

FORTRESS BUILDING PRODUCTS TEST REPORT

SCOPE OF WORK

ICC-ES AC273 TESTING ON FE26 TRADITIONAL LEVEL RAILING WITH WOOD DRINK RAIL

REPORT NUMBER

K9337.01-119-19 R0

TEST DATES

04/22/20 - 04/23/20

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TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: K9337.01-119-19 R0

Date: 06/09/20

REPORT ISSUED TO

FORTRESS BUILDING PRODUCTS

1720 North First Street

Suite B

Garland, Texas 75040

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Fortress Building Products to perform structural testing in accordance with ICC-ES™ AC273 on their 10 ft by 36 in *Fe26 Traditional* level railing with wood drink rail. This report is in conjunction with Intertek Report No.'s J0101.02-119-19 which includes structural performance testing of the *Fe26* post mount, and B2564.01-119-19 and J7825.01-119-19 which include assembly fastener testing of the wood 4x4 and *Fe26* post mounts respectively. Results obtained are tested values and were secured by using the designated test methods. Testing was conducted at Intertek test facility in York, Pennsylvania.

Intertek B&C in York, Pennsylvania has demonstrated compliance with ISO/IEC International Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. (IAS). Intertek B&C is accredited to perform all testing reported herein.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Adam J. Schrum
TITLE:	Project Manager
SIGNATURE:	
DATE:	06/09/20

AJS:vtm/aas

REVIEWED BY:	V. Thomas Mickley, Jr., P.E.
TITLE:	Senior Staff Engineer
SIGNATURE:	
DATE:	06/09/20

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SECTION 2

TEST METHODS

The specimens were evaluated in accordance with the following:

ICC-ES™ AC273 (March 1, 2017), *Acceptance Criteria for Handrails and Guards*

ICC-ES™ AC273 was developed by the ICC Evaluation Service, Inc. (ICC-ES™) as acceptance criteria to evaluate compliance with the following building codes:

2015 *International Building Code*®, International Code Council

2015 *International Residential Code*®, International Code Council

Limitations

All tests performed were to evaluate structural performance of the railing assembly to carry and transfer imposed loads to the supports (posts). The test specimen evaluated included the pickets, rails, rail brackets, posts, and attachment to the supporting structure. Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

Testing is limited to satisfying the IRC - One- and Two-Family Dwellings requirements of ICC-ES™ AC273.

Test specimens were not sampled or selected by a third-party inspection agency as required by Section 2.4 of ICC-ES™ AC273.

Tensile testing was not conducted, and certificates of conformance were not provided in order to verify the material specifications as required by Section 4.1 of ICC-ES™ AC273.

SECTION 3

MATERIAL SOURCE

Test samples were provided by the client.

Representative samples of the test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

SECTION 4

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Kevin J. Eichelberger	Intertek B&C

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SECTION 5**TEST PROCEDURE**

Railing assembly tests were performed per ICC-ES™ AC273, Section 4.2.1 in a self-contained structural frame designed to accommodate anchorage of a rail assembly and application of the required test loads. The specimen was loaded using an electric winch mounted to a rigid steel test frame. High strength steel cables, nylon straps, and load distribution beams were used to impose test loads on the specimen. Applied load was measured using an electronic load cell located in-line with the loading system. Deflections were measured to the nearest 0.01 in using electronic linear displacement transducers.

The railing assembly was installed and tested as a single railing section by directly securing (surface-mounting) the base of the *Fe26* post mounts to a rigid steel test frame (simulated concrete) or by directly securing the 4x4 posts to rigid steel stanchions, which kept the posts from deflecting. The railing was assembled by an Intertek B&C technician. Transducers mounted to an independent reference frame were located to record movement of reference points on the railing system components (ends and mid-point) to determine net component deflections. See photographs in Section 9 for test setups.

As a worse-case scenario, no support block on the bottom rail was used for testing.

The test specimen was inspected prior to testing to verify size and general condition of the materials, assembly, and installation. No potentially compromising defects were observed. One specimen was used for all load tests which were performed in the order reported. Each design load test was performed using the following procedure:

1. Zeroed transducers and load cell at zero load;
2. Increased load to specified test load in no less than ten seconds; and
3. Held test load for no less than one minute.

Unless otherwise noted, all loads and displacement measurements were normal to the rail (horizontal). The test results apply only to the railing assembly between supports and anchorage to the support.

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TEST SPECIMEN DESCRIPTION

The *Fe26 Traditional* guardrail system with wood drink rail is comprised of pre-galvanized formed steel top and bottom rails, pickets spaced between the rail members, and posts. Test specimens consisted of two product colors: Antique Bronze and Black. Drawings are included in Section 10 to verify the overall dimensions and other pertinent information of the tested product, its components, and any constructed assemblies. Photographs are provided in Section 9.

SERIES/MODEL	<i>Fe26 Traditional</i> guardrail system with wood drink rail
COLOR	Antique Bronze and Black
MATERIALS	Steel and wood
RAIL LENGTH	117-3/4 in (inside of post to inside of post)
RAIL HEIGHT	35-1/4 in (top of top rail to bottom of bottom rail)
TOP / BOTTOM RAIL	1 in square by 0.055 in thick steel rail
DRINK RAIL	5-1/2 in wide by 1 in thick preservative treated Southern Yellow Pine Deck Board attached to the top rail
RAIL ATTACHMENT	<i>UB-04</i> steel brackets attached the rails to the post mounts U-shaped steel rail clips attached the drink rail to the top rail (five clips total, 6 in from each end and equally spaced)
PICKET	5/8 in square by 0.039 in thick steel picket
POSTS	3 in square by 0.075 in thick steel tube connected to a 5-1/8 in square by 0.30 in thick steel base plate with a 3/16 in continuous fillet weld; the base plate included four 1/2 in diameter holes and one 15/16 in diameter hole Preservative treated Southern Yellow Pine 4x4

Fastening Schedule

CONNECTION	FASTENER
Rail Bracket to Steel Post*	Two #12-24 by 3/4", Torx drive, flat-head, Type F thread cutting point, steel screws
Rail Bracket to Wood Post	Two #12-10 by 2-1/2" (0.153 in minor diameter) Torx drive, flat-head, Type A point, steel screws
Rail Bracket to Rail*	One #12-24 by 3/4", Torx drive, flat-head, Type F thread cutting point, steel screw
Drink Rail Bracket to Drink Rail	Two #8-10 by 3/4" (0.100 in minor diameter) pan-head, Torx drive, wood screw
Drink Rail Bracket to Top Rail	Slip fit - no mechanical connection

* 5/32 in diameter pre-drill used

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TEST RESULTS

Key to Test Results Tables:

Load Level: Target test load

Test Load: Actual applied load at the designated load level (target). Where more than one value is reported, the test load was the range (min. - max.) that was held during the time indicated in the test.

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure. Where more than one value is reported, the time was the range (start-end) that the designated load level was reached and sustained.

10 ft (117-3/4 in) by 36 in Fe26 Traditional Level Railing with Wood Drink Rail Limited to Use in IRC - One- and Two-Family Dwellings / ICC-ES™ AC273

Specimen No. 1 of 3

Test No. 1 - Test Date: 04/22/20

Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	127 - 133	00:32 - 01:45	Sustained load equal to or greater than 125 lb for one full minute without failure

Test No. 2 - Test Date: 04/22/20

Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	127 - 130	00:26 - 01:38	Sustained load equal to or greater than 125 lb for one full minute without failure

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Test No. 3 - Test Date: 04/22/20

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:36	0.19	0.33	0.02	0.23
500 lb (2.50 x D.L.)	501 - 515	00:47 - 02:00	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.33 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{h}{24} + \frac{l}{96}\right) = \left(\frac{36}{24} + \frac{117.75}{96}\right) = 2.73 \text{ in} \geq 0.33 \text{ in} \therefore OK$$

Net rail deflection at 200 lb = 0.23 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.23 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 4 - Test Date: 04/22/20

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:35	0.00	0.37	0.00	0.37
500 lb (2.50 x D.L.)	502 - 515	00:47 - 02:05	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.37 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.37 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

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Test No. 5 - Test Date: 04/22/20

Design Load: 200 lb Horizontal Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.) x 2	1001 - 1007	00:58 - 02:06	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

Test No. 6 - Test Date: 04/23/20

Design Load: 200 lb Vertical Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
500 lb (2.50 x D.L.)	1000 - 1015	00:37 - 01:47	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

Specimen No. 2 of 3

Test No. 1 - Test Date: 04/23/20

Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	127 - 139	00:30 - 01:41	Sustained load equal to or greater than 125 lb for one full minute without failure

Test No. 2 - Test Date: 04/23/20

Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	127 - 136	00:41 - 01:56	Sustained load equal to or greater than 125 lb for one full minute without failure

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Test No. 3 - Test Date: 04/23/20

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:40	0.20	0.44	0.02	0.33
500 lb (2.50 x D.L.)	501 - 512	00:55 - 02:04	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.44 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{h}{24} + \frac{l}{96}\right) = \left(\frac{36}{24} + \frac{117.75}{96}\right) = 2.73 \text{ in} \geq 0.44 \text{ in} \therefore OK$$

Net rail deflection at 200 lb = 0.33 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.33 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 4 - Test Date: 04/23/20

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:29	0.00	0.38	0.00	0.38
500 lb (2.50 x D.L.)	501 - 510	00:38 - 01:52	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.38 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.38 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

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Test No. 5 - Test Date: 04/23/20

Design Load: 200 lb Horizontal Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.) x 2	1002 - 1023	00:57 - 02:05	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

Test No. 6 - Test Date: 04/23/20

Design Load: 200 lb Vertical Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
500 lb (2.50 x D.L.)	1001 - 1014	00:44 - 01:54	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

Specimen No. 3 of 3

Test No. 1 - Test Date: 04/23/20

Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	130 - 135	00:29 - 01:41	Sustained load equal to or greater than 125 lb for one full minute without failure

Test No. 2 - Test Date: 04/23/20

Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
125 lb (2.50 x D.L.)	125 - 135	00:22 - 01:34	Sustained load equal to or greater than 125 lb for one full minute without failure

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Test No. 3 - Test Date: 04/23/20

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:31	0.20	0.37	0.02	0.26
500 lb (2.50 x D.L.)	504 - 519	00:45 - 01:53	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.37 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{h}{24} + \frac{l}{96}\right) = \left(\frac{36}{24} + \frac{117.75}{96}\right) = 2.73 \text{ in} \geq 0.37 \text{ in} \therefore OK$$

Net rail deflection at 200 lb = 0.26 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.26 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 4 - Test Date: 04/23/20

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:29	0.00	0.37	0.00	0.37
500 lb (2.50 x D.L.)	500 - 512	00:45 - 01:54	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

Deflection Evaluation:

Maximum rail deflection at 200 lb = 0.37 in on a 10 ft rail (117-3/4 in)

Limits per AC273:

$$\left(\frac{l}{96}\right) = \left(\frac{117.75}{96}\right) = 1.23 \text{ in} \geq 0.37 \text{ in} \therefore OK$$

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

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Test No. 5 - Test Date: 04/23/20

Design Load: 200 lb Horizontal Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.) x 2	1000 - 1013	01:31 - 03:01	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

Test No. 6 - Test Date: 04/23/20

Design Load: 200 lb Vertical Concentrated Load at Ends of Top Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	RESULT
500 lb (2.50 x D.L.)	1001 - 1015	00:44 - 01:53	Each end sustained load equal to or greater than 500 lb for one full minute without failure

¹ Load was imposed on both ends of rail using a spreader beam; therefore, loads were doubled.

SECTION 8

CONCLUSION

When installed between adequate supports, the railing assemblies reported herein meet the structural performance requirements of Section 4.2.1 of ICC-ES™ AC273 for use in One- and Two-Family Dwellings (IRC).

Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

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SECTION 9 PHOTOGRAPHS



Photo No. 1

***Fe26* Traditional Rail with Wood Drink Rail Installed in Test Fixture**



Photo No. 2

Bracket Attachment to Wood Post

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Photo No. 3
Bracket Attachment to Steel Post Mount



Photo No. 4
Wood Drink Rail Attachment Bracket

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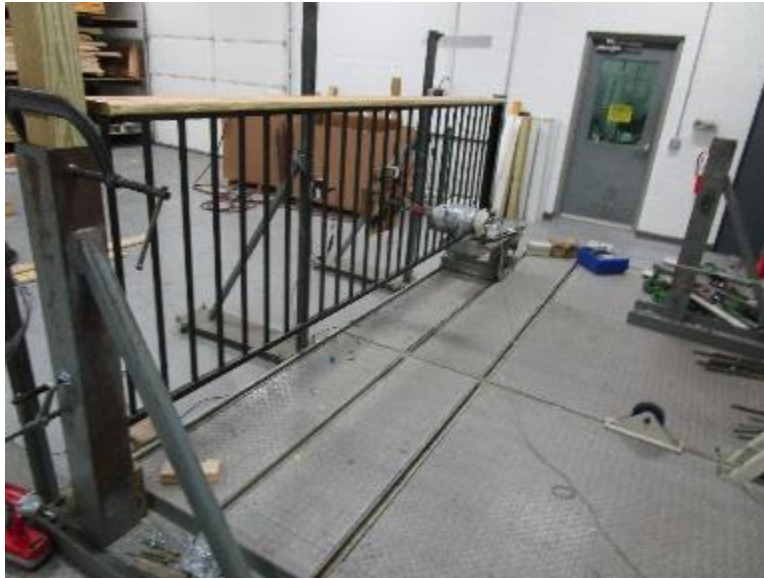


Photo No. 5
In-Fill Load Test at Center of Two Pickets

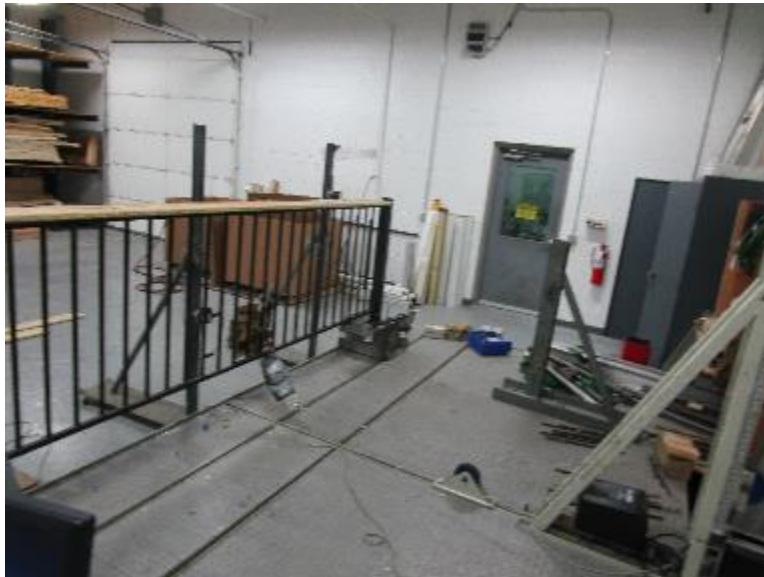


Photo No. 6
In-Fill Load Test at Bottom of Two Pickets

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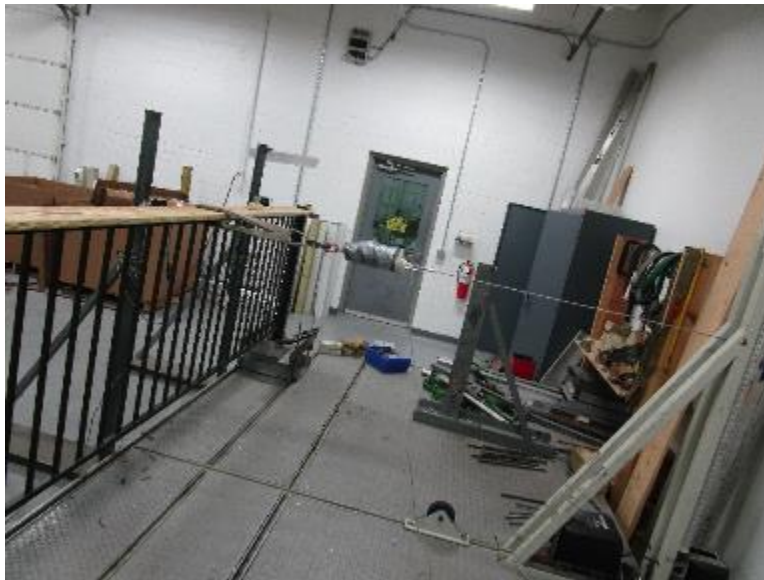


Photo No. 7

Horizontal Concentrated Load Test at Mid-Span of Top Rail

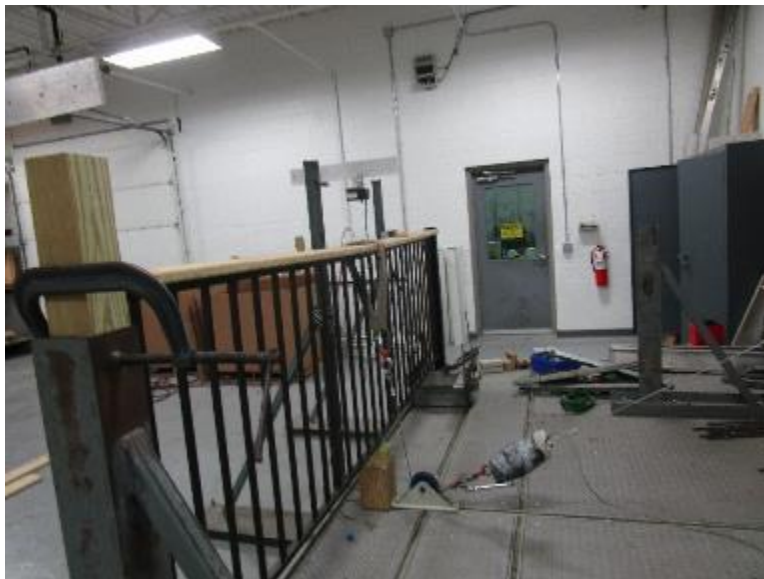


Photo No. 8

Vertical Concentrated Load Test at Mid-Span of Top Rail

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Photo No. 9
Horizontal Concentrated Load at Ends of Rail (Brackets)

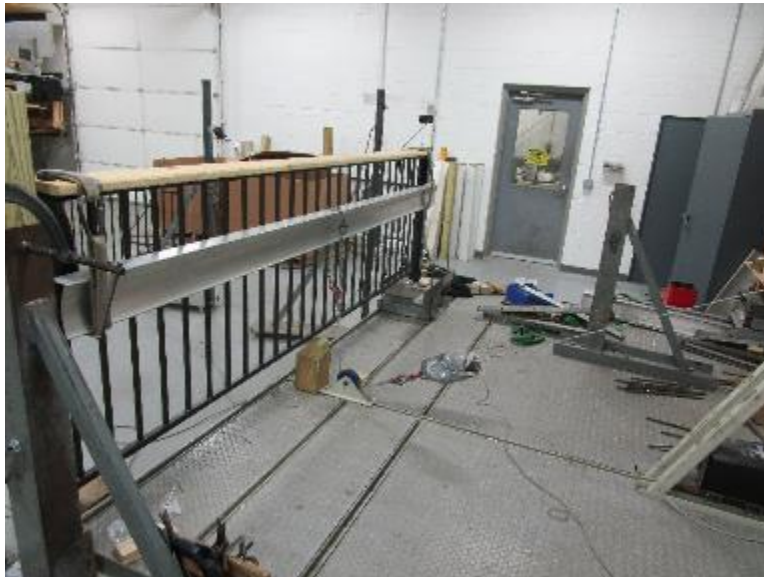


Photo No. 10
Vertical Concentrated Load at Ends of Rail (Brackets)



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Date: 06/09/20

SECTION 10 DRAWINGS

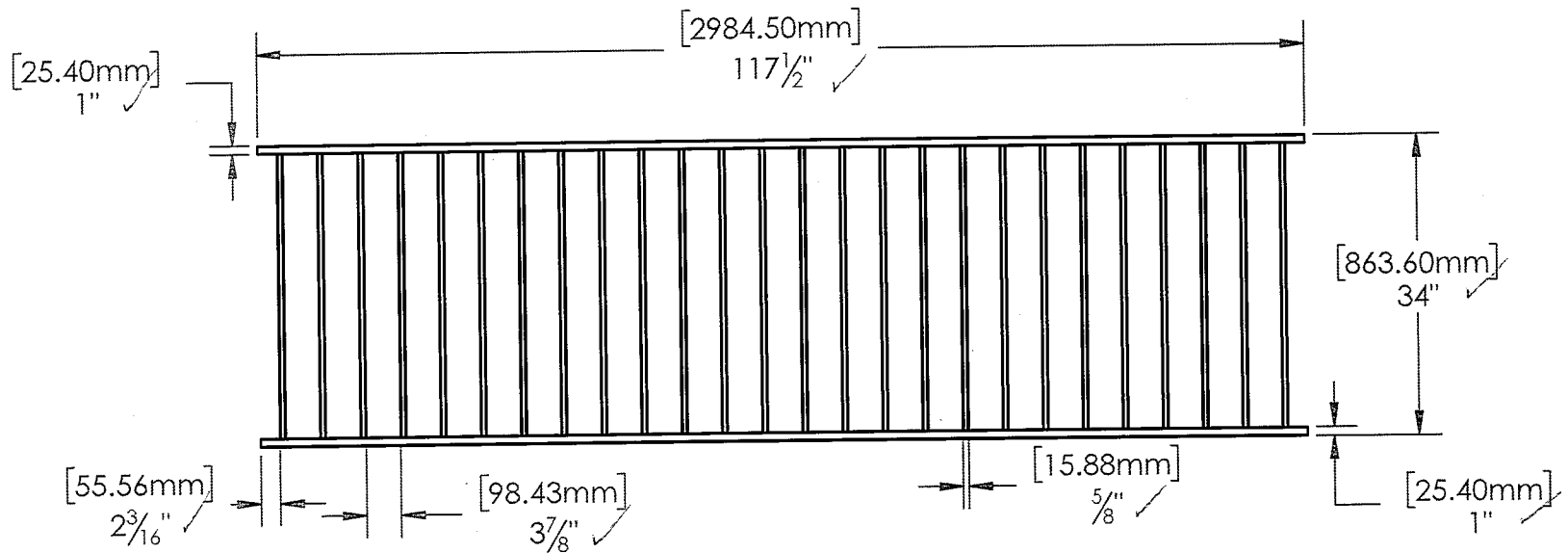
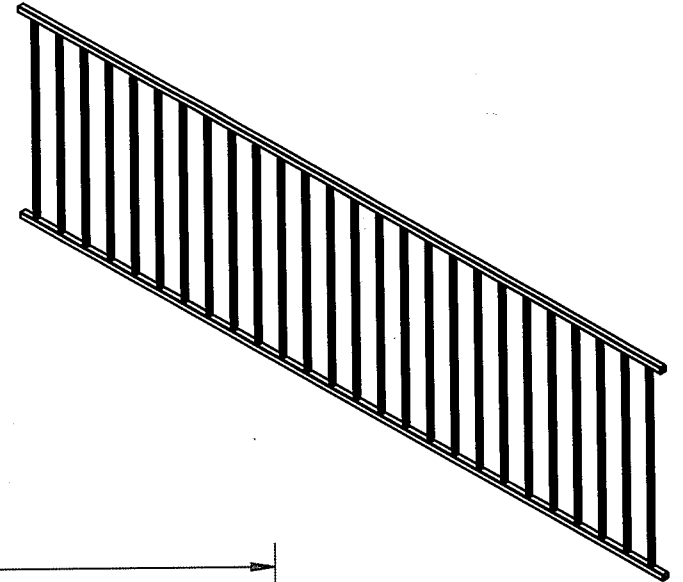
The "As-Built" drawings for the *Fe26 Traditional* level railing with wood drink rail which follow have been reviewed by Intertek B&C and are representative of the project reported herein. Project construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

intertek

Test sample complies with these details.
Deviations are noted.

Report # R9337.01-119-19

Date 5/7/20 Tech AJS



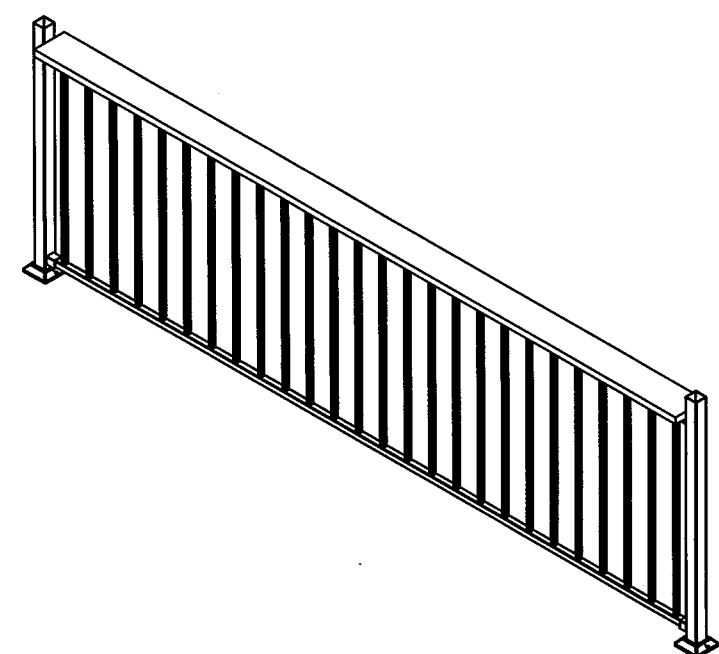
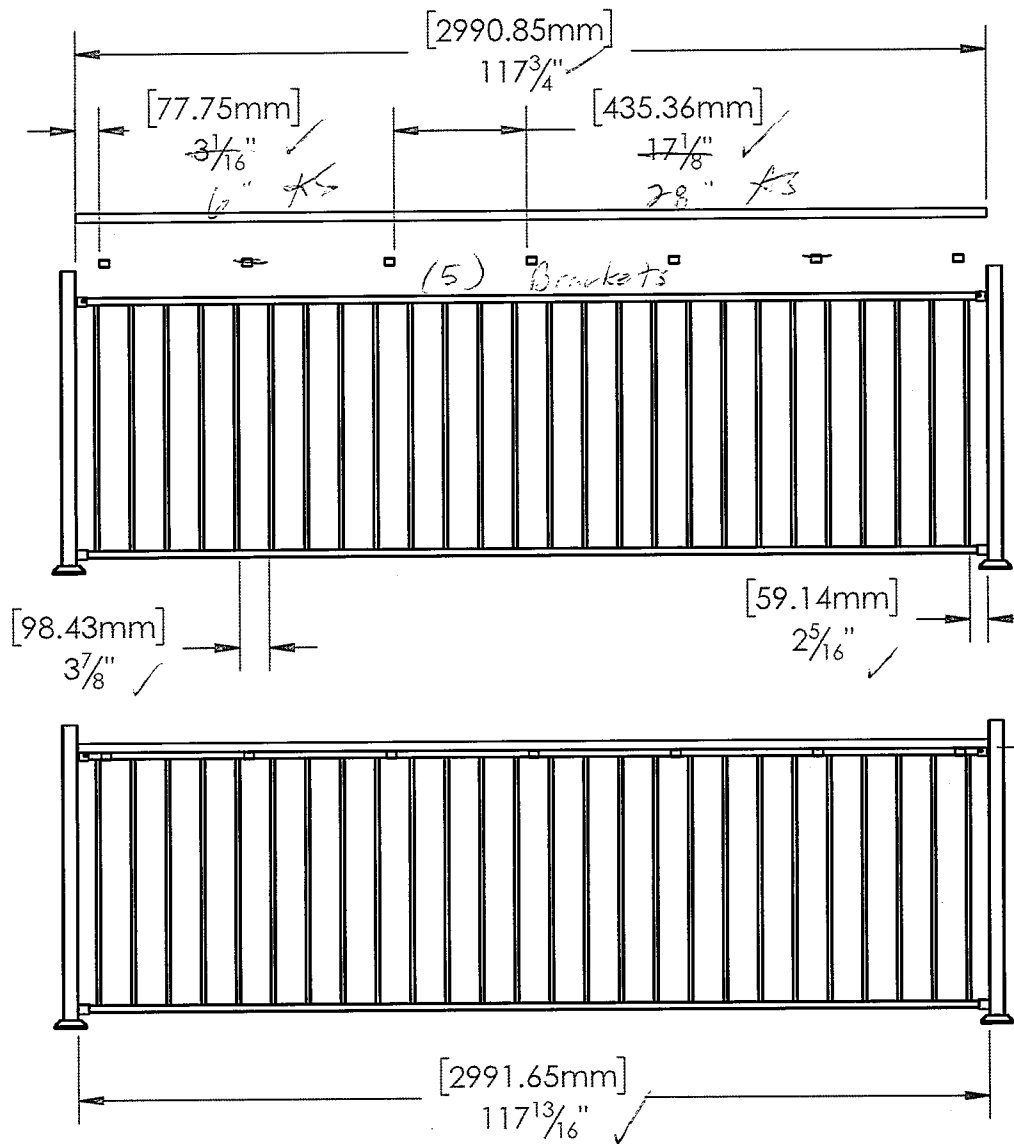
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Fortress Railing
1720 N 1st Street
Garland, Tx 75040

Sheet: 1 OF 1

B	04/27/2020	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION: FE26-TRADITIONAL 34"X10'			
DRAWN BY: TylerF		SCALE: AS SHOWN	
DATE: 04/27/2020	DIVISION: Fortress Railing		REV: B
ITEM #: 53134120	FILE NAME/PART #: Fe26 34in x 10ft Panel		



intertek

Test sample complies with these details.
Deviations are noted.

Report # K9337.01-119-19
Date 5/4/20 Tech A.J.S

B	04/24/20	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION: FE26-TRADITIONAL 34"X10'			
DRAWN BY: TylerF		SCALE: AS SHOWN	
DATE: 04/24/2020		DIVISION:	
ITEM #: 53134120	FILE NAME/PART #: Fe26 34in x 10ft with Drink	REV: B	

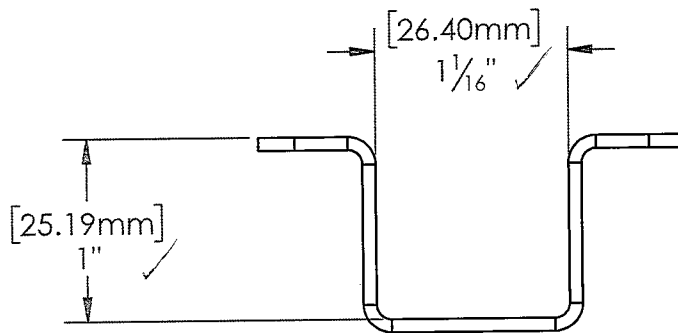
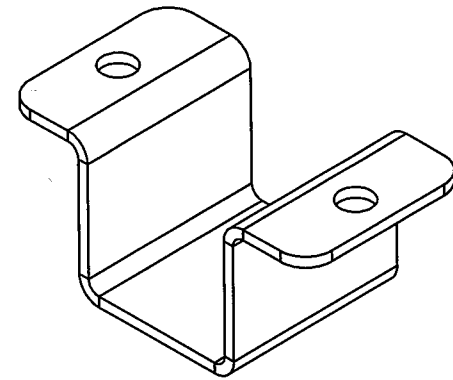
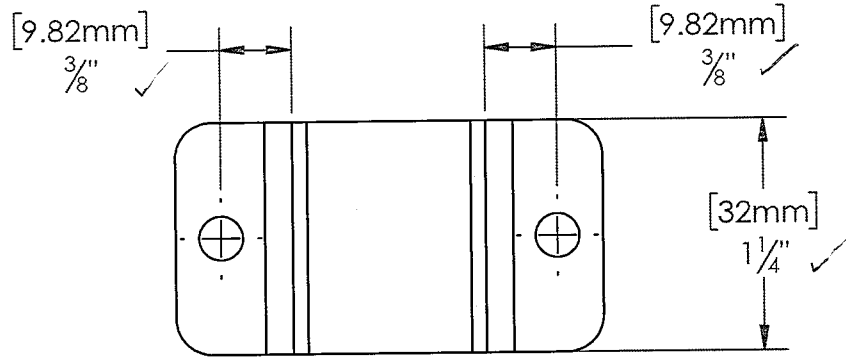
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FORTRESS
RAILING PRODUCTS

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Sheet: 1 OF 1

Rail



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Test sample complies with these details.
Deviations are noted.

Report # K9337-01-119-19

Date 5/4/20 Tech AJS

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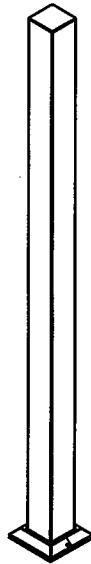
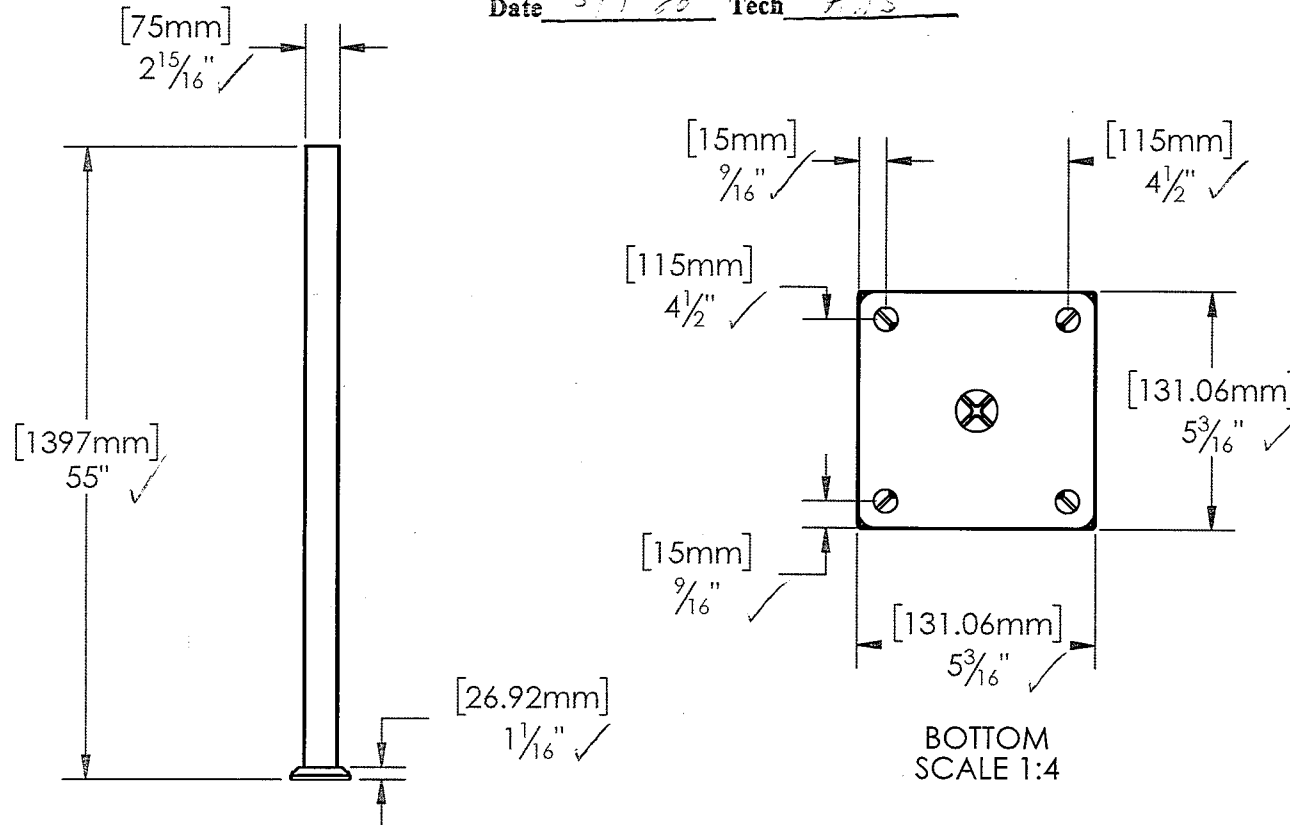
Sheet: 1 OF 1

D	04/28/2020	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION: FE26-CAP RAIL CLIP			
DRAWN BY: TylerF			SCALE: AS SHOWN
DATE: 04/28/2020		DIVISION: Fortress Railing	
ITEM #:	FILE NAME/PART #:	REV:	
	Fe26 Rail Clip	D	


intertek

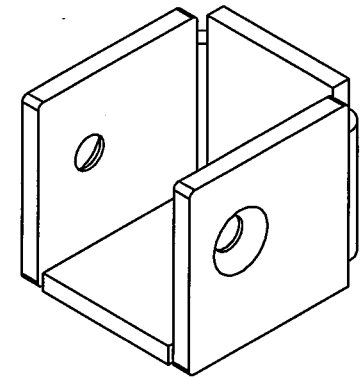
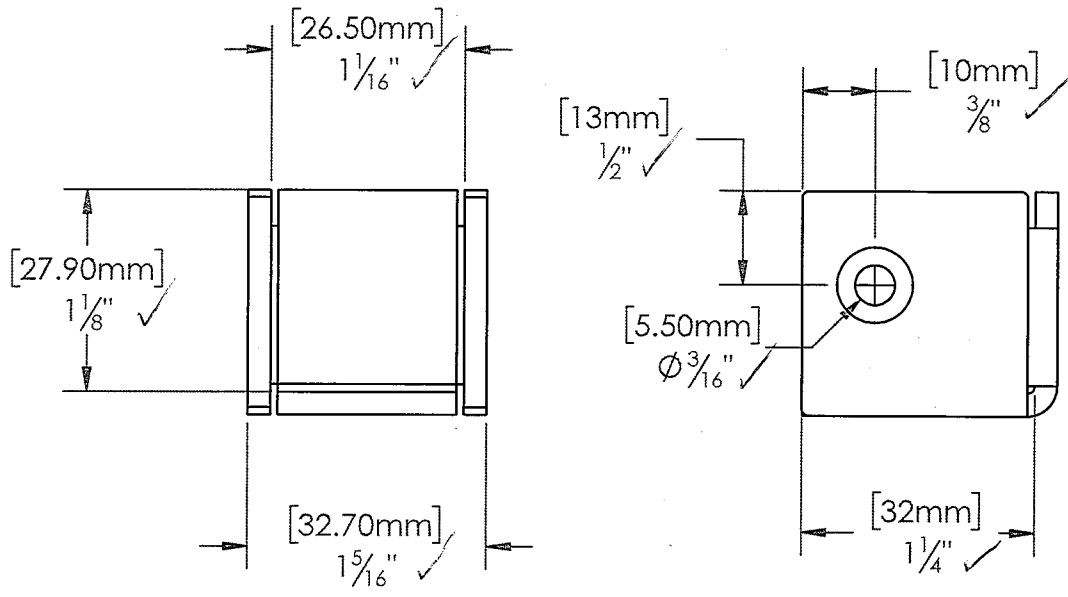
Test sample complies with these details.
Deviations are noted.

Report # K9337-01-119-19
Date 5/4/20 Tech AJS



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 Fortress Railing 1720 N 1st Street Garland, Tx 75040	B 04/27/2020 TF Initial Drawing	
	REV DATE BY DESCRIPTION	
DESCRIPTION: FE26 PLUS POST 3"X55" W/5.25		
DATE: 02/05/2016 DIVISION: Fortress Railing		SCALE: AS SHOWN
Sheet: 1 OF 1	ITEM #: 5330355X	FILE NAME/PART #: Fe26 3in x 55in post
		REV: B



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Test sample complies with these details.
Deviations are noted.

Report # K9337-01-119-19

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Sheet: 1 OF 1

E	04/27/2020	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION: FE-26 UB-04 CUP			
DRAWN BY: TylerF			SCALE: AS SHOWN
DATE: 04/27/2020		DIVISION: Railing	
ITEM #:	FILE NAME/PART #:		REV:
	UB-04		E



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TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: K9337.01-119-19 R0

Date: 06/09/20

SECTION 11

REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	06/09/20	N/A	Original Report Issue