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COASTAL CLASSIC RAILING LLC
TEST REPORT

SCOPE OF WORK
ICC-ES AC174 PERFORMANCE TESTING ON *TRADEMARK* AND *MODERN* GUARDRAIL SYSTEMS

REPORT NUMBER
I6424.01-119-19-R0

TEST DATE(S)
07/09/18 - 07/16/18

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09/12/18

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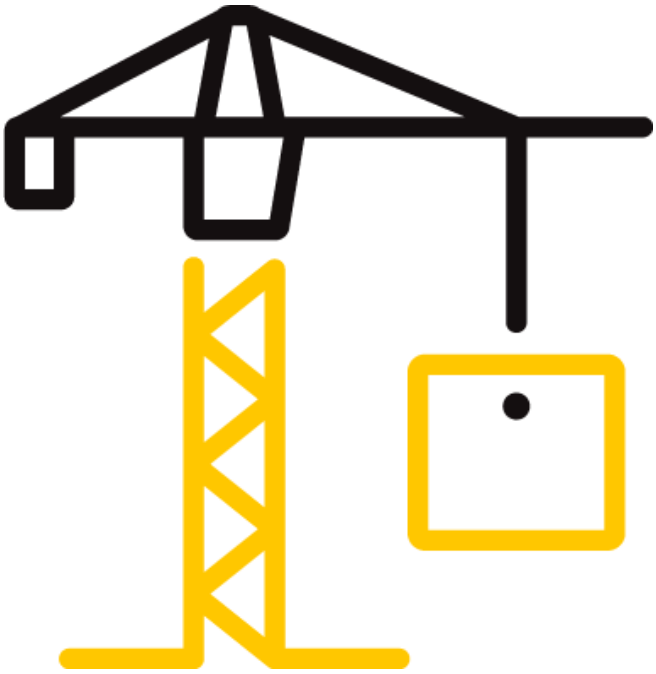

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
Report No.: I6424.01-119-19-R0
Date: 09/12/18

REPORT ISSUED TO
COASTAL CLASSIC RAILING LLC
103 Birch Drive
Cape May Court House, NJ 08210

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by Coastal Classic Railing LLC, Cape May Court House, NJ to perform testing in accordance with Sections 5.1 and 5.2 of ICC-ES™ AC174, on their *Trademark* and *Modern* guardrail (railing) systems. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at the Intertek B&C 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	**REVIEWED BY:**	V. Thomas Mickley, Jr., P.E.
TITLE:	Lead Technician	**TITLE:**	Senior Staff Engineer
SIGNATURE:	Digitally Signed by: Adam J. Schrum	**SIGNATURE:**	Digitally Signed by: Virgal Thomas Mickley, Jr.
DATE:	09/12/18	**DATE:**	09/12/18

AJS:vtm/aaa

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SECTION 2
TEST METHOD(S)

The purpose of the testing was structural performance evaluation in accordance with Sections 5.1 and 5.2 of the following criteria:

> **ICC-ES™ AC174 (approved January 2012, editorially revised December 2014)**, *Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems* (*Guards and Handrails*)

ICC-ES™ AC174-12 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

The specimens were evaluated in accordance with the following:

> **ASTM D1761-06**, *Standard Test Methods for Mechanical Fasteners in Wood*
>
> **ASTM D7032-10a**, *Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails)*

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 balusters, rails, rail brackets and attachment to the supporting structure. The preservative treated 4x4 support posts were conventional construction and not within the scope of the evaluation. Posts (preservative treated 4x4's) were therefore not a tested component and were included in the test specimen only to facilitate anchorage of the rail brackets.

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

Determination of guardrail end-use adjustments for the rigid cellular PVC material in accordance with Sections 3.6 - 3.8 of ICC-ES™ AC174 was not included in the scope of testing. Therefore, the test load adjustment factor was 2.5 x design load for all load tests.

SECTION 3
MATERIAL SOURCE/INSTALLATION

All materials utilized for testing reported herein were provided to Intertek B&C by Coastal Classic Railing LLC and were not sampled or selected by an independent inspection agency.

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

Test specimens were inspected prior to testing to verify the condition of the materials was suitable for testing. No potentially compromising defects were observed.

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SECTION 4
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Robert Greco	Coastal Classic Railing LLC
Charles Mullen	Coastal Classic Railing LLC
Adam J. Schrum	Intertek B&C

SECTION 5
TEST PROCEDURE

Unless otherwise indicated, all testing reported herein was conducted in a laboratory set to maintain temperature in the range of 68 ± 4 °F and humidity in the range of 50 ± 5% RH. All test specimen materials were stored in the laboratory environment for no less than 40 hours prior to testing.

ICC-ES™ AC174, Section 5.2 - Assembly Fastener Testing
The purpose of this testing was to simulate a 90° bracket loading condition for the in-line application, which addresses a situation when the guardrail system is to be installed with the top rails in a corner condition.

The testing machine was fitted with the post sections at the top and bottom to accommodate anchorage of the rail and brackets. The top post section was attached to the test machine's crosshead with a swivel mechanism, and the bottom post section was attached rigidly to the base of the test machine.

Reference photographs in Section 9 for test setups.

Testing was performed in accordance with ASTM D1761 and by using a computer-monitored and controlled Instron Model 3369 Universal Testing Machine. Tests were run at a crosshead speed of 0.05 in/min, and each specimen was tested in tension to its ultimate load capacity.

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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Date: 09/12/18

ICC-ES™ AC174, Section 5.1 - Structural Performance Testing of Assembled Railing Systems
Railing assemblies were tested 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.

Testing and evaluation was performed in accordance with Section 5.1 of ICC-ES™ AC174. 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; and
2. Increased load to specified test load in no less than ten seconds

The *Trademark* railing assembly was assembled and installed by an Intertek B&C technician and tested as a single span railing section by directly securing the 4x4 treated wood posts (Southern Pine) to a rigid test frame, which rigidly restrained the rail system. The 4x4 treated wood posts were included only to facilitate anchorage of the test specimen and were not tested components.

The *Modern* railing assembly was assembled and installed by an Intertek-ATI technician and tested as a two-span railing section (three posts) by directly securing (surface mounting) the stainless steel support posts and intermediate balusters to treated wood decking installed over steel channels and by directly securing the 4x4 treated wood posts (Southern Pine) to a rigid test frame, which rigidly restrained the rail system.

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.

SECTION 6
TEST SPECIMEN DESCRIPTION

Trademark railing systems are comprised of rigid cellular PVC rails and balusters produced by an extrusion process as well as extruded aluminium top and bottom rail reinforcing. *Modern* railing systems are comprised of rigid cellular PVC top rail caps, aluminium top rail reinforcing, stainless steel cable infill, and stainless steel posts. Extruded products are mono-extruded. 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.

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ICC-ES™ AC174, Section 5.2 - Assembly Fastener Testing

Short sections of the top rail reinforcing were attached in accordance with Coastal Classic Railing LLC's installation instructions to short sections of posts. Specimens were assembled by an Intertek B&C technician. The rail brackets were attached to treated 4x4 wood posts (Southern Pine). Brackets were secured to the post and to the rail as described in the Fastening Schedule.

ICC-ES™ AC174, Section 5.1 - Structural Performance Testing of Assembled Railing Systems

The *Trademark* guardrail systems consisted of rigid cellular PVC top and bottom rails with spaced balusters between the rail members. The railing systems had an overall top rail length (inside of post to inside of post) of 144-3/8 in (level rail) or 121 in (stair rail) with an overall rail height (top of top rail to bottom of bottom rail) of 39-1/4 in (level rail) or 39-1/2 in (stair rail; measured parallel to the baluster). The *Modern* guardrail systems consisted of aluminum reinforced rigid cellular PVC top rails with horizontal cable infill. The railing systems had an overall top rail length (inside of post to inside of post) of 124 in (level and stair rail) with an overall rail height (top of top rail to bottom of infill) of 40 in (level rail) or 40-3/4 in (stair rail; measured parallel to the post). Top (*Trademark* and *Modern*) and bottom (*Trademark* only) rails attached to treated 4x4 wood posts (Southern Pine) via metal brackets. See Fastening Schedule for connection details. The level *Trademark* guardrail system included three support blocks and the stair *Trademark* guardrail system included two support blocks. Support blocks were equally spaced along the bottom rail. See Fastening Schedule for connection details. See drawings in Section 10 and photographs in Section 9 for additional details.

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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Date: 09/12/18

Component Descriptions

Top Rail: - *Trademark* - 3-15/16 in wide by 2-5/8 in high contoured, *Classic Cove*, rigid cellular PVC rail profile (aluminum reinforced)

- *Modern* - 3-3/16 in wide by 2-1/2 in high flat top rigid cellular PVC rail profile (aluminum reinforced)

Bottom Rail - *Trademark* - 3-3/16 in wide by 2-1/2 in high flat top rigid cellular PVC rail profile (aluminum reinforced)

Aluminum Reinforcing Inserts - 2 in wide by 1-13/16 in high extruded 6061-T6 aluminum section with four raceway channels, full length of rail. Used in top and bottom rail of *Trademark* rail systems and top rail of *Modern* rail systems.

Balusters: *Trademark* - 1-1/2 in square, solid, rigid cellular PVC pickets

Modern - 1/8 in, 1x19, stainless steel cable

Support Block - *Trademark* - 1-1/2 in square, solid, rigid cellular PVC picket

Intermediate Baluster - 3/4 in square by 0.060 in wall stainless steel picket (*Modern* guardrail system only) (one each at midspan of each of two guardrail sections)

Rail Connection Condition - Level Rail - 2 in wide by 1-5/8 in high by 0.11 in thick, 316 stainless internal brackets with connection details as found in the Fastening Schedule.

- Stair Rail - 1-15/16 in wide by 2-1/8 in high by 0.15 in thick, 316 stainless internal brackets with connection details as found in the Fastening Schedule.

Support Posts: - *Trademark* - Preservative-treated wood (Southern Pine) 4x4

- *Modern* - 1-1/2 in square by 0.080 in wall, stainless steel tube post welded to 3-13/16 in square by 0.23 in thick base plate with 3/16 in fillet weld all around; the base plate included four 1/4 in diameter countersunk holes spaced 9/16 in on-center from each edge and 2-11/16 in on-center apart and one 1-1/2 in square hole at the center of the plate

- Preservative-treated wood (Southern Pine) 4x4

Note: Each Modern guardrail system consisted of three stainless steel posts (one at midpoint and one at each end) as well as two preservative treated 4x4's. The top rail reinforcing attached to each of the three stainless steel posts as well as to each of the two 4x4's. Reference photographs in Section 9 for additional information.

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Fastening Schedule

CONNECTION	FASTENER
Rail Bracket to Wood Post	Three 1/4-14 by 3-1/2 in (0.178 in minor diameter) star-drive, flat-head, Type 17 point, wood screw
Rail Bracket to Rail Reinforcing	Four #10-24 by 1-1/4 in star-drive, flat-head, machine screws
Top Rail Reinforcing to 1-1/2 in Square Post (*Modern* rail system only)	Two 5/16-20 by 1-1/4 in machine screws with washers and nuts. The head of the machine screws were welded to the end of the 1-1/2 in Square Post.
Intermediate Baluster to Top Rail Reinforcing	One 5/16-20 by 1-1/4 in machine screw with washer and nut. The head of the machine screw was welded to the end of the intermediate baluster.
Picket to Top Rail Reinforcing / Bottom Rail	One #12-14 by 2-1/2 in (0.152 in minor diameter) star-drive, flat-head, Type 17 point, wood screw
Support Block to Bottom Rail Reinforcing	One #12-14 by 2-1/2 in (0.152 in minor diameter) star-drive, flat-head, Type 17 point, wood screw
Cable Infill to 1-1/2 in Square Support Post (Ends)	Quick connect, threaded, swageless fitting
Cable Infill to Intermediate Baluster / Center 1-1/2 in Square Support Post	Cable infill was run through holes in post - No mechanical connection
1-1/2 in Square Support Post to Wood Decking and Steel Channel	Four 1/4 in Gr. 5 hex head bolts with nut and washer
Intermediate Baluster to Wood Decking and Steel Channel	One 5/16-12 by 1-3/8 in (0.237 in minor diameter) wood screw. The head of the wood screw was welded to the end of the intermediate baluster.

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SECTION 7
TEST RESULTS

ICC-ES™ AC174, Section 5.2 - Assembly Fastener Testing

TEST DATE: 07/10/18			
SPECIMEN NO.	**ULTIMATE LOAD (lb)**	**DEVIATION FROM AVERAGE**	**MODE OF FAILURE**
1	2639	-30.9%	Bracket to rail reinforcing connection screw failure
2	4312	+12.9%	
3	4510	+18.1%	
AVERAGE	**3820**		
ALLOWABLE CAPACITY [1]	**1273**	**≥ 300 lb ∴ OK [2]**	

[1] *Average ultimate load divided by a factor of safety of three (3.0)*

[2] *Acceptance criteria determined from the uniform load test: 50 plf x 144 in ÷ 12 in ÷ 2 brackets = 300 lb*

ICC-ES™ AC174, Section 5.1 - Structural Performance Testing of Assembled Railing Systems
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. The test load adjustment factor was 2.5 x design load for all load tests.

Key to Test Results Tables:

Load Level: Target test load

Test Load: Actual applied load at the designated load level (target)

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
Report No.: I6424.01-119-19-R0
Date: 09/12/18

Test Series No. 1
12 ft by 42 in *Trademark* Rigid Cellular PVC Level Guardrail
IBC - All Use Groups / ICC-ES AC174

Specimen No. 1 of 3

TEST NO. 1 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	132	00:38	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	127	00:30	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1509	01:48	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 4 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1505	00:47	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

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TEST NO. 5 - TEST DATE: 07/09/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	202	00:29	0.00	2.28	0.02	2.27
500 lb (2.50 x D.L.)	503	00:55	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 202 lb = 2.27 in on a 144-3/8 in rail Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{144.375}{96}\right)=3.25" > 2.27" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/09/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:48	Each end withstood load equal to or greater than 500 lb 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: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	128	00:16	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	127	00:17	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1517	00:47	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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Date: 09/12/18

TEST NO. 4 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1509	00:43	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 5 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	200	00:26	0.00	2.15	0.02	2.14
500 lb (2.50 x D.L.)	506	00:49	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 200 lb = 2.14 in on a 144-3/8 in rail Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{144.375}{96}\right)=3.25" > 2.14" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:33	Each end withstood load equal to or greater than 500 lb 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: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	127	00:15	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	127	00:12	Withstood load equal to or greater than 125 lb without failure

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Date: 09/12/18

TEST NO. 3 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1516	01:35	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 4 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (144.375 IN ÷ 12 IN/FT) = 602 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1505 lb (2.50 x D.L.)	1506	00:49	Withstood load equal to or greater than 1505 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 5 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	201	00:27	0.02	2.15	0.02	2.13
500 lb (2.50 x D.L.)	502	00:55	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 201 lb = 2.13 in on a 144-3/8 in rail Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{144.375}{96}\right)=3.25" > 2.13" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:31	Each end withstood load equal to or greater than 500 lb without failure

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

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
Report No.: I6424.01-119-19-R0
Date: 09/12/18

Test Series No. 2
10 ft in by 42 in *Modern* Cable Infill Level Guardrail (Tested in a Two-Span Condition)
IBC - All Use Groups / ICC-ES AC174

Specimen No. 1 of 3

TEST NO. 1 - TEST DATE: 07/10/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL**			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	254	00:58	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *sections of infill using a spreader beam; therefore, loads were doubled.*

TEST NO. 2 - TEST DATE: 07/10/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTERS**			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	257	00:30	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *intermediate balusters using a spreader beam; therefore, loads were doubled.*

TEST NO. 3 - TEST DATE: 07/10/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1294	01:27	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with five equal point loads.*

TEST NO. 4 - TEST DATE: 07/10/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1295	00:48	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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TEST NO. 5 - TEST DATE: 07/10/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT [1] (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	400	00:33	1.20	1.23
1000 lb (2.50 x D.L.) x 2	1006	00:55	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 200 lb = 1.23 in on a 124 in rail (two, 59-1/4 in spans) Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37" > 1.23" \therefore ok$				

[1] Each displacement was measured at the midspan of the section.

[2] Load was imposed simultaneously on both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/10/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1019	00:33	Each end withstood load equal to or greater than 500 lb without failure

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

TEST NO. 7 - TEST DATE: 07/10/18 **DESIGN LOAD: 50 PLF X (59-1/4 IN RAIL LENGTH + 1-1/2 IN POST WIDTH) ÷ 12 IN/FT = 253 LB CONCENTRATED LOAD ON TOP OF A CENTER POST [1]**			
LOAD LEVEL	**TEST LOAD (LB)**	**E.T. (MIN:SEC)**	**DISPLACEMENT (INCHES)**
200 lb	203	00:53	1.20
633 lb (2.5 x D.L.)	647	01:27	**Result**: Withstood load equal to or greater than 633 lb without failure
Deflection Evaluation: Maximum post deflection at 203 lb = 1.20 in Limit per AC174 : $\frac{h}{12}=\frac{42}{12}=3.50" > 1.20" \therefore ok$			

[1] Load was imposed on post during the horizontal uniform load test.

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Specimen No. 2 of 3

TEST NO. 1 - TEST DATE: 07/11/18 DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	254	00:28	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *sections of infill using a spreader beam; therefore, loads were doubled.*

TEST NO. 2 - TEST DATE: 07/11/18 DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTERS			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	250	00:20	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *intermediate balusters using a spreader beam; therefore, loads were doubled.*

TEST NO. 3 - TEST DATE: 07/11/18 DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1295	01:34	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with five equal point loads.*

TEST NO. 4 - TEST DATE: 07/11/18 DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1295	01:11	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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TEST NO. 5 - TEST DATE: 07/11/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT [1] (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	402	00:27	1.24	1.23
1000 lb (2.50 x D.L.) x 2	1035	00:47	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 201 lb = 1.24 in on a 124 in rail (two, 59-1/4 in spans) Limits per AC174 : $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37"> 1.24" \therefore ok$				

[1] Each displacement was measured at the midspan of the section.

[2] Load was imposed simultaneously on both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/11/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:38	Each end withstood load equal to or greater than 500 lb without failure

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

TEST NO. 7 - TEST DATE: 07/11/18 and 09/10/18 **DESIGN LOAD: 50 PLF X (59-1/4 IN RAIL LENGTH + 1-1/2 IN POST WIDTH) ÷ 12 IN/FT = 253 LB CONCENTRATED LOAD ON TOP OF A CENTER POST [1]**			
LOAD LEVEL	**TEST LOAD (LB)**	**E.T. (MIN:SEC)**	**DISPLACEMENT (INCHES)**
200 lb (D.L.)	202	00:35	1.38
633 lb (2.5 x D.L.)	648	01:34	**Result**: Withstood load equal to or greater than 633 lb without failure
Deflection Evaluation: Maximum post deflection at 201 lb = 1.38 in Limit per AC174 : $\frac{h}{12}=\frac{42}{12}=3.50"> 1.38" \therefore ok$			

[1] Load was imposed on post during the horizontal uniform load test.

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Report No.: I6424.01-119-19-R0
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Specimen No. 3 of 3

TEST NO. 1 - TEST DATE: 07/11/18 DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	255	00:23	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *sections of infill using a spreader beam; therefore, loads were doubled.*

TEST NO. 2 - TEST DATE: 07/11/18 DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTERS			
LOAD LEVEL [1]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
250 lb (2.50 x D.L.) x 2	254	00:29	Each section withstood load equal to or greater than 125 lb without failure

[1] *Load was imposed simultaneously on* both *intermediate balusters using a spreader beam; therefore, loads were doubled.*

TEST NO. 3 - TEST DATE: 07/11/18 DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1304	01:17	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with five equal point loads.*

TEST NO. 4 - TEST DATE: 07/11/18 DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 517 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1293 lb (2.50 x D.L.)	1305	00:46	Withstood load equal to or greater than 1293 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

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TEST NO. 5 - TEST DATE: 07/11/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	400	00:23	1.32	1.30
1000 lb (2.50 x D.L.) x 2	1005	00:46	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 200 lb = 1.32 in on a 124 in rail (two, 59-1/4 in spans) Limits per AC174 : $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37"> 1.32" \therefore ok$				

[1] Each displacement was measured at the midspan of the section.

[2] Load was imposed simultaneously on both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/11/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1022	00:25	Each end withstood load equal to or greater than 500 lb without failure

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

TEST NO. 7 - TEST DATES: 07/11/18 and 09/10/18 **DESIGN LOAD: 50 PLF X (59-1/4 IN RAIL LENGTH + 1-1/2 IN POST WIDTH) ÷ 12 IN/FT = 253 LB CONCENTRATED LOAD ON TOP OF A CENTER POST [1]**			
LOAD LEVEL	**TEST LOAD (LB)**	**E.T. (MIN:SEC)**	**DISPLACEMENT (INCHES)**
200 lb (D.L)	201	00:30	1.28
633 lb (2.5 x D.L.)	652	01:17	**Result**: Withstood load equal to or greater than 633 lb without failure
Deflection Evaluation: Maximum post deflection at 208 lb = 1.28 in Limit per AC174 : $\frac{h}{12}=\frac{42}{12}=3.50"> 1.28" \therefore ok$			

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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Test Series No. 3
10 ft by 42 in by 35° *Trademark* Rigid Cellular PVC Stair Guardrail
IBC - All Use Groups / ICC-ES AC174

Specimen No. 1 of 3

TEST NO. 1 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	127	00:25	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	128	00:28	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1273	01:04	Withstood load equal to or greater than 1260 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

TEST NO. 4 - TEST DATE: 07/09/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1266	00:59	Withstood load equal to or greater than 1260 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
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TEST NO. 5 - TEST DATE: 07/09/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	200	00:27	0.11	1.33	0.03	1.26
500 lb (2.50 x D.L.)	504	00:53	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 200 lb = 1.26 in on a 121 in rail Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{121}{96}\right)=3.01" > 1.26" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/09/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1009	00:47	Each end withstood load equal to or greater than 500 lb 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: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	126	00:15	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	133	00:10	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1267	01:12	Withstood load equal to or greater than 1260 lb without failure

[1] Uniform load was simulated with four equal point loads.

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TEST NO. 4 - TEST DATE: 07/12/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1261	00:38	Withstood load equal to or greater than 1260 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 5 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	201	00:12	0.02	1.36	0.10	1.30
500 lb (2.50 x D.L.)	508	00:27	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 201 lb = 1.30 in on a 121 in rail Limits per AC174 : $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{121}{96}\right)=3.01" > 1.30" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/12/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:30	Each end withstood load equal to or greater than 500 lb 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: 07/13/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	126	00:21	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT BOTTOM OF TWO PICKETS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	131	00:14	Withstood load equal to or greater than 125 lb without failure

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Date: 09/12/18

TEST NO. 3 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1260	01:26	Withstood load equal to or greater than 1260 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

TEST NO. 4 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 PLF X (121 IN ÷ 12 IN/FT) = 504 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1260 lb (2.50 x D.L.)	1271	00:55	Withstood load equal to or greater than 1260 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

TEST NO. 5 - TEST DATE: 07/13/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**						
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT (INCHES)**			
			END	**MID**	**END**	**NET [1]**
200 lb (D.L.)	202	00:24	0.02	1.44	0.15	1.36
500 lb (2.50 x D.L.)	507	00:57	**Result**: Withstood load equal to or greater than 500 lb without failure			
Deflection Evaluation: Maximum rail deflection at 202 lb = 1.36 in on a 121 in rail Limits per AC174 : $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{121}{96}\right)=3.01" > 1.36" \therefore ok$						

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

TEST NO. 6 - TEST DATE: 07/13/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1012	00:30	Each end withstood load equal to or greater than 500 lb without failure

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

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TEST REPORT FOR COASTAL CLASSIC RAILING LLC
Report No.: I6424.01-119-19-R0
Date: 09/12/18

Test Series No. 4
10 ft by 42 in by 35° *Modern* Cable Infill Stair Guardrail (Tested in a Two-Span Condition)
IBC - All Use Groups / ICC-ES AC174

Specimen No. 1 of 3

TEST NO. 1 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	130	00:24	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTER**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	129	00:13	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1298	02:26	Withstood load equal to or greater than 1292 lb without failure

[1] *Uniform load was simulated with five equal point loads.*

TEST NO. 4 - TEST DATE: 07/13/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1297	01:19	Withstood load equal to or greater than 1292 lb without failure

[1] *Uniform load was simulated with four equal point loads.*

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TEST NO. 5 - TEST DATE: 07/13/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT [1] (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	401	00:41	0.14	2.21
1000 lb (2.50 x D.L.) x 2	1003	01:12	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 200 lb = 2.21 in on a 124 in rail (two, 59-1/4 in spans) Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37<2.21\therefore ok$				

[1] Each displacement was measured at the midspan of the section.

[2] Load was imposed simultaneously on both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/13/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1004	00:37	Each end withstood load equal to or greater than 500 lb 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: 07/16/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	129	00:27	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTERS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	128	00:12	Withstood load equal to or greater than 125 lb without failure

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TEST NO. 3 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1292	02:38	Withstood load equal to or greater than 1292 lb without failure

[1] Uniform load was simulated with five equal point loads.

TEST NO. 4 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1298	00:51	Withstood load equal to or greater than 1292 lb without failure

[1] Uniform load was simulated with four equal point loads.

TEST NO. 5 - TEST DATE: 07/16/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT [1] (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	410	00:24	1.46	1.54
1000 lb (2.50 x D.L.) x 2	1004	01:05	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 205 lb = 1.54 in on an 124 in rail (two, 59-1/4 in spans) Limits per AC174 : $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37>1.54\therefore ok$				

[1] Each end displacement was measured at the midspan of the section.

[2] Load was imposed simultaneously on both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/16/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1009	00:35	Each end withstood load equal to or greater than 500 lb without failure

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

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Specimen No. 3 of 3

TEST NO. 1 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF CABLE INFILL**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	131	00:18	Withstood load equal to or greater than 125 lb without failure

TEST NO. 2 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 LB / 1 SQUARE FT OF INFILL AT CENTER OF INTERMEDIATE BALUSTERS**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
125 lb (2.50 x D.L.)	129	00:17	Withstood load equal to or greater than 125 lb without failure

TEST NO. 3 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB HORIZONTAL UNIFORM LOAD ON TOP RAIL [1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1302	01:14	Withstood load equal to or greater than 1292 lb without failure

[1] Uniform load was simulated with five equal point loads.

TEST NO. 4 - TEST DATE: 07/16/18 **DESIGN LOAD: 50 PLF X (124 IN ÷ 12 IN/FT) = 516.7 LB VERTICAL UNIFORM LOAD ON TOP RAIL[1]**			
LOAD LEVEL	**TEST LOAD (lb)**	**E.T. (min:sec)**	**RESULT**
1292 lb (2.50 x D.L.)	1293	00:37	Withstood load equal to or greater than 1292 lb without failure

[1] Uniform load was simulated with four equal point loads.

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TEST NO. 5 - TEST DATE: 07/16/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT MIDSPAN OF TOP RAIL**				
LOAD LEVEL [2]	**TEST LOAD (lb)**	**E.T. (min:sec)**	**DISPLACEMENT [1] (INCHES)**	
			LEFT SECTION	**RIGHT SECTION**
400 lb (D.L.) x 2	404	00:24	1.49	1.55
1000 lb (2.50 x D.L.) x 2	1009	00:45	**Result**: Each section withstood load equal to or greater than 500 lb without failure	
Deflection Evaluation: Maximum rail deflection at 202 lb = 1.55 in on a 124 in rail (two, 59-1/4 in spans) Limits per AC174: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{42}{24}+\frac{59.25}{96}\right)=2.37>1.55\therefore ok$				

[1] *Each end displacement was measured at the center of the midspan of the section.*

[2] *Load was imposed simultaneously on* both *spans of guardrail using a spreader beam; therefore, loads were doubled.*

TEST NO. 6 - TEST DATE: 07/16/18 **DESIGN LOAD: 200 LB CONCENTRATED LOAD AT BOTH 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	1007	00:23	Each end withstood load equal to or greater than 500 lb without failure

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

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SECTION 8
CONCLUSION

ICC-ES™ AC174, Section 5.2 - Assembly Fastener Testing
The maximum design load rating required for guardrail systems for use in IRC - One- and Two-Family Dwellings is 200 lbs, and the maximum design load rating required for guardrail systems with rail lengths up to and including 12 ft for use in IBC - All Use Groups is 300 lbs. Therefore, fasteners / connectors reported herein meet the performance requirements of ICC-ES™ AC174 for use in corner conditions.

ICC-ES™ AC174, Section 5.1 - Structural Performance Testing of Assembled Railing Systems
The railing assemblies reported herein meet the structural performance requirements of Section 5.1 of ICC-ES™ AC174 as installed between adequate supports.

The railing supports were not included within the scope of this testing, and these conclusions would apply only for a railing that is provided with adequate supports that provide equal or better substrate material (Southern Pine wood) for the fasteners used to anchor the rail brackets.

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
Assembly Fastener Test Setup

Photo No. 2
Infill Loading at Center of Two Balusters

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Photo No. 3
Infill Loading at Center of Both Intermediate Balusters

Photo No. 4
Horizontal Uniform Load on Top Rail

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Photo No. 5
Vertical Uniform Load on Top Rail

Photo No. 6
Concentrated Load at Midspan of Top Rail - *Trademark*

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Photo No. 7
Concentrated Load at Midspan of Top Rail - *Modern*

Photo No. 8
Concentrated Load at Both Ends of Top Rail (Brackets)

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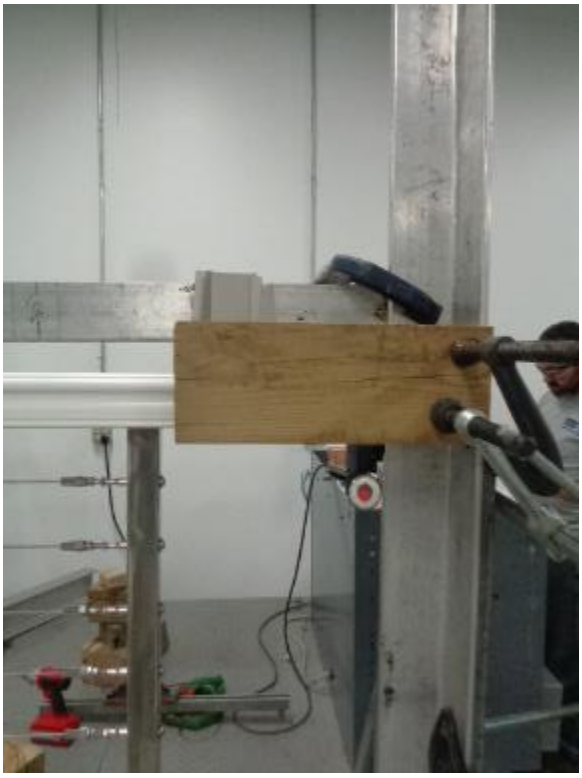

Photo No. 9
Modern Guardrail - End of Rail Condition

SECTION 10
DRAWINGS

The "As-Built" drawings for the *Trademark* and *Modern* guardrail (railing) systems 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.

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Test sample complies with these details. Deviations are noted.

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NAME

Trademark Railings
Rails Details - Esc: 1:4

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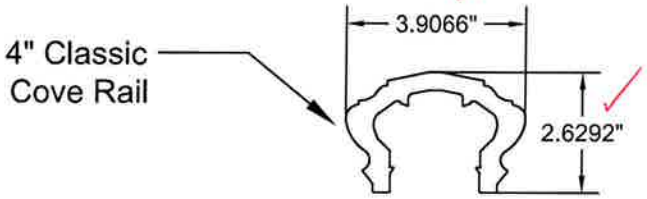
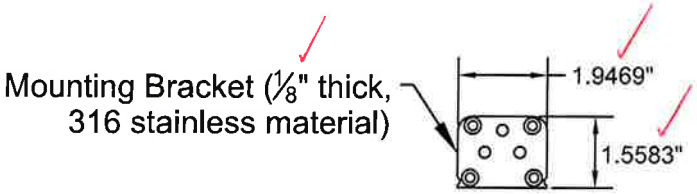
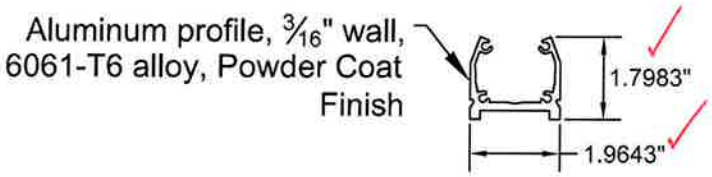
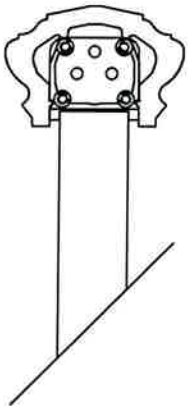
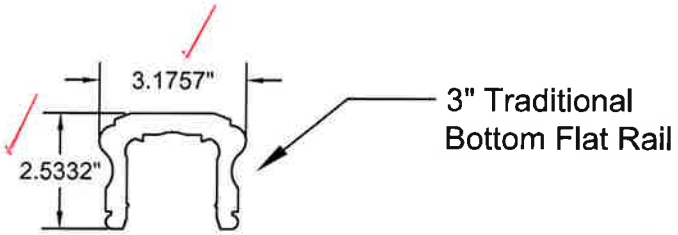


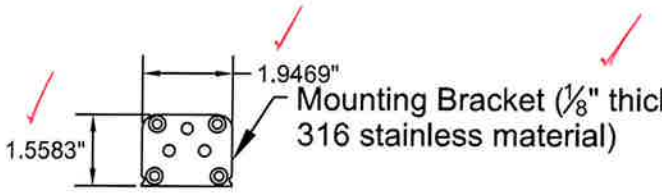


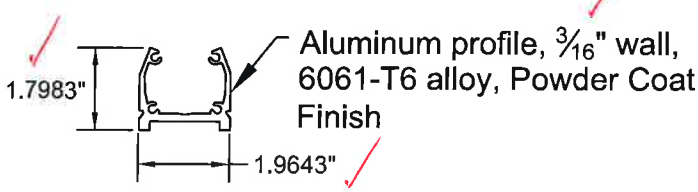


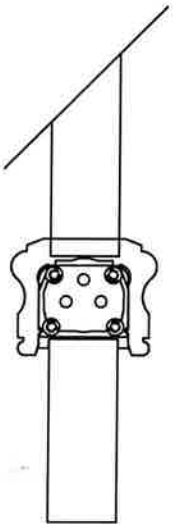


Top Rail









Bottom Rail

NAME

Modern Cable Continuous HandRail - Esc: 1:16

A: Stainless post
B: Cable support
C: Continuous aluminium top rail
D: Continuous PVC top rail cover

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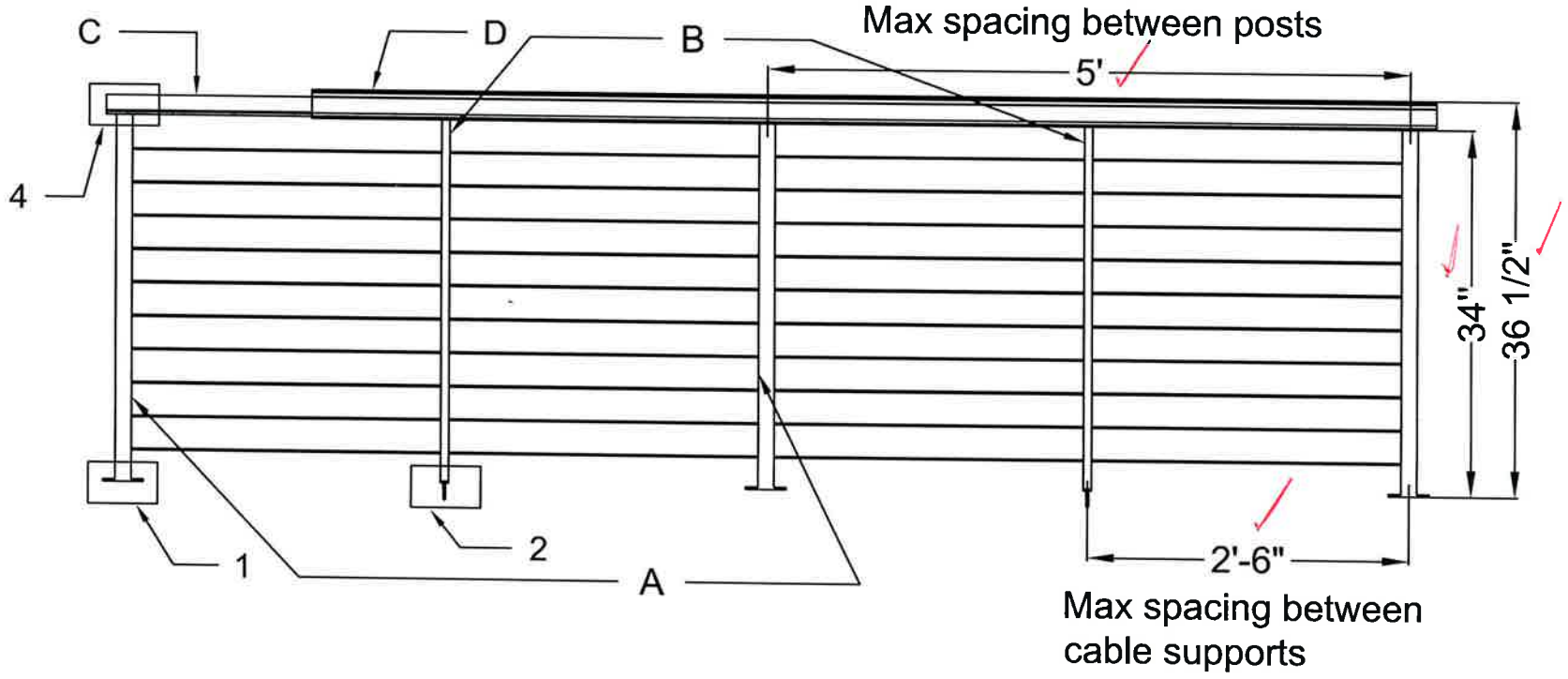

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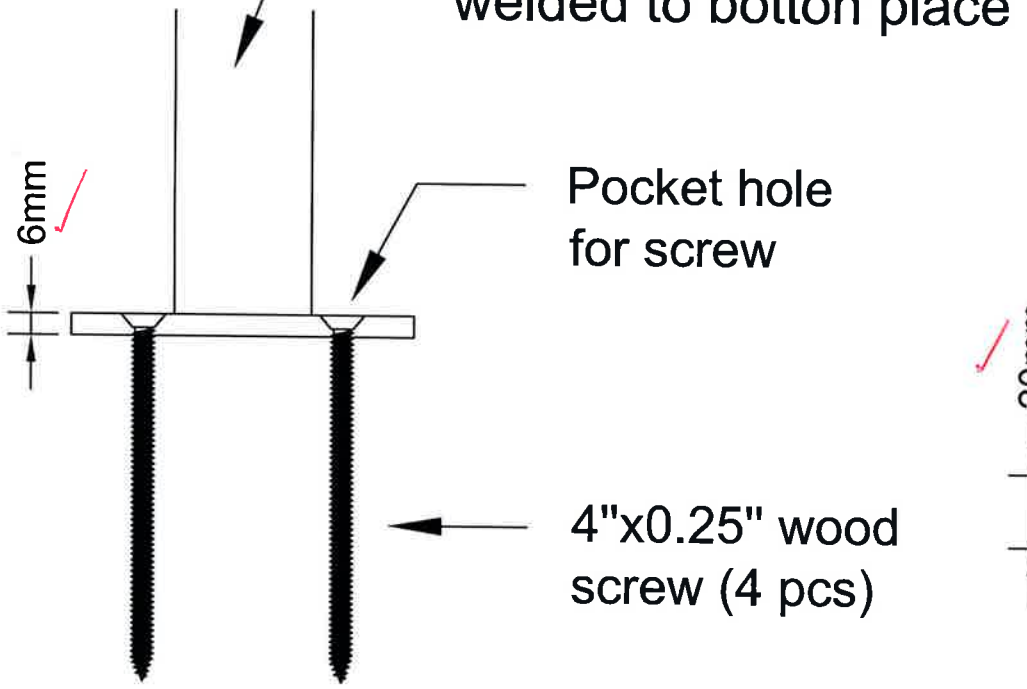
NAME

Modern Cable Continuous HandRail

Detail 1 - Esc: 1:2



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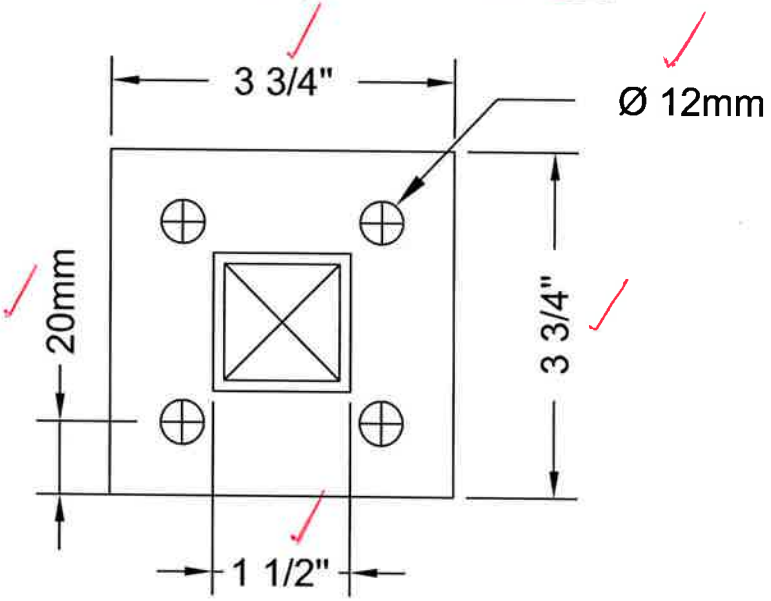

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NAME

Modern Cable Continuous HandRail Detail 2

M8 nut with lock washer

M8 bolt welded to the top of ¾ x ¾ tube

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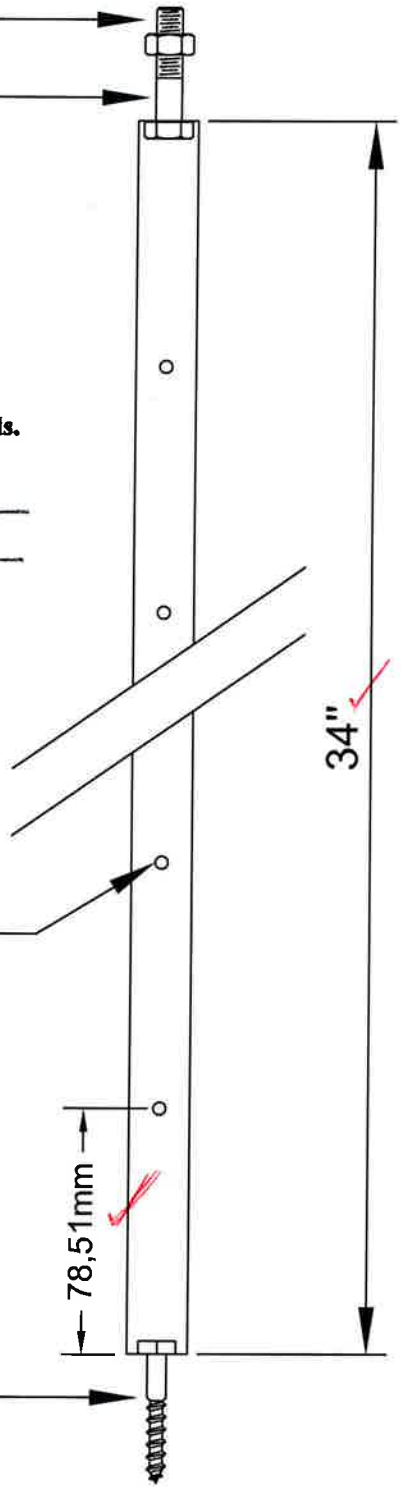

4mm through holes (10 holes spaced equally)

Wood thrend bolt welded to the botton of SS tube

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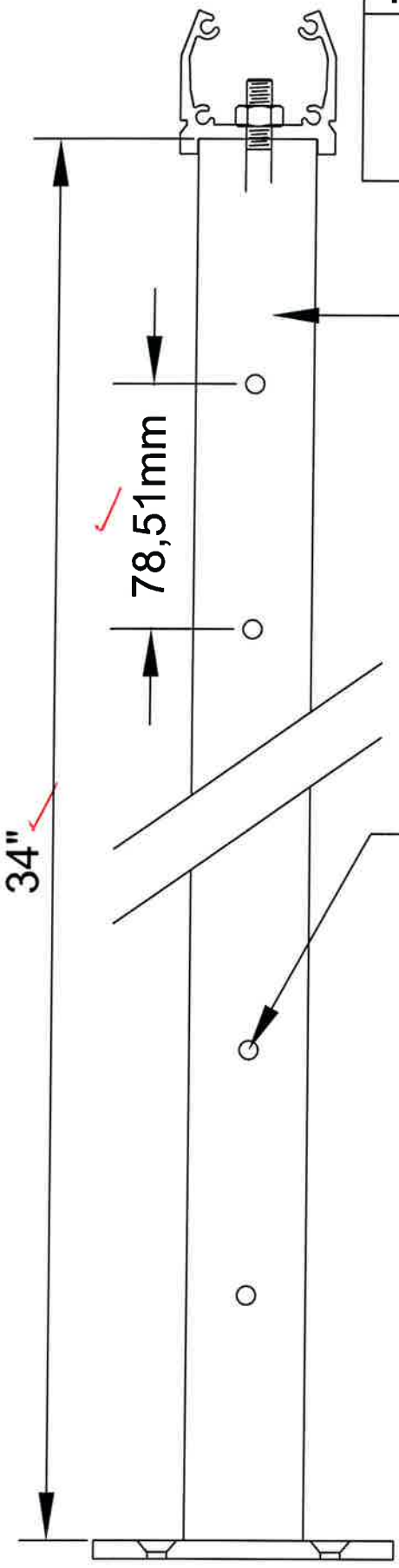
Modern Cable Continuous HandRail

Detail 4 - Esc: 1:2



1 ½ x1½ x 3mm wall
⅜ stainless tube

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Test sample complies with these details.
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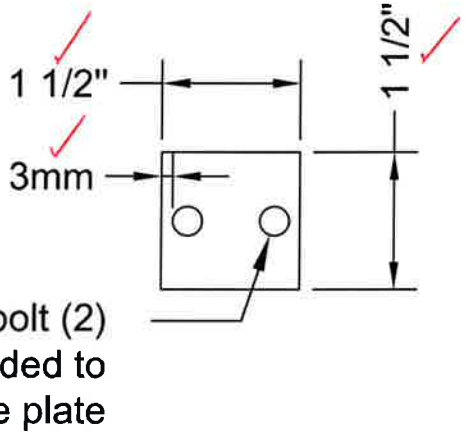
6mm through holes
(10 holes)



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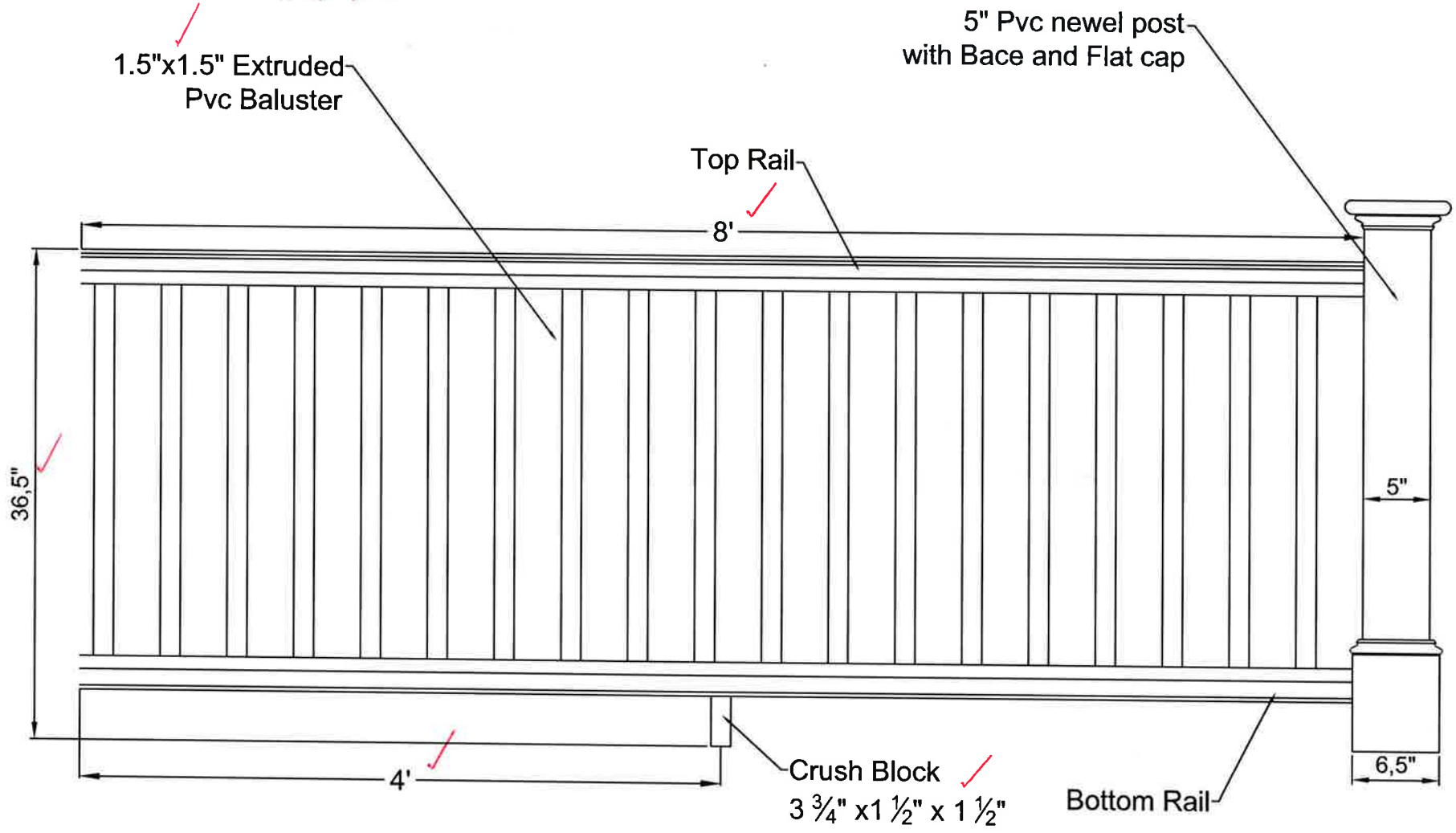
NAME

Trademark Railings



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NAME

Trademark Railings
Fastening of Rails and aluminum profile into balusters

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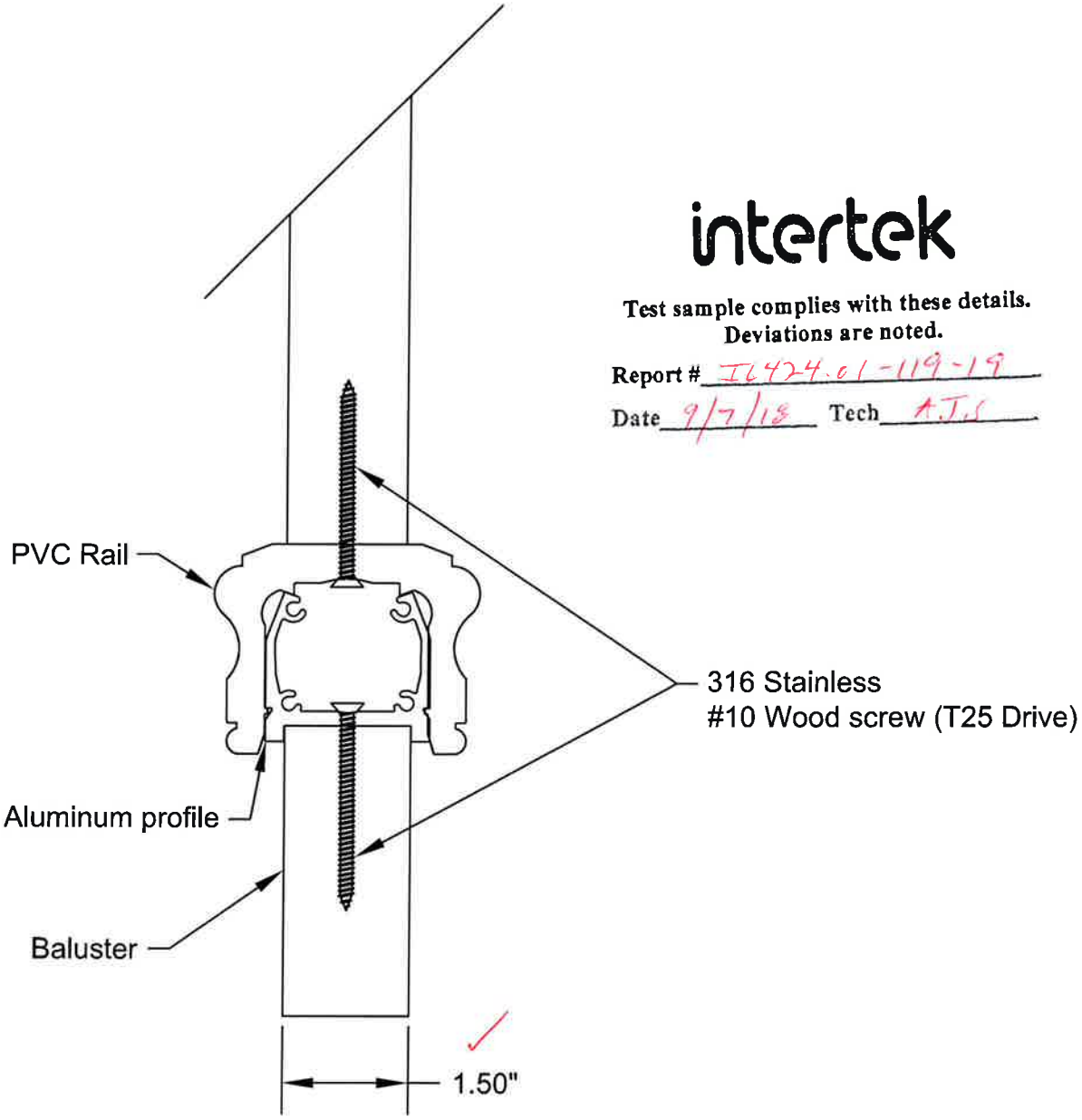

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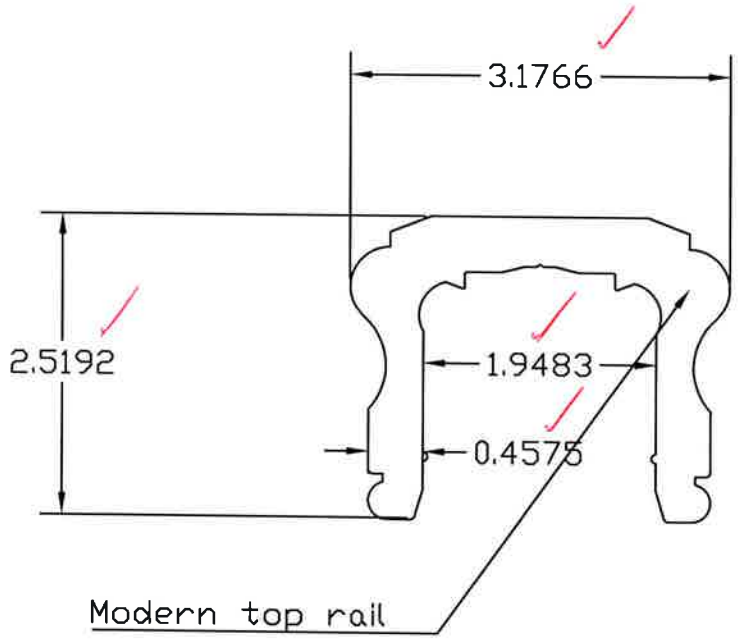
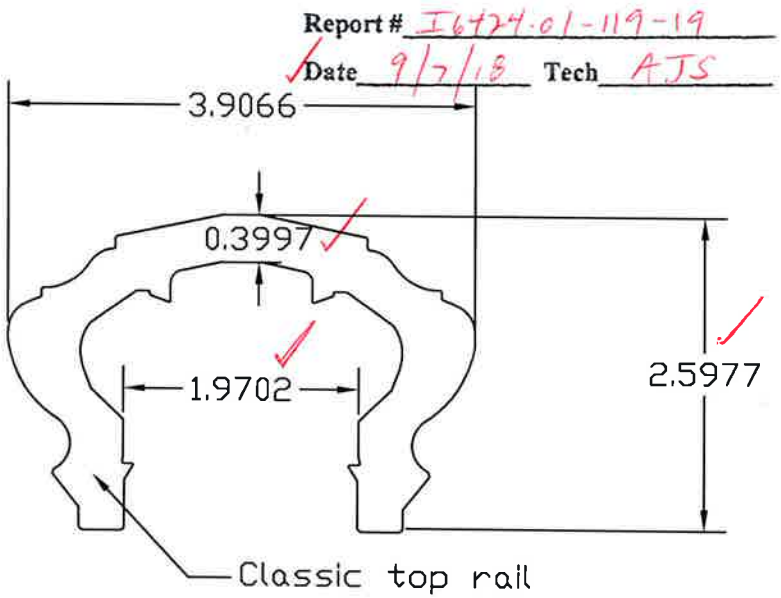
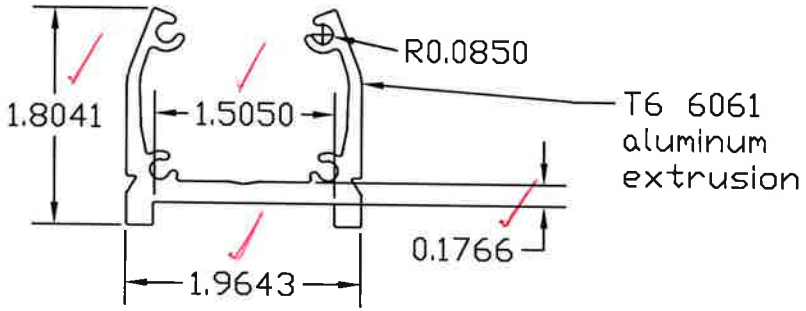
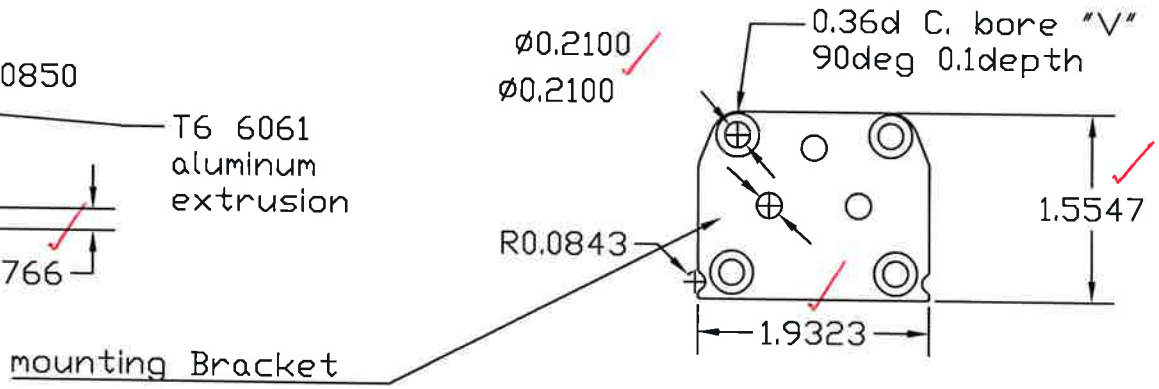


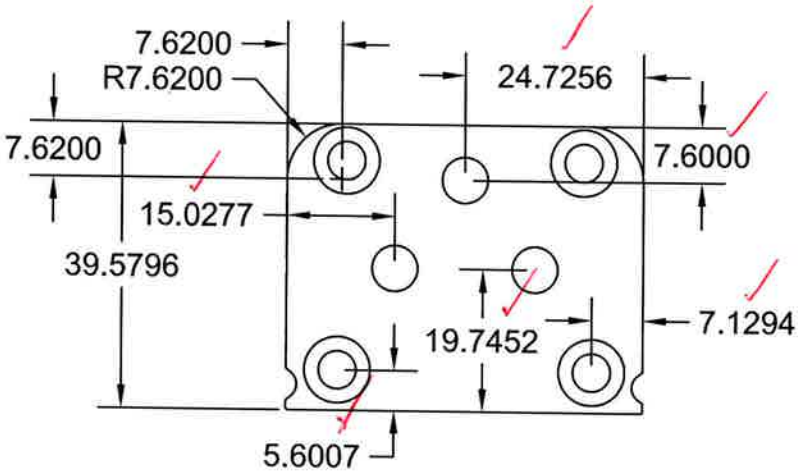


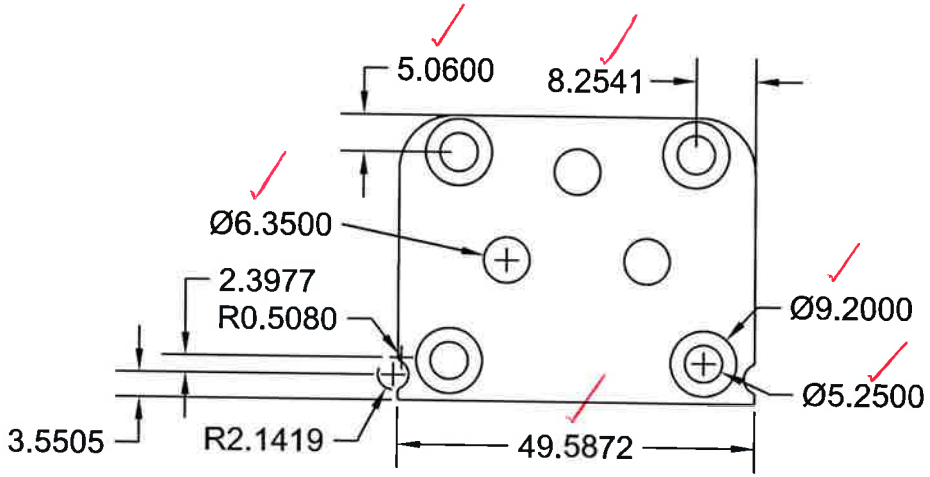




NAME

Trademark Railings
Detail of Mounting Bracket
Esc: 1:1





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Test sample complies with these details.
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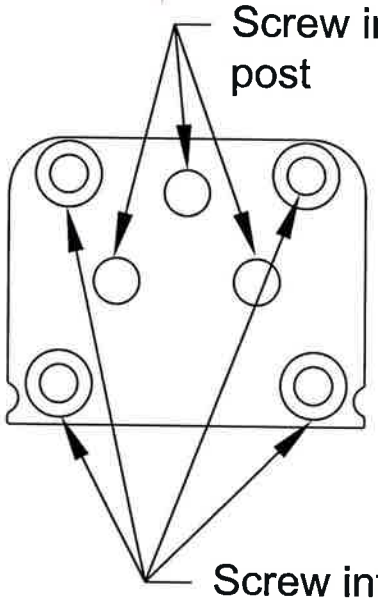

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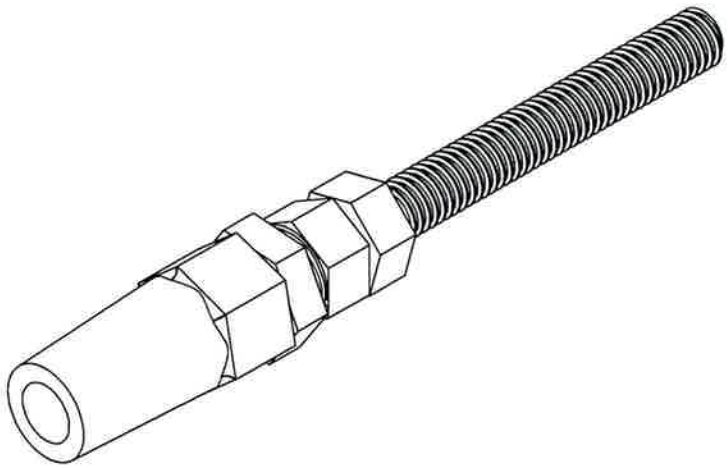

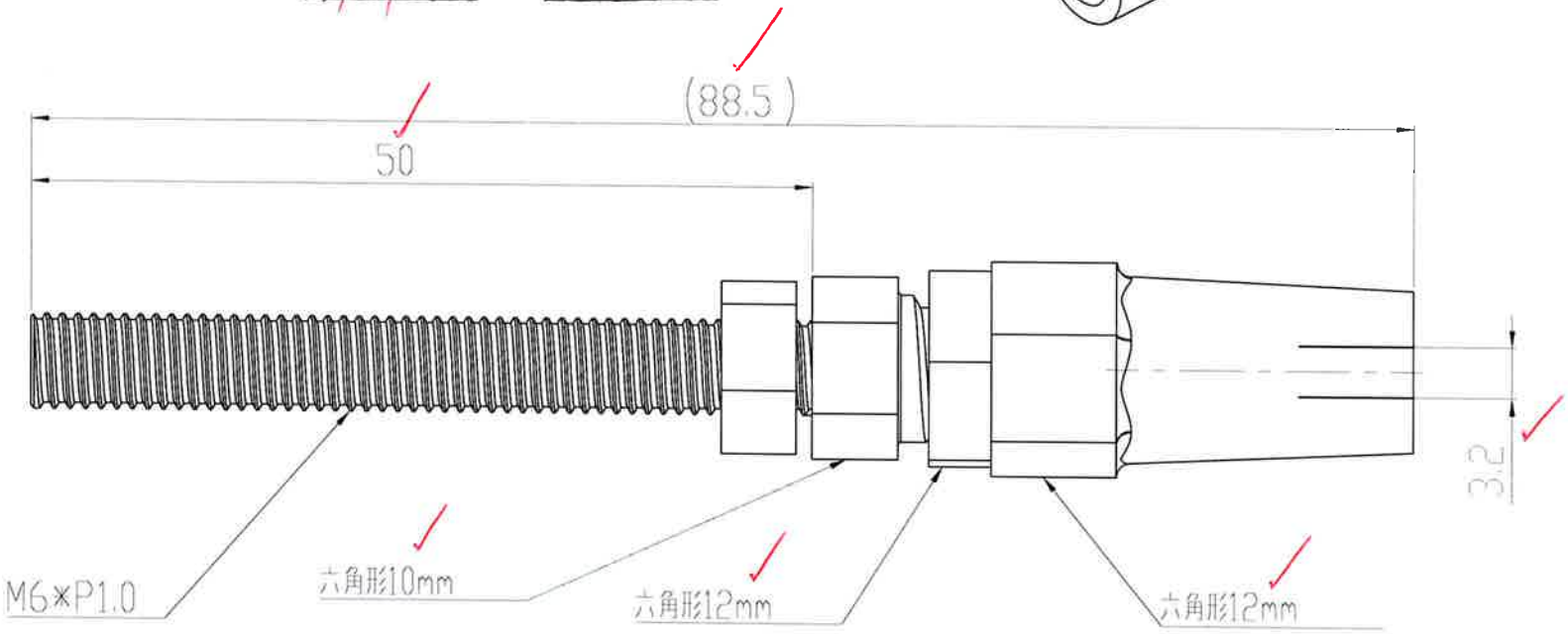

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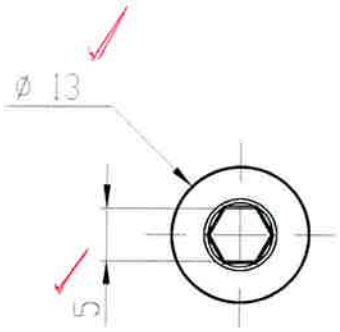
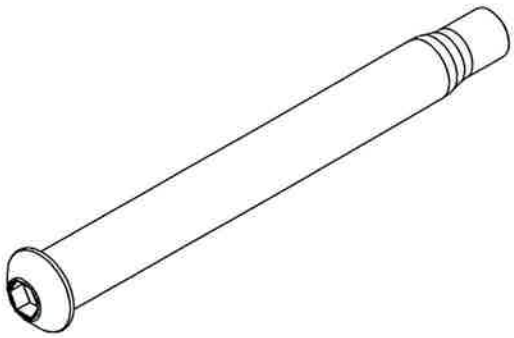
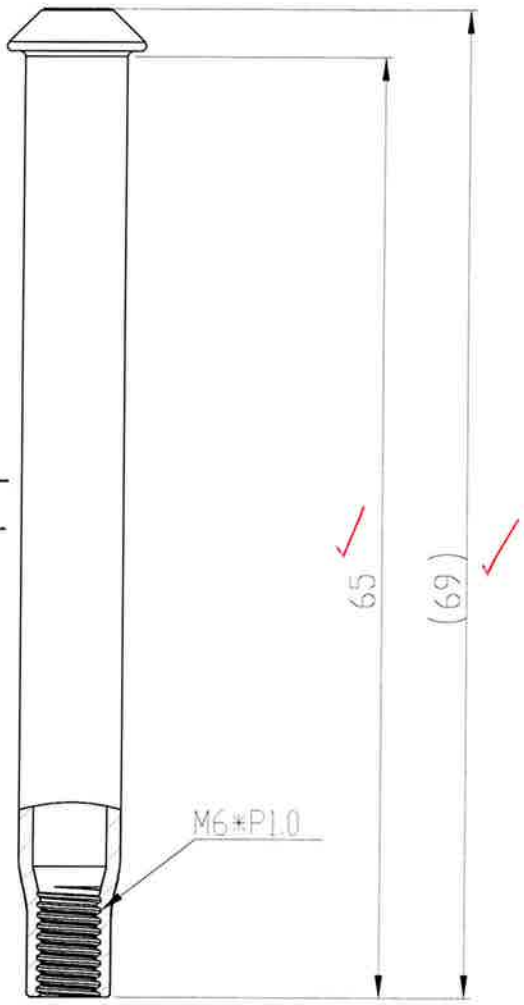
日期 2018/09/31	比例 2:1	張數 1







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SECTION 11
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	09/12/18	N/A	Original Report Issue