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FAIRWAY ARCHITECTURAL RAILING SOLUTIONS
TEST REPORT

SCOPE OF WORK
STRUCTURAL PEFORMANCE TESTING ON *P300* RIGID CELLULAR PVC GUARDRAIL SYSTEM

REPORT NUMBER
H8228.01-119-19 R0

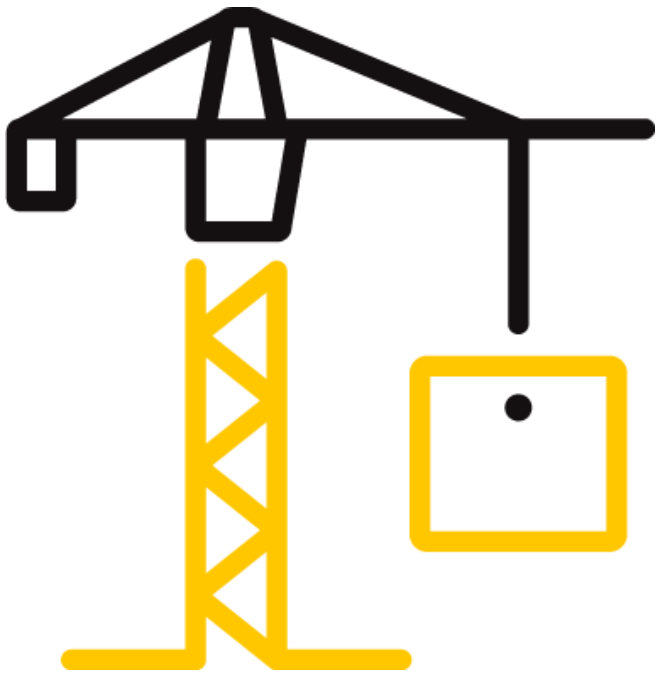
TEST DATE(S)
11/20/17

ISSUE DATE
02/20/18

RECORD RETENTION END DATE
11/20/21

PAGES
20

DOCUMENT CONTROL NUMBER
ATI 00642 (07/26/17)
RT-R-AMER-Test-2846



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TEST REPORT FOR FAIRWAY ARCHITECTURAL RAILING SOLUTIONS

Report No.: H8228.01-119-19 R0
Date: 02/20/18

REPORT ISSUED TO

FAIRWAY ARCHITECTURAL RAILING SOLUTIONS
53 Eby Chiques Road
P.O. Box 37
Mount Joy, PA 17552

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Fairway Architectural Railing Solutions to perform structural performance testing in accordance with the 2015 IBC on their 96 in wide by 42 in high *P300* rigid cellular PVC guardrail system. All tests performed were to evaluate structural performance of the guardrail assembly to carry and transfer imposed loads to the supporting structure. The test specimens evaluated included the infill, rails, rail brackets, and attachment to support posts. The support posts were conventional construction and not within the scope of the evaluation. Posts 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.

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

SECTION 2

SUMMARY OF TEST RESULTS

The specimen met the 2015 IBC design load performance requirements.

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:	02/20/18	**DATE:**	02/20/18

AJS:vtm/aaa

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SECTION 3
TEST METHOD(S)

The specimen was evaluated in accordance with the following:

2015, *International Building Code*®, International Code Council

Structural tests were performed according to Chapter 17 (Structural Tests and Special Inspections) of IBC 2015.

SECTION 4
MATERIAL SOURCE/INSTALLATION

Test samples were provided by the client.

The 96 in wide by 42 in high guardrail assembly was installed and tested as a single railing section by directly securing the posts into a rigid steel test fixture, which rigidly restrained the posts from deflecting. Transducers mounted to an independent reference frame were located to record movement of reference points on the guardrail system components (ends and mid-point) to determine net component deflections. See photographs in Section 11 for individual test setups.

SECTION 5
EQUIPMENT

The guardrail was tested in a self-contained structural frame designed to accommodate anchorage of the guardrail assembly and application of the required test loads. The specimens were 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 specimens. Applied load was measured using an electronic load cell located in-line with the loading system. Electronic linear motion transducers were used to measure deflections.

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Travis Scott	Fairway Architectural Railing Solutions
Adam J. Schrum	Intertek B&C
Isaiah Gebhart	Intertek B&C

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SECTION 7
TEST PROCEDURE

Each 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 prior to testing.

An initial load, not exceeding 50% of design load, was applied and transducers were zeroed. Load was then applied at a steady uniform rate until reaching 2.0 times design load in no less than 10 seconds. After reaching 2.0 times design load, the load was released. After allowing a minimum period of one minute for stabilization, load was reapplied to the initial load level used at the start of the loading procedure, and deflections were recorded and used to analyze recovery. Load was then increased at a steady uniform rate until reaching 2.5 times design load or until failure occurred. The testing time was continually recorded from the application of initial test load until the ultimate test load was reached.

Deflection and permanent set were component deflections relative to their end-points; they were not overall system displacements. All loads and displacement measurements were horizontal, unless noted otherwise.

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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SECTION 8
TEST SPECIMEN DESCRIPTION

Fairway Architectural Railing Solutions provided the fully-assembled test specimens with the following details:

PRODUCT	*P300* Rigid Cellular PVC Guardrail System
OVERALL DIMENSIONS	96 in wide (inside of post to inside of post) by 42 in high (deck surface to top of top rail)
TOP RAIL	3-3/8 in wide by 2-3/8 in high rigid cellular PVC contoured rail
BOTTOM RAIL	2-5/8 in wide by 2-1/8 in high rigid cellular PVC contoured rail
BALUSTERS (IN-FILL)	1-1/4 in square solid rigid cellular PVC picket
REINFORCING	1-11/16 in wide by 1-3/4 in high, H-shaped, unspecified aluminum alloy section; full length of top and bottom rail
BOTTOM RAIL SUPPORT BLOCK	Section of 1-1/4 in square picket cut to length and secured to the bottom rail reinforcing; located at midspan of bottom rail
RAIL BRACKETS	300 Series Stainless Steel Powder Coated Brackets
FASTENERS	#10-20 by 1-1/4 in (0.135 in minor diameter) pan head, square-drive screws, hi-lo threads (two in top bracket/post); 1/4 in-16 by 1 in (0.165 in minor diameter) pan head, square-drive screw, hi-lo threads (one in bottom bracket/post); #10-12 by 3/4 in (0.134 in minor diameter) pan-head, square-drive screws (two in top rail/bracket, one in bottom rail/bracket, one in bottom rail reinforcing/support block)
POST	Preservative treated Southern Yellow Pine 4 in by 4 in

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SECTION 9
TEST RESULTS

P300 Rigid Cellular PVC Level Guardrail System

TEST NO. 1 - 11/20/17
DESIGN LOAD: 50 lb / 1 Square ft at Center of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	25	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	103	00:28	0.41	0.88	0.46	0.45
Initial Load	25	02:03	0.05	0.04	0.02	0.01
98% Recovery from 2.0 x Design Load						
2.50 x Design Load	135	02:13	Achieved Load without Failure			

[1] *Net displacement was the infill displacement relative to its top and bottom.*

TEST NO. 2 - 11/20/17
DESIGN LOAD: 50 lb / 1 Square ft at Bottom of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	25	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	100	00:23	0.04	0.55	0.04	0.51
Initial Load	25	02:26	0.00	0.00	0.00	0.00
100% Recovery from 2.0 x Design Load						
2.50 x Design Load	133	02:51	Achieved Load without Failure			

[1] *Net displacement was the bottom rail displacement relative to its ends.*

TEST NO. 3 - 11/20/17
DESIGN LOAD: 50 plf Uniform Load on Top Rail - Horizontal [2]

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	80	00:00	0.00	0.00	0.00	0.00
2.0x Design Load	809	00:44	0.06	3.39	0.08	3.32
Initial Load	80	02:19	0.01	0.03	0.00	0.03
99% Recovery from 2.0 x Design Load						
2.50 x Design Load	1056	02:57	Achieved Load without Failure			

[1] *Net displacement was the mid-rail rail displacement relative to its ends.*
[2] *Uniform load was simulated with quarter point loading.*

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TEST NO. 4 - 11/20/17
DESIGN LOAD: **50 plf Uniform Load on Top Rail - Vertical** [1]

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
			MID
Initial Load	81	00:00	0.00
2.0 x Design Load	800	00:25	0.10
Initial Load	80	01:56	0.03
70% Recovery from 2.0 x Design Load			
2.50 x Design Load	1068	02:25	Achieved Load without Failure

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

Test No. 5 - 11/20/17
DESIGN LOAD: **200 lb Concentrated Load at Midspan of Top Rail - Horizontal**

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)			
			END	MID	END	NET [1]
Initial Load	50	00:00	0.00	0.00	0.00	0.00
2.0 x Design Load	405	00:31	0.02	2.58	0.03	2.56
Initial Load	50	02:05	0.00	0.02	0.00	0.02
99% Recovery from 2.0 x Design Load						
2.50 x Design Load	531	02:35	Achieved Load without Failure			

[1] *Net displacement was mid-rail displacement relative to the rail at the support posts.*

Test No. 6 - 11/20/17
DESIGN LOAD: **200 lb Concentrated Load at Ends of Top Rail (Brackets)**

LOAD LEVEL [1]	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)	
			RAIL END #1	RAIL END #2
Initial Load	81	00:00	0.00	0.00
2.0 x Design Load	806	00:39	0.20	0.21
Initial Load	80	02:13	0.01	0.00
95% Recovery (Rail End #1) and 100% Recovery (Rail End #2) from 2.0 x Design Load				
2.50 x Design Load	1062	02:39	Achieved Load without Failure	

[1] *A spreader beam was used to impose loads on* both *ends of the railing system; therefore, loads were doubled.*

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SECTION 10
CONCLUSION

Using performance criteria of withstanding an ultimate load of 2.5 times design load, the test results substantiate compliance with the design load requirements of the referenced building codes for the 96 in wide by 42 in high *P300* rigid cellular PVC railing assembly reported herein.

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 11
PHOTOGRAPHS

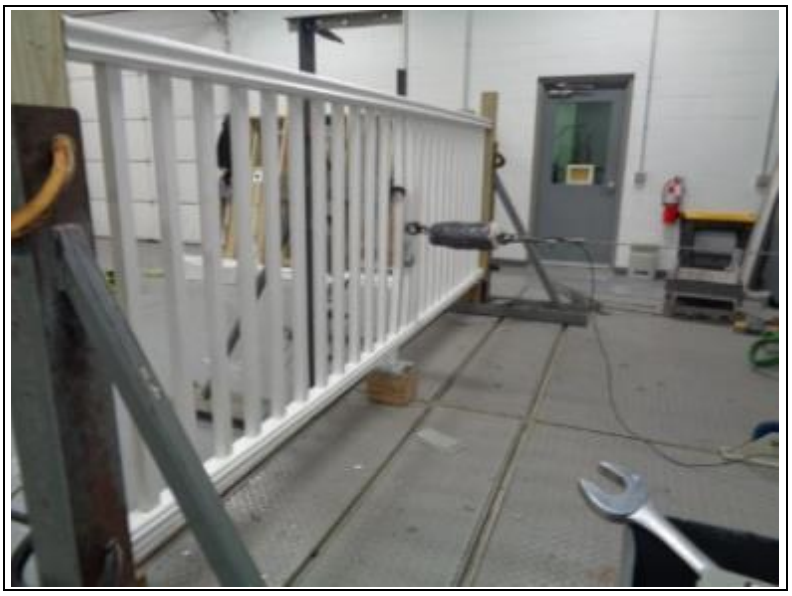

Photo No. 1
In-Fill Load Test at Center of Two Pickets

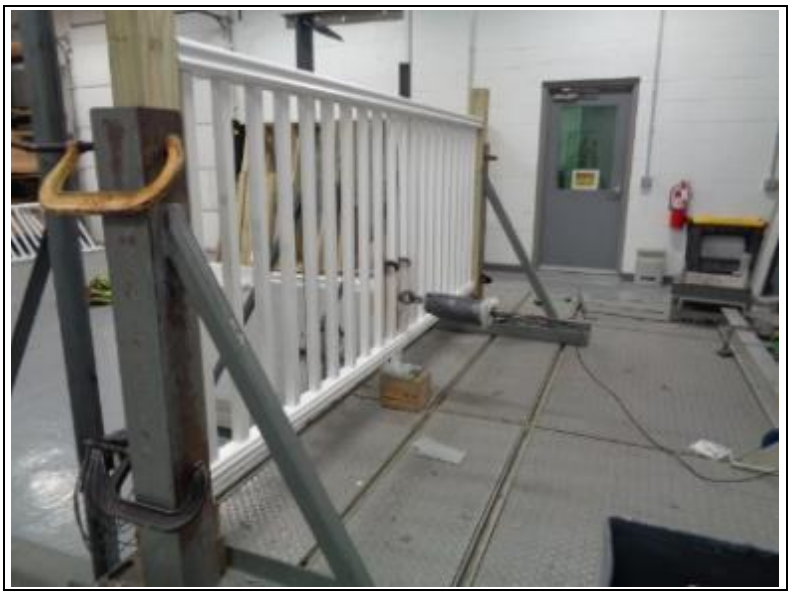

Photo No. 2
In-Fill Load Test at Bottom of Two Pickets

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Photo No. 3
Horizontal Uniform Load on Top Rail

Photo No. 4
Vertical Uniform Load on Top Rail

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Photo No. 5
Concentrated Horizontal Load Test at Midspan of Top Rail

Photo No. 6
Concentrated Horizontal Load Test at Ends of Top Rail (Brackets)

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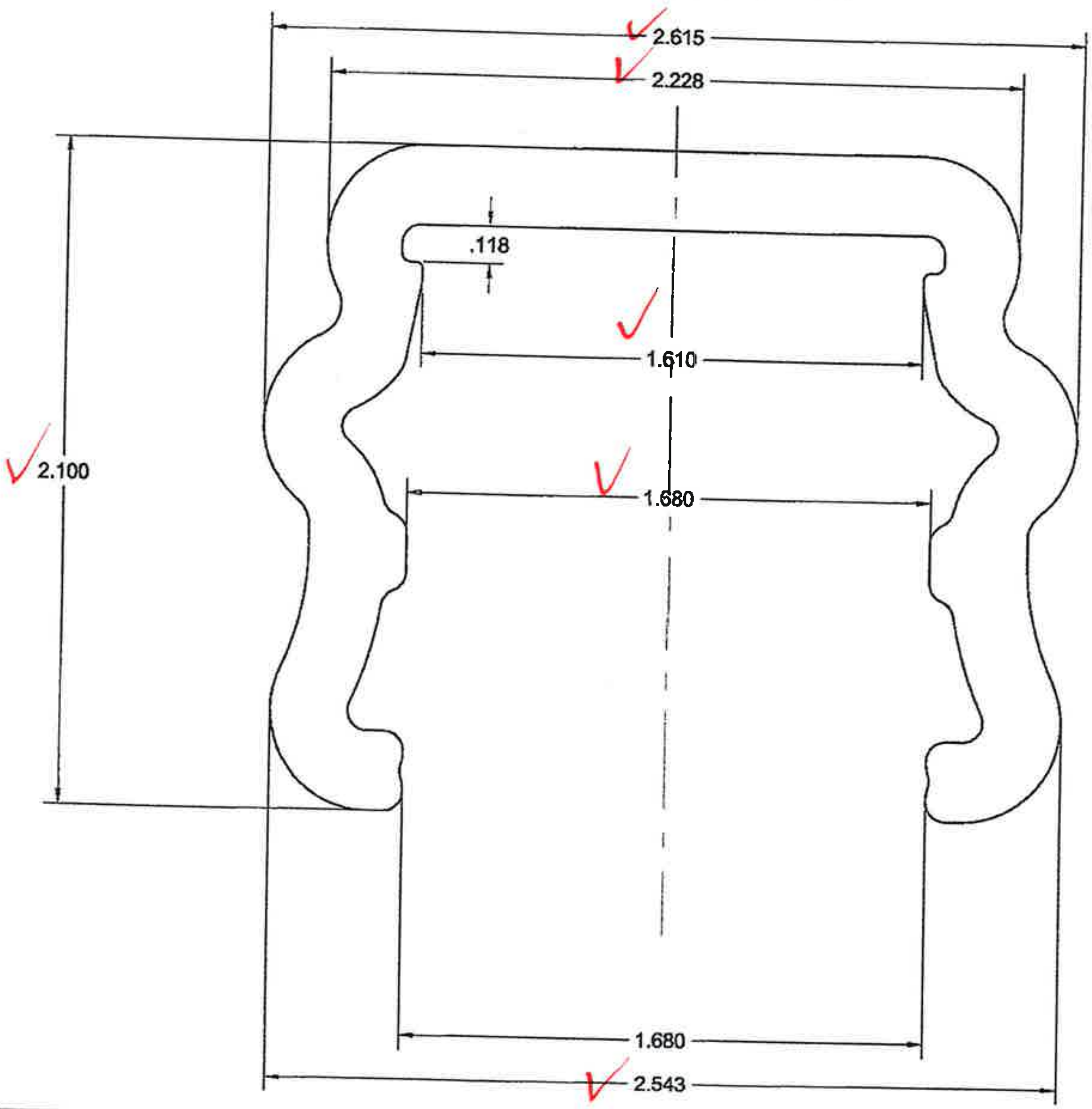
SECTION 12
DRAWINGS

The "As-Built" drawings for the *P300* rigid cellular PVC guardrail system 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.

7939

APPROVAL PRINT



ANNUAL QUANTITY (FEET) ______

LINEAL LENGTH(S) 72", 96", 120"

COLOR(S) WHITE

SIGNATURE [signature]

DATE 18 MAY 2017

I (WE) HEREBY SIGNIFY THAT THE DIMENSIONS LISTED ARE THOSE THAT WILL BE USED IN THE CONTROLLING PARAMETERS OF EXTRUSION OPERATION AND QC VALIDATION

intertek

Test sample complies with these details.
Deviations are noted.

Report # H8228.01

Date 2/20/18 Tech EAR

PRELIMINARY PART #	992-3974		
UNLESS OTHERWISE SPECIFIED			
MATERIAL CELLULAR P.V.C. (.775g/cc)		WALLS	.250
EXTERIOR COATING		RADII	.062 R
FLEXIBLE P.V.C.		ANGULARITY	±1°
TOTAL AREA	1.6065		

CELLULAR BOTTOM RAIL

DRAWN BY:	DESIGNED BY:	DATE	SCALE
EAS	EAS	05-09-17	NTS-1
CHECKED BY:	APPROVED BY:	DRAWING No. 7939	

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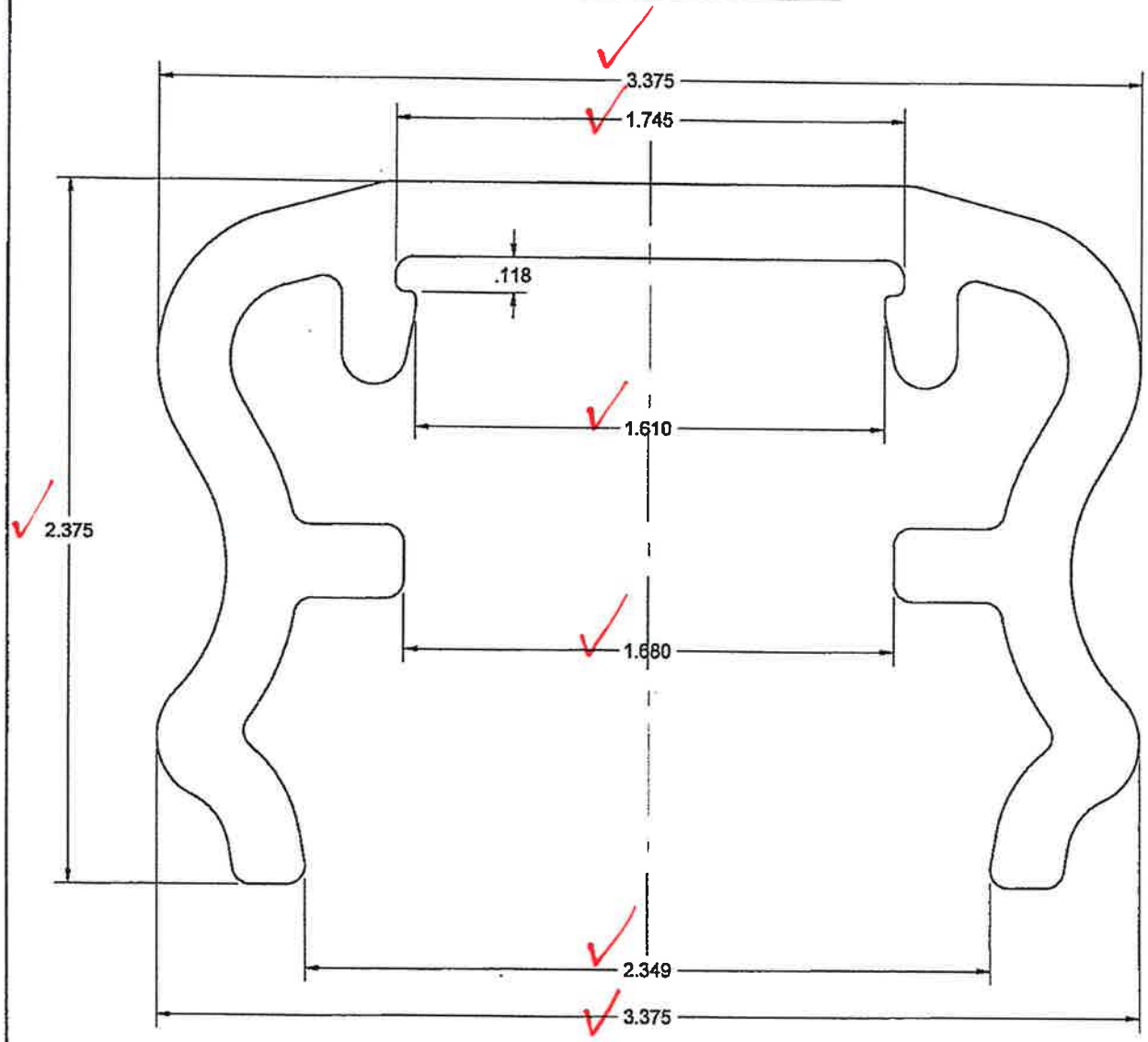
a member of aluplast group
565 CEDAR WAY, OAKMONT PA 15139

No.	REVISION	BY	DATE
1	REDESIGN TO ENGAGE REBAR	EAS	05-16-17

7938

APPROVAL PRINT



ANNUAL QUANTITY (FEET) _____

LINEAL LENGTH(S) 72", 96", 120"

COLOR(S) WHITE

SIGNATURE [signature]

DATE 18 MAY 2017

I (WE) HEREBY SIGNIFY THAT THE DIMENSIONS LISTED ARE THOSE THAT WILL BE USED IN THE CONTROLLING PARAMETERS OF EXTRUSION OPERATION AND QC VALIDATION

intertek

Test sample complies with these details.
Deviations are noted.

Report # H8228.01

Date 2/20/18 Tech EOR

PRELIMINARY PART #	992-3972		
UNLESS OTHERWISE SPECIFIED			
MATERIAL CELLULAR P.V.C. (.775g/cc)		WALLS	.250
EXTERIOR COATING		RADII	.062 R
FLEXIBLE P.V.C.		ANGULARITY	±1°
TOTAL AREA	2.2456		

No.	REVISION	BY	DATE

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a member of alupiast group
565 CEDAR WAY, OAKMONT PA 15139

CELLULAR TOP RAIL

DRAWN BY:	DESIGNED BY:	DATE	SCALE
EAS	EAS	05-09-17	NTS-1
CHECKED BY:	APPROVED BY:	DRAWING No.	
		7938	

7940

APPROVAL PRINT

ANNUAL QUANTITY (FEET) _____

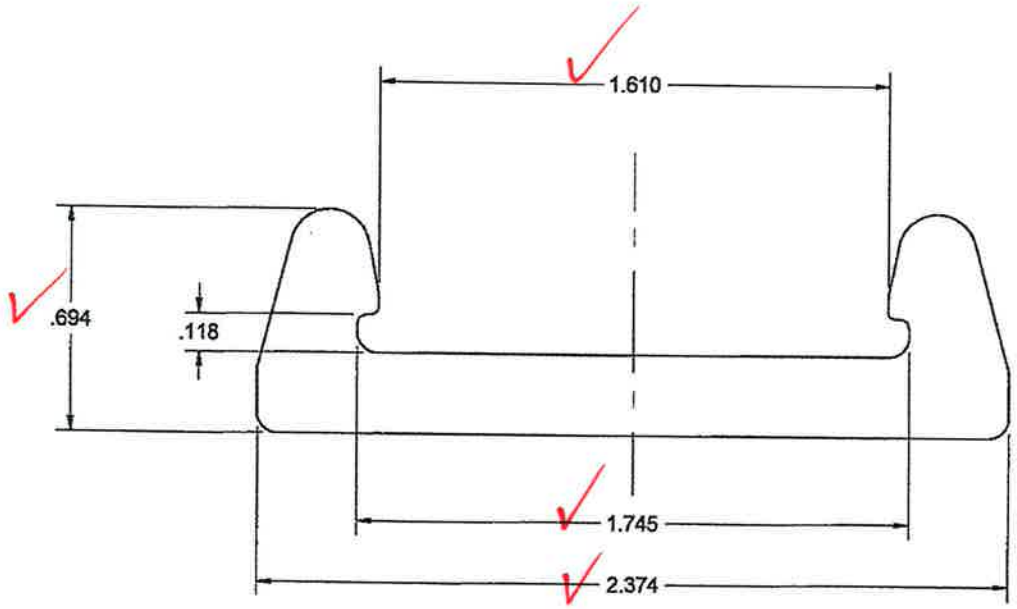
LINEAL LENGTH(S) 72", 96", 120"

COLOR(S) WHITE

SIGNATURE [signature]

DATE 18MAY2017

I (WE) HEREBY SIGNIFY THAT THE DIMENSIONS LISTED ARE THOSE THAT WILL BE USED IN THE CONTROLLING PARAMETERS OF EXTRUSION OPERATION AND QC VALIDATION



intertek

Test sample complies with these details.
Deviations are noted.

Report # H8228.01

Date 2/20/18 Tech SOR

PRELIMINARY PART # 992-3973	
UNLESS OTHERWISE SPECIFIED	
MATERIAL CELLULAR P.V.C. (.775g/cc)	WALLS .250
EXTERIOR COATING	RADII .062 R
FLEXIBLE P.V.C.	ANGULARITY ±1°
TOTAL AREA .8313	

No.	REVISION	BY	DATE

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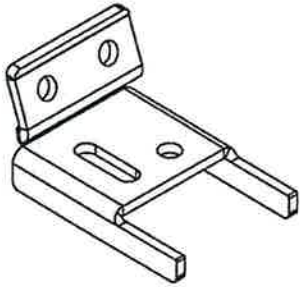
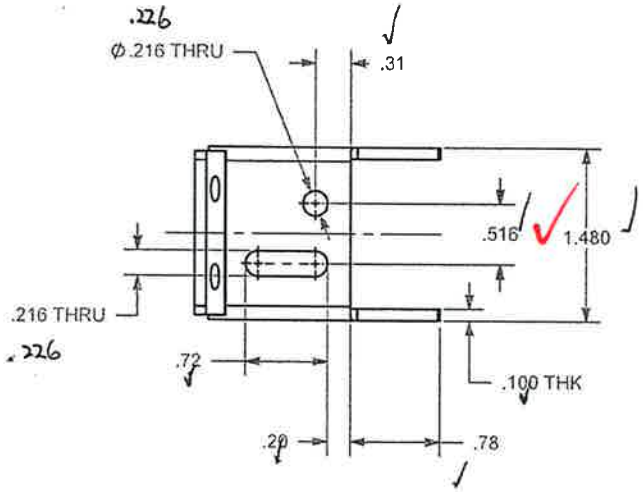
CELLULAR BOTTOM CAP

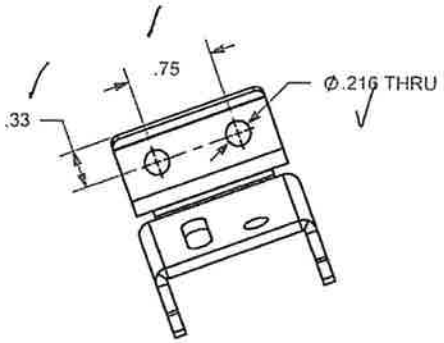
DRAWN BY:	DESIGNED BY:	DATE	SCALE
EAS	EAS	05-09-17	NTS-1
CHECKED BY:	APPROVED BY:	DRAWING No.	
		7940	

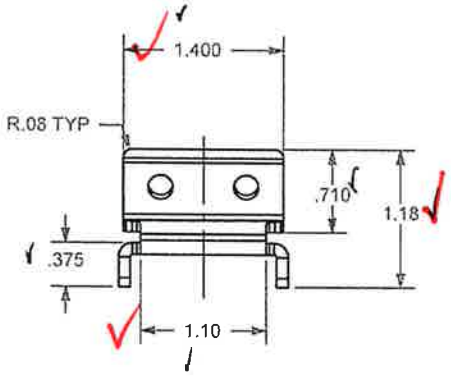
LEVEL TOP RAIL BRACKET

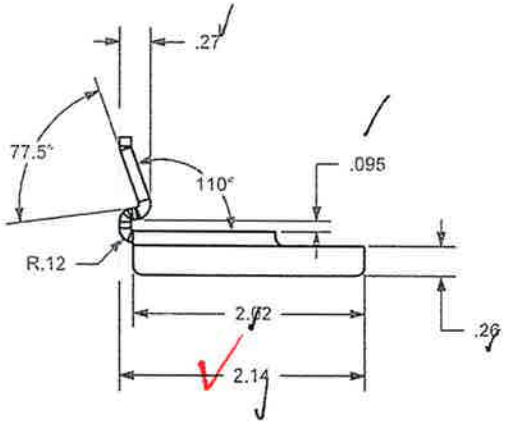
MATERIAL: 300 SERIES STAINLESS STEEL
FINISH: POWDERCOAT
COLOR: SEE TABLE











VIEW A-A

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Test sample complies with these details.
Deviations are noted.

Report # H8228.01

Date 2/20/18 Tech CQR

FAIRWAY
P300 RAILING
BRACKET PACKS

SIZE A | DWG. NO. 50009* | REV. -

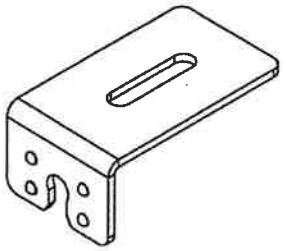
SCALE:3 | WEIGHT: | SHEET 6 OF 16

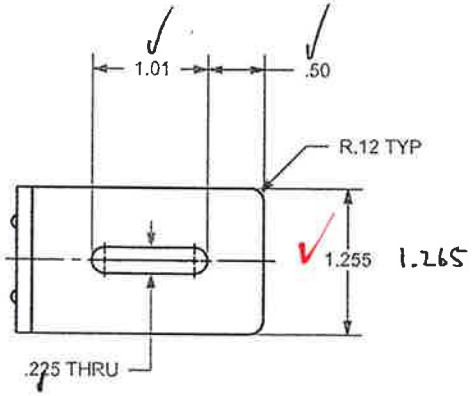
LEVEL BOTTOM RAIL BRACKET

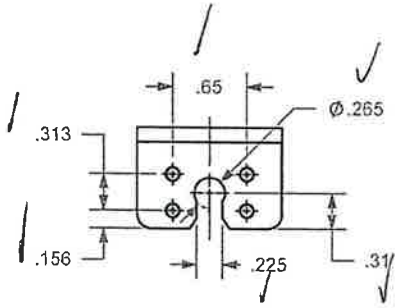
MATERIAL: 300 SERIES STAINLESS STEEL

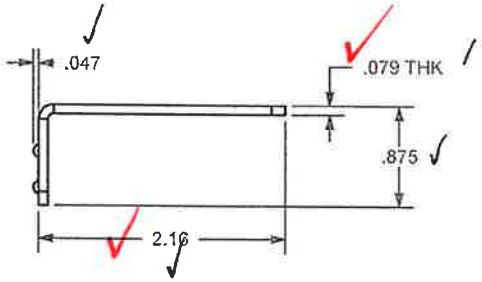
FINISH: POWDERCOAT

COLOR: SEE TABLE









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Test sample complies with these details.
Deviations are noted.

Report # H8228.01

Date 2/20/18 Tech EGF

FAIRWAY
P300 RAILING
BRACKET PACKS

SIZE A | DWG. NO. 50009* | REV. -

SCALE:2:3 | WEIGHT: | SHEET 7 OF 16

QC PRINT NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DEVELOP	INPROCESS	PRODUCTION
7936qc	EAS					

PART NAME:	DESCRIPTION:	SUPPLIER/PLANT:
7936	1-1/4" SQUARE	CHELSEA BUILDING PRODUCTS

ILLUSTRATION OF PART AND CONTROL POINTS

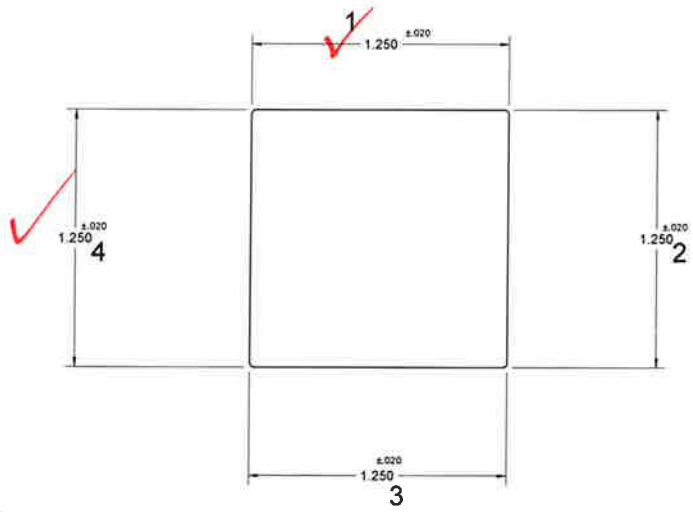
CHELSEA BUILDING PRODUCTS, INC.
565 CEDAR WAY, OAKMONT PA 15139

NOTES:
1. MATERIAL = CELLULAR P.V.C.
2. FLEXIBLE P.V.C. =
3. EXTERIOR COATING =
4. LAMINATE =
5. THINNER INTERIOR WALLS =
6. WALL THICKNESS =
7. RADIUS = .018 R
8. LOCATION FOR IMPACT TEST
9. ANGULARITY =
10. PERPENDICULARITY =
11. PARALLELISM =
12. FLATNESS =
13. SPECIFICATION LENGTH TO +3/4 -0"
14. ANGULARITY TO BE ± 1°
15. PROFILE MUST MEET Q-303 PER AAMA SPECIFICATIONS
16. PROFILE MUST MEET Q-304 PER AAMA SPECIFICATIONS
17. PROFILE MUST MEET Q-901 PER AAMA SPECIFICATIONS
18. PROFILE MUST MEET Q-902 IMPACT RESISTANCE PER AAMA SPECIFICATIONS
19. MAX BOW .045in PER 3ft LENGTH
20. INTERNAL WALL THICKNESS ±.010 UNLESS OTHERWISE SPECIFIED

WEATHERSTRIP SPECIFICATION

POSITION	SIZE	WEATHERSTRIP TYPE

FUNCTIONAL CHECK



NOTES:
1. DENSITY TO RUN BETWEEN .750 AND .800
2. ROUGHNESS MEASUREMENT MUST BE ABOVE 60 (AVERAGE OF THREE MEASUREMENTS)

NO.	REVISION	BY	DATE
3	CHANGED SPEC LENGTH FROM ±3/8 TO +3/4 -0. WO#15216	JAF	11/19/15
2	ADDED DENSITY CHECK TO "RATIONALE OF MEASUREMENT" LIST, WO#15064	BLG	03/20/15
1	ADDED DENSITY NOTE, WO#13145	BLG	07/25/13

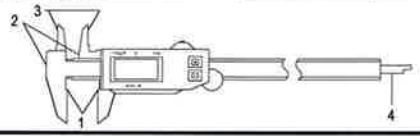
CUSTOMER LENGTH	CHELSEA CUT LENGTH	TOLERANCE

DRAWN DATE: 01-23-13

Use the caliper diagram as your guide to measure the following control points.
Measure the following control points using #1 on the caliper diagram:
Measure the following control points using #2 on the caliper diagram:
Measure the following control points using #3 on the caliper diagram:
Measure the following control points using #4 on the caliper diagram:

Frequency of sampling: Process Specialist- 3 samples per shift recorded every 4 hours
Auditor- 1 sample per shift recorded 1 hour after shift start.

IF ANY CONTROL POINTS ARE NOT IN SPEC.
CORRECTIVE ACTION REQUIRED



Test sample complies with these details.
Deviations are noted.
Report # H8229.01
Date 2/20/18 Tech SDK

DATE:		LINE #		MATERIAL:		COLOR:		
DIM	RATIONALE OF MEASUREMENT	LSL	NOMINAL	USL	SAMPLE #1	SAMPLE #2	SAMPLE #3	AUDITOR
1	CALIPER MEASUREMENT	1.230	1.250	1.270				
2	CALIPER MEASUREMENT	1.230	1.250	1.270				
3	CALIPER MEASUREMENT	1.230	1.250	1.270				
4	CALIPER MEASUREMENT	1.230	1.250	1.270				
5	DENSITY CHECK	.750	.775	.800				
6								
7								
8								
9								
10								
11								
12								
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14								
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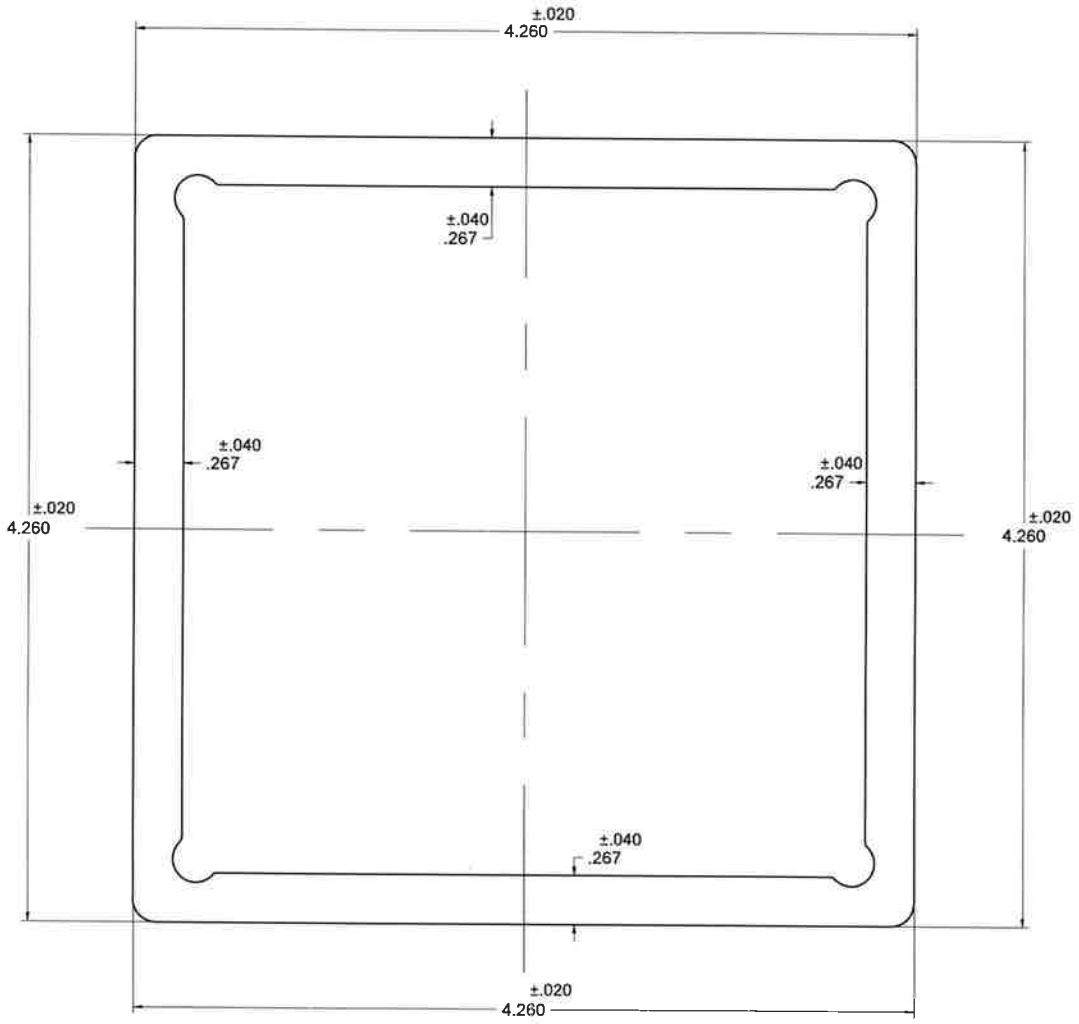
31								
32								

7950



Test sample complies with these details.
Deviations are noted.

Report # H8218.01

Date 2/20/18 Tech EAR

PRELIMINARY PART #	997-1368		
UNLESS OTHERWISE SPECIFIED			
MATERIAL		WALLS	.267
EXTERIOR COATING		RADII	.031
FLEXIBLE P.V.C.		ANGULARITY	±1°
TOTAL AREA	4.1964		

No.	REVISION	BY	DATE

4X4 POST SLEEVE

DRAWN BY:	DESIGNED BY:	DATE	SCALE
JAF	JAF	03/07/17	NTS-1
CHECKED BY:	APPROVED BY:	DRAWING No.	
		7950	

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York, Pennsylvania 17406

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SECTION 13
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	02/20/18	N/A	Original Report Issue