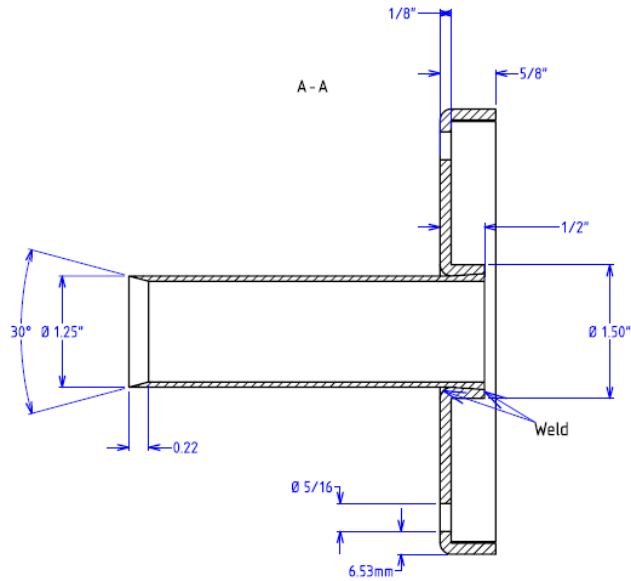
(Drawings – 3 pages)



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



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



## 9 Appendix B – Revision Page

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Revision No.	Date	Changes	Author	Reviewer
0	March 30, 2012	First issue	Claudio Sacilotto	Vern Jones

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