

June 18, 2021



Steenhof Building Systems
40 Peter Street South
Orillia, ON
L3V 5A9

Attention: Griff Ferguson

**Re: Fortress Building Products
AL13 Home 44.5 Traditional Aluminum Guardrail System
Structural Review for Compliance with Quebec Building Code
CJE Reference Number: 21-2093**

Cleland Jardine Engineering was retained to review the AL13 Home 44.5 Fortress building system railing for compliance with the Quebec construction code. Specifically:

- Review of Quebec code requirements
- Review drawings
- Review test results
- Comment on compliance with code requirements.

Code Loading Requirements

The 2020 Quebec Construction Code references the 2010 National Building Code clause 9.8.8.2 for guard loading requirements.

Under Clause 9.8.8.2, the following applies for guards to be used with in dwelling units and exterior guards serving not more than two dwelling units:

- One of the following horizontal loads applied inward or outward at any point at the minimum required height of the guard resulting in the most critical condition:
 - o 0.5 kN/m or
 - o Concentrated load of 1.0kN applied at any point.
- Horizontal load of 0.5kN applied inward or outward on any elements within the guard including pickets. The load is to be applied over a maximum width of 300mm and a height of 300mm.
- Evenly distributed vertical load of 1.5kN/m applied at the top of the guard.

Railing Design

The railing reviewed consists of 6061-T6 aluminum railings as detailed on the attached drawings:

<u>Drawing No.</u>	<u>Description</u>
R3936-09051 Rev.3	AL13 Home Pool Panel 44.5" x 8'
R3936-10972 Rev.2	AL13 Traditional 44.5" x 8' weldment
R3931-10974 Rev.2	AL13 Home Top Rail 8' closer spacing
R3931-10975 Rev.2	AL13 Home Bottom Rail 8' decreased
R3931-06236 Rev.E	AL13 Home Top Cap
R3932-10772 Rev.4	AL13 Home 3.25m Baluster
R3934-03618 Rev.D	AL13 Home Bracket Cup
R3935-06297 Rev.A	AL Res-3" x 51" Post Weldment
R3935-03606 Rev.C	AL13 Home Post Base Plate 3"
R3935-06296 Rev.A	AL Res-3" x 51" Post Tube

Test Results

The railing components were load tested for compliance with the code loading requirements as per following report.


"Intertek report L2777.01-119-19 Ro dated 01/12/21 "Structural Performance Testing on the AL13 home 44.5 Guardrail System"

A copy of the test results is attached.

Conclusion

Based on our review of the railing details and test results provided, The AL13 railing has adequate capacity to resist the required Quebec Construction Code loading requirements. Anchoring of the posts was not included in our review and would require separate engineering evaluation.

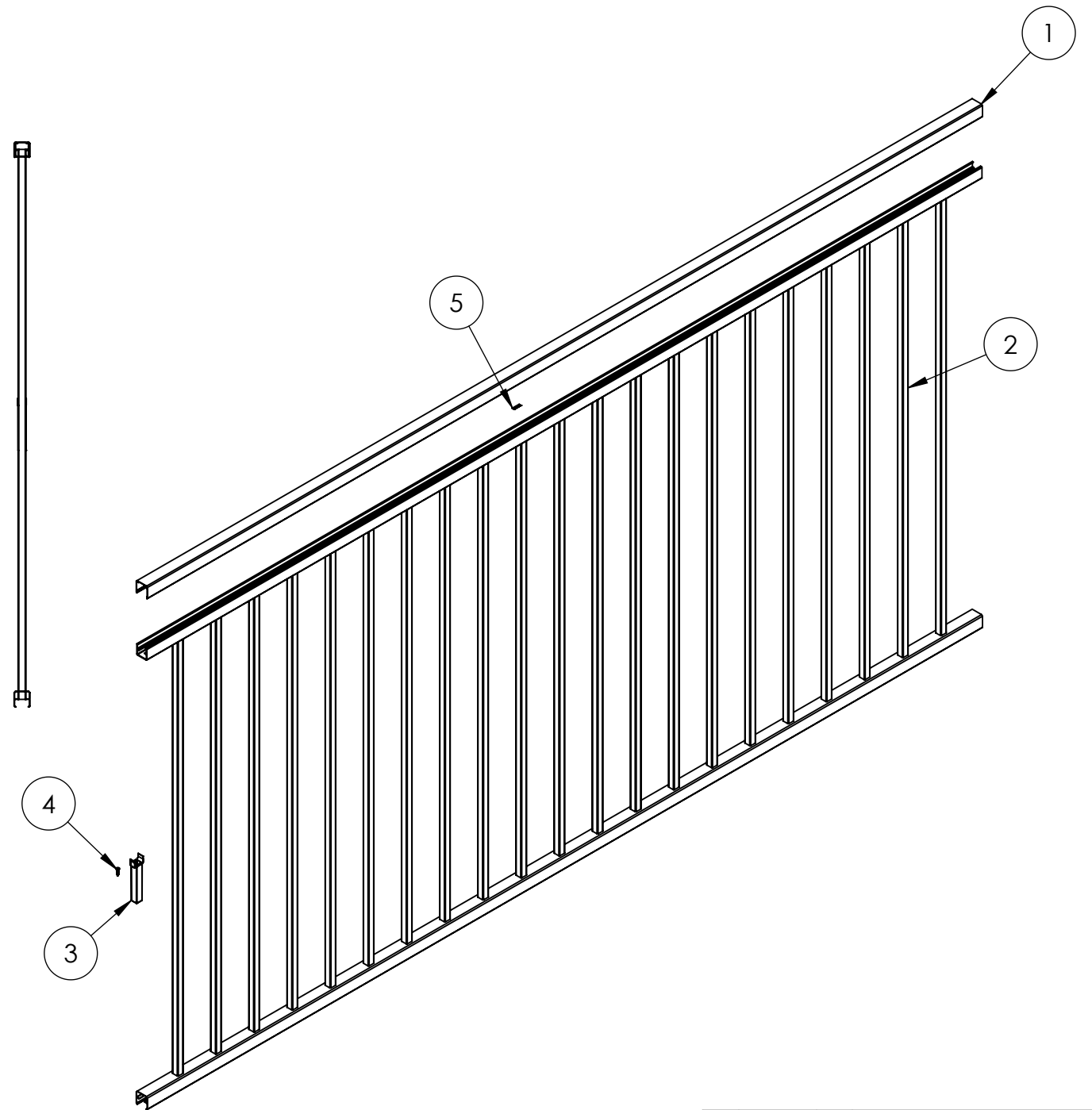
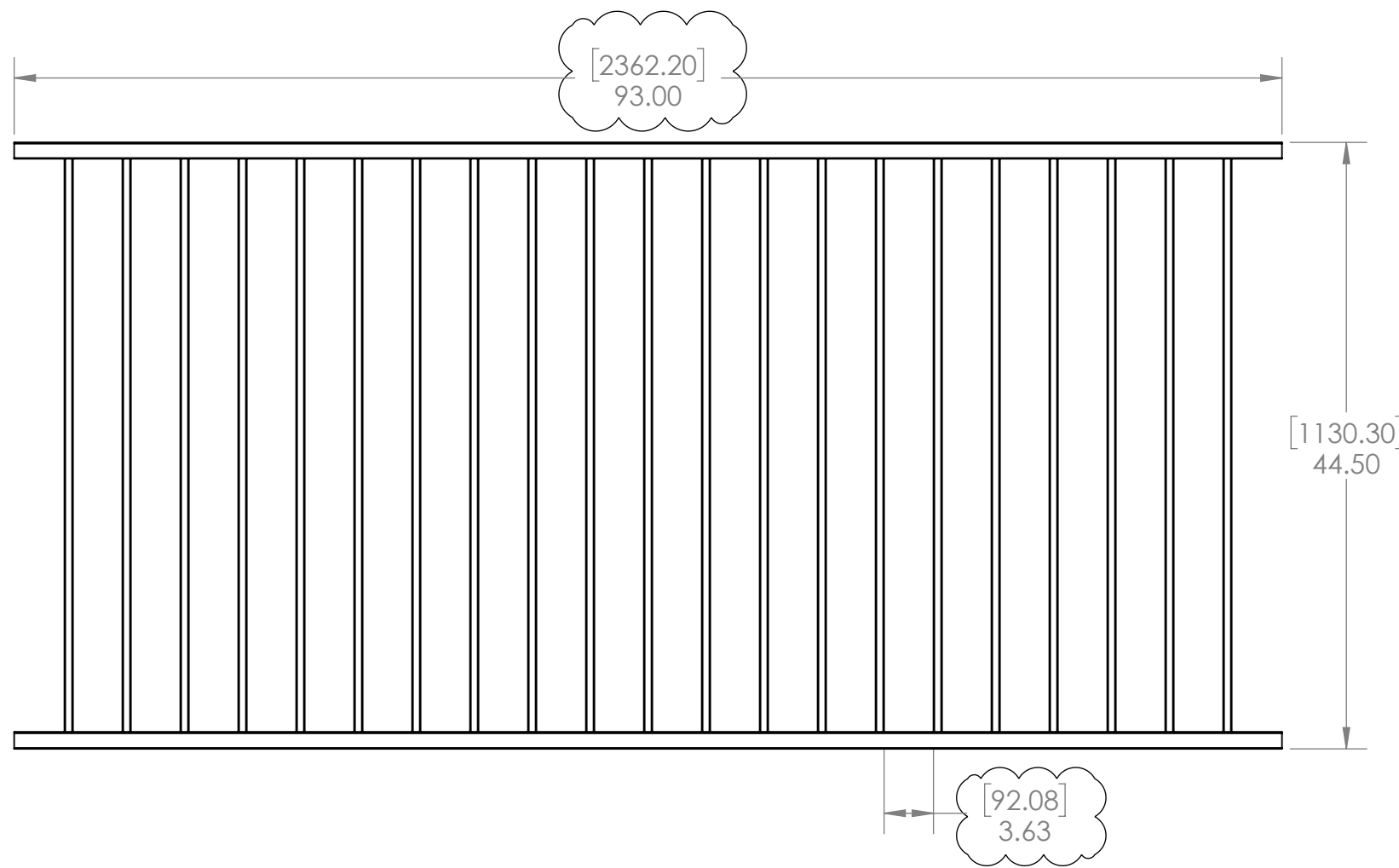
CLELAND JARDINE ENGINEERING LTD.



André Marcoux, ing. OIQ# 119833

Fortress Building Product AL13 Home 44.5 Railing Details

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3931-06236 93"	AL13 HOME TOP CAP	1
2	R3936-10972	AL13 HOME TRADITIONAL 44.5" X 8' WELDMENT	1
	R3931-10974	AL13 HOME TOP RAIL 8' CLOSER SPACING	1
	R3932-10772	AL13 HOME 3.25mm BALUSTER 43.3"	21
	R3931-10975	AL13 HOME BOTTOM RAIL 8' DECREASED SPACING	1
3	R3939-07240	AL13 HOME 32.5" I SUPPORT	1
4	C9191-02671	AL13 PLUS I-SUPPORT WOOD SCREW	1
5	C9296-04509	MDC STICKER	1



GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [mm]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT LINE NOTES PAGE R3900-00001
 5. MATERIAL: NOTED IN INDIVIDUAL COMPONENTS
 6. WEIGHT: 27.46 LBM
 7. WARRANTY: LIFETIME

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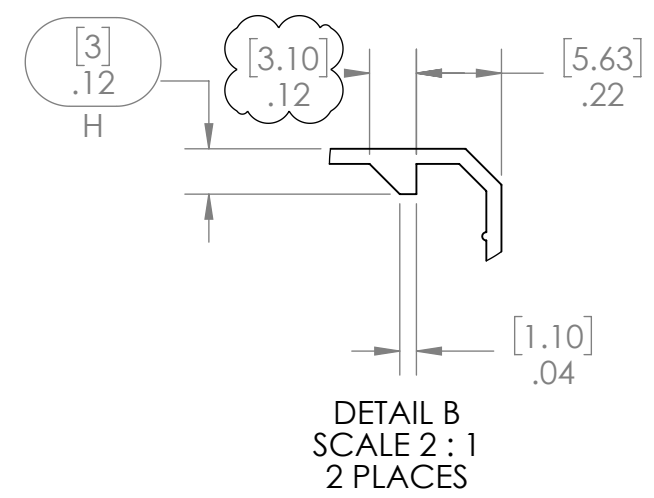
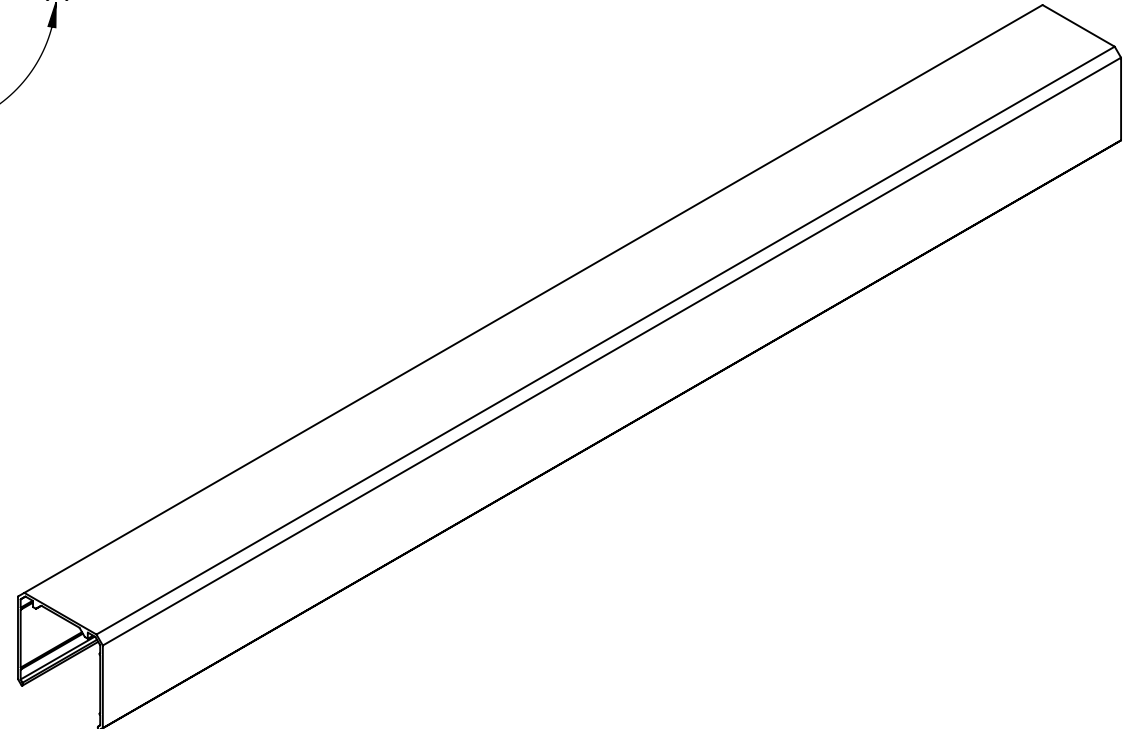
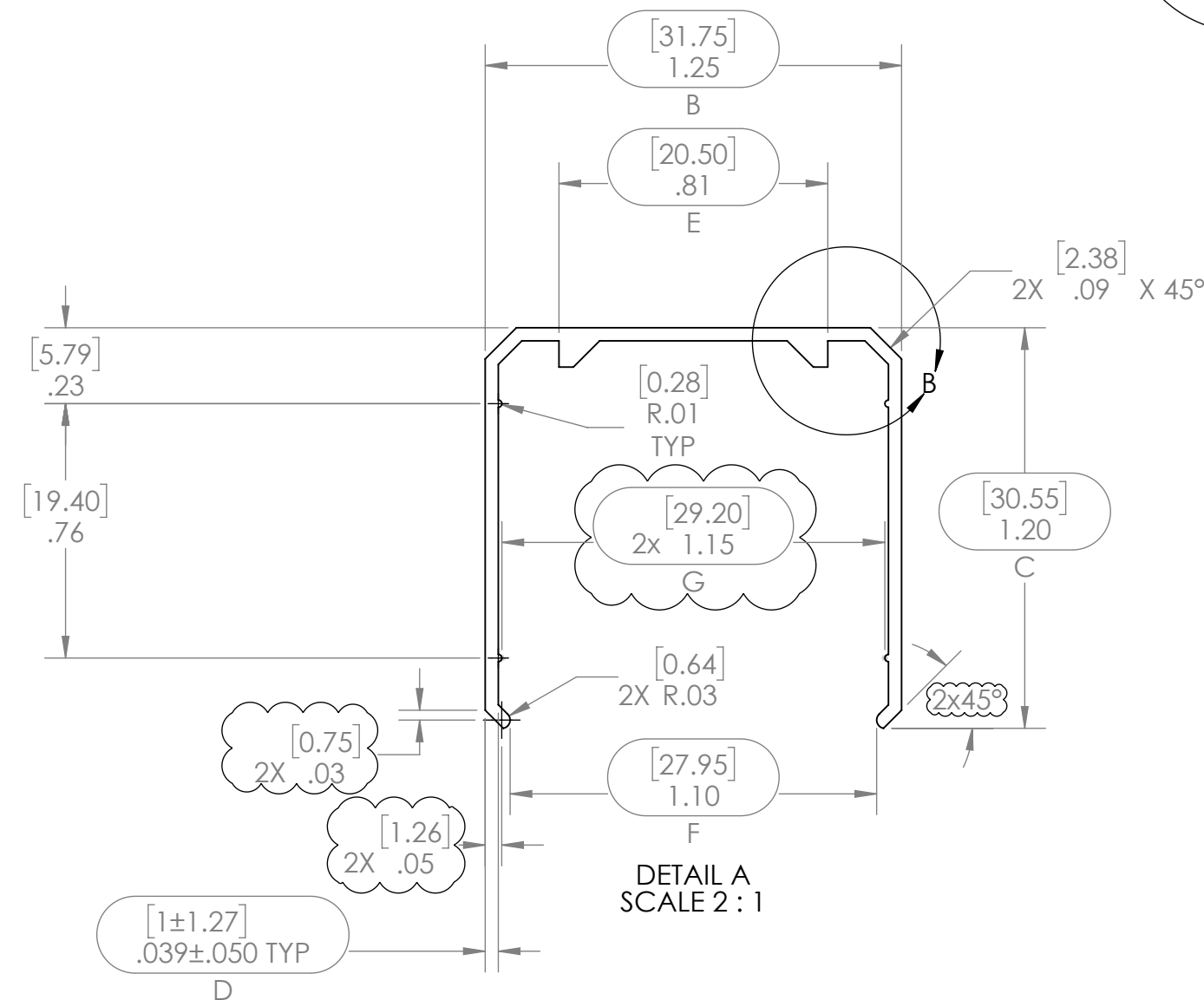
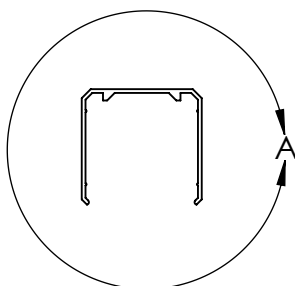
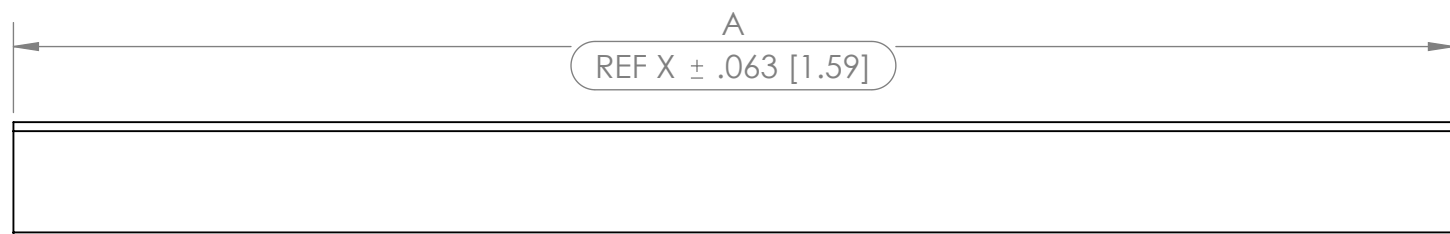


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 Garland, Tx 75040

Sheet: 1 OF 1

REV	DATE	BY	DESCRIPTION	SCALE:
3	07/29/20	KF	CHANGED SPACING	1:12
DESCRIPTION: AL13 HOME POOL PANEL 44.5" X 8'				REV: 3
DRAWN BY: KevinF		DIVISION: Fortress Rail		
DATE: 02/28/2019	ITEM #:	FILE NAME/PART #:		
	5914493X	R3936-09051		

ITEM NO.	PART NUMBER	DESCRIPTION	REF. X
1	R3931-06236 7"	AL13 HOME TOP CAP 7"	7 [177.8]
2	R3931-06236 14"	AL13 HOME TOP CAP 14"	14 [355.6]
3	R3931-06236 15"	AL13 HOME TOP CAP 15"	15 [381.0]
4	R3931-06236 30"	AL13 HOME TOP CAP 30"	30 [762.0]
5	R3931-06236 65.5"	AL13 HOME TOP CAP 65.5"	65.5 [1663.7]
6	R3931-06236 69"	AL13 HOME TOP CAP 69"	69 [1752.6]
7	R3931-06236 69.5"	AL13 HOME TOP CAP 69.5"	69.5 [1765.3]
8	R3931-06236 72"	AL13 HOME TOP CAP 72"	72 [1828.8]
9	R3931-06236 92.24"	AL13 HOME TOP CAP 92.24"	92.24 [2343.0]
10	R3931-06236 93"	AL13 HOME TOP CAP 93"	93 [2362.2]
11	R3931-06236 93.5"	AL13 HOME TOP CAP 93.5"	93.5 [2374.9]



GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [mm]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT LINE NOTES PAGE R3900-00001
 5. MATERIAL: 6061-T5
 6. WEIGHT: 0.22 LBM
 7. WARRANTY: N/A

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FORTRESS
 BUILDING PRODUCTS

Sheet: 1 OF 1

REV	DATE	BY	DESCRIPTION
E	8/20/20	JH	FIXED DIMENSIONS

DESCRIPTION:
 AL13 HOME TOP CAP

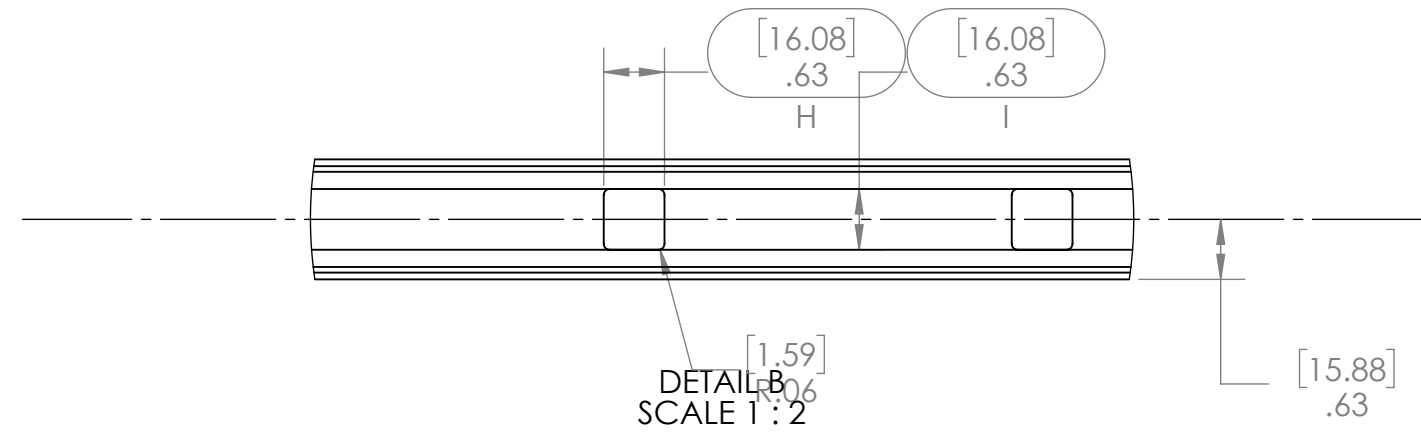
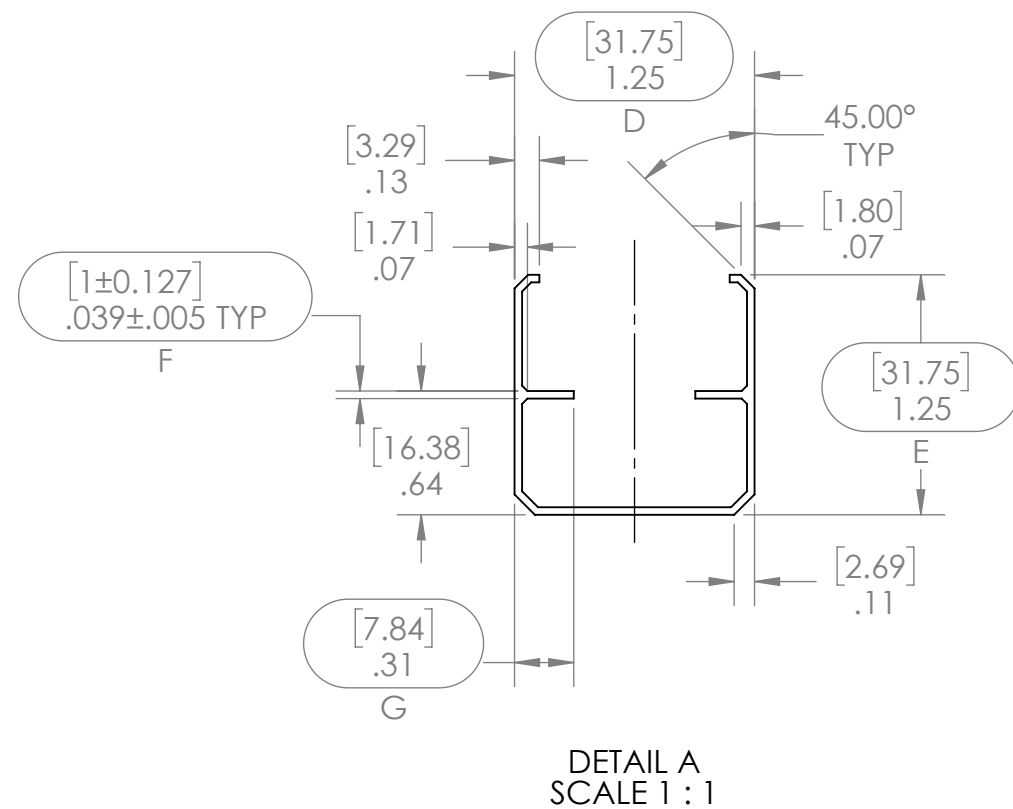
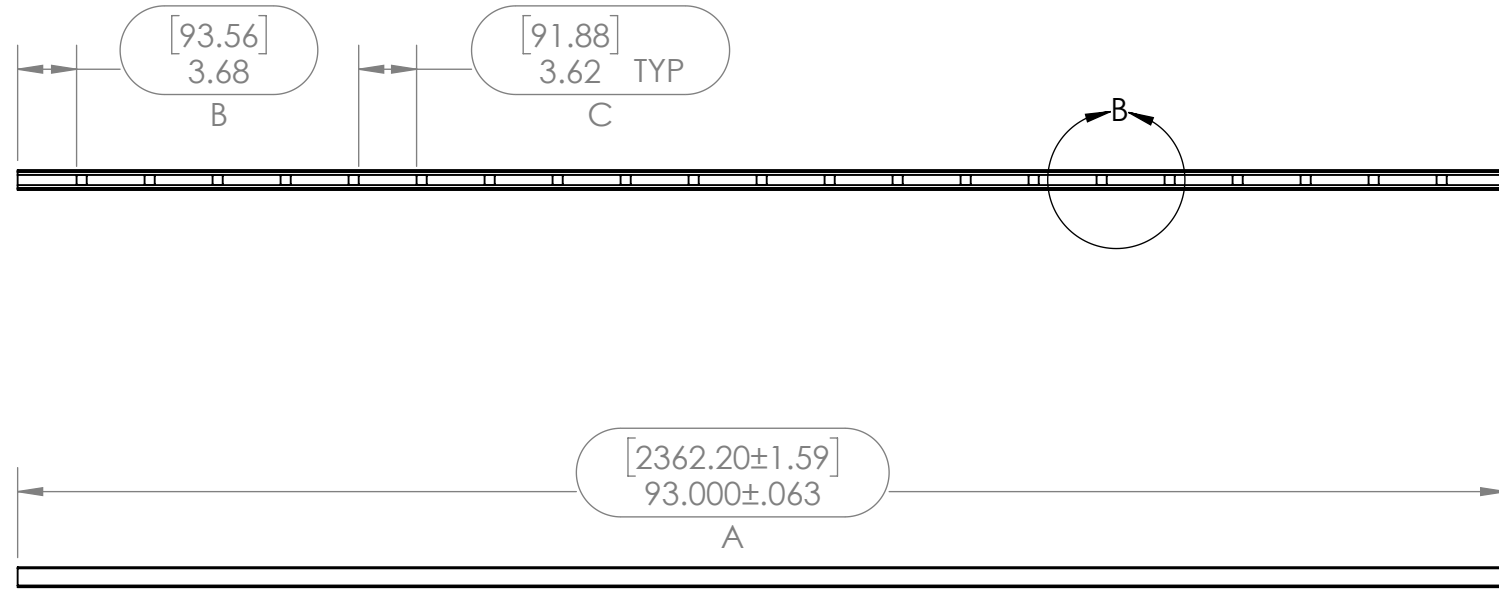
DRAWN BY: KevinF
 DATE: 08/17/2017
 DIVISION: Fortress Rail

SCALE: 1:2

ITEM #: R3931-06236

REV: E

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3931-10975	AL13 HOME BOTTOM RAIL 8' DECREASED SPACING	1

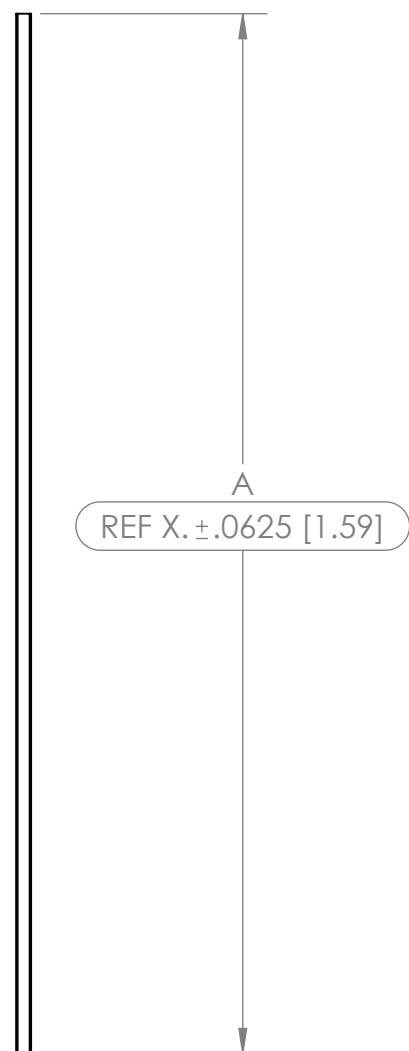
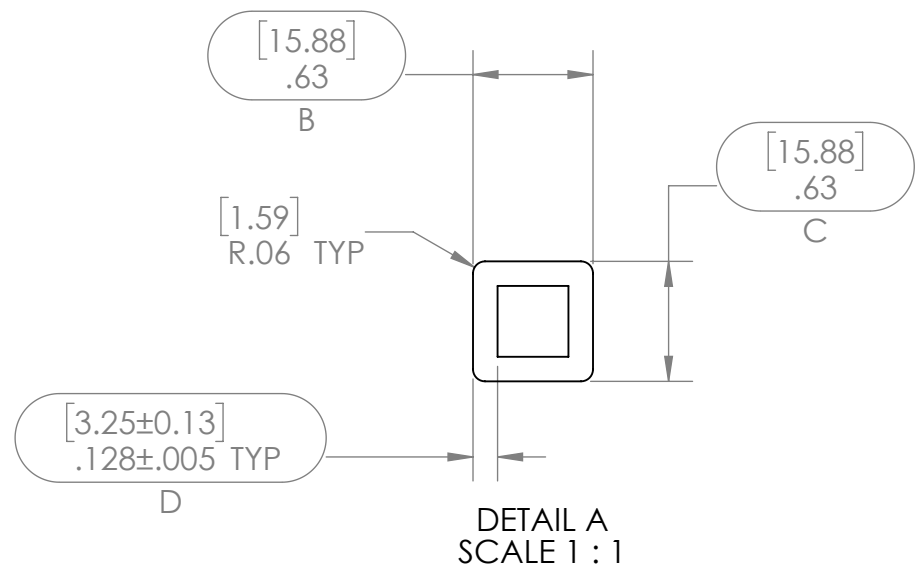
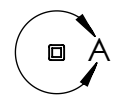


GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [mm]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT LINE NOTES PAGE R3900-00001
 5. CROSS SECTIONAL AREA: 107.92 mm²
 6. MATERIAL: 6063-T5
 7. WEIGHT: 1.49 LBM
 8. WARRANTY: N/A

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	Fortress Iron, LP 1720 N 1st Street Garland, Tx 75040		2 3/1/18 MF STANDARDIZED DRAWING REV DATE BY DESCRIPTION
	Sheet: 1 OF 1	ITEM #: R3931-10975	FILE NAME/PART #: R3931-10975

ITEM NO.	PART NUMBER	DESCRIPTION	REF. X
1	R3932-10772 31.3"	AL13 HOME 31.3" X 32.5mm BALUSTER	31.3 [795.6]
2	R3932-10772 38.8"	AL13 HOME 38.8" X 32.5mm BALUSTER	38.8 [986.1]
3	R3932-10772 43.3"	AL13 HOME 43.3" X 32.5mm BALUSTER	43.3 [1100.4]

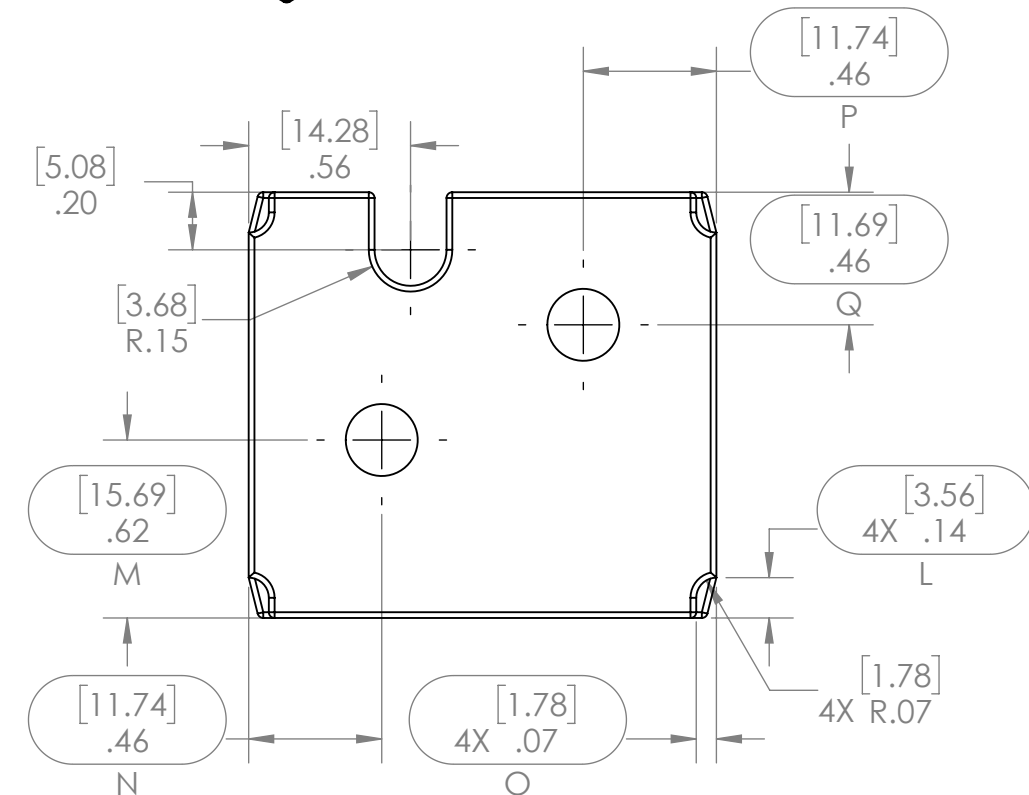
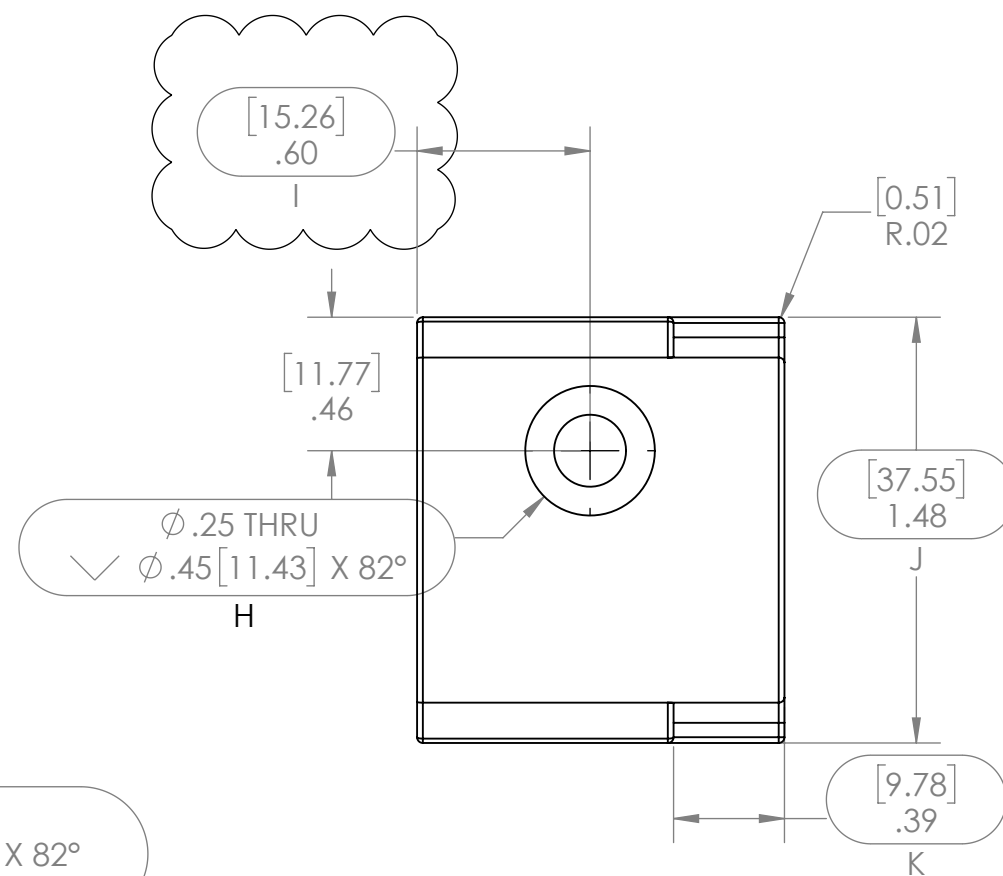
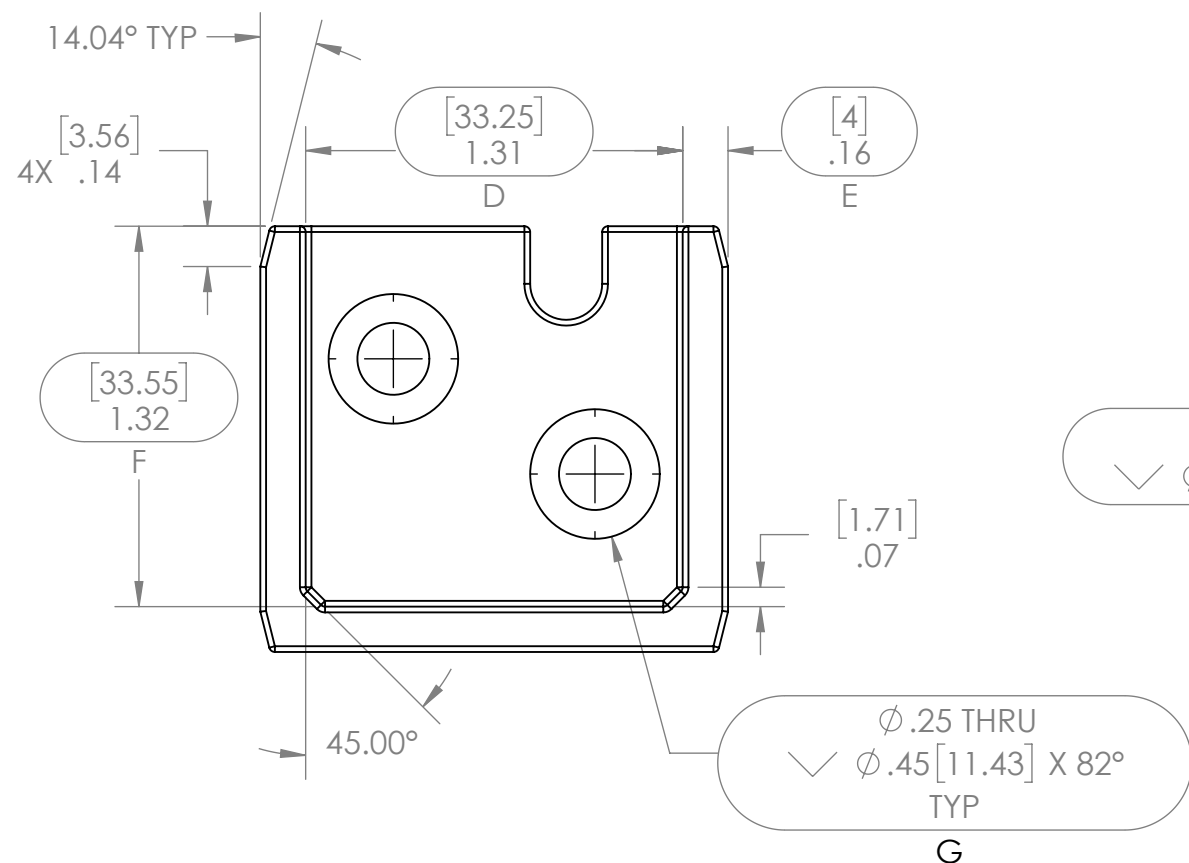
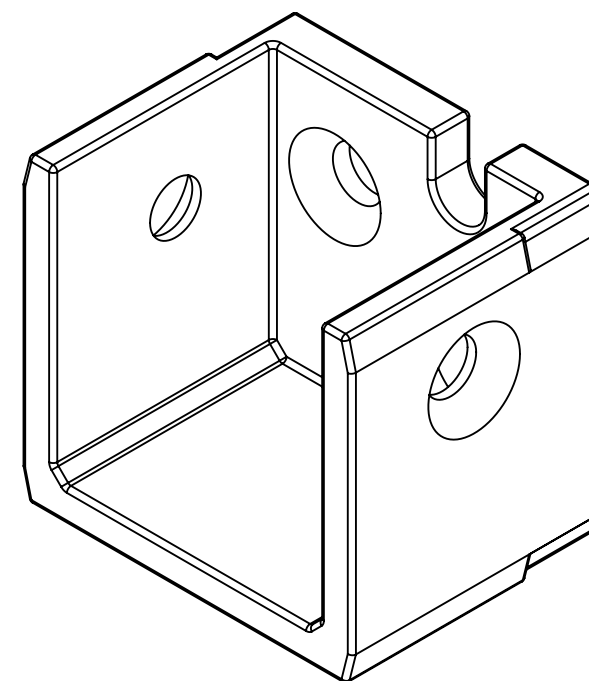
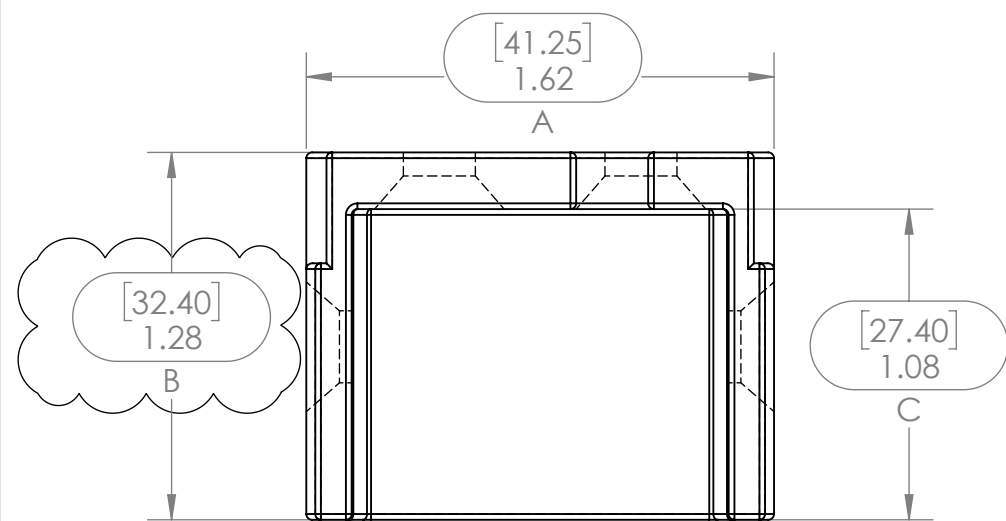


GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [mm]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5 mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT LINE NOTES PAGE R3900-00001
 5. CROSS SECTIONAL AREA: 161.96 mm²
 6. MATERIAL: 6063-T5
 7. WEIGHT: 1.06 LBM
 8. WARRANTY: N/A

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	Fortress Iron, LP 1720 N 1st Street Garland, Tx 75040	4 08/06/20 KF ADDED CONFIGURATIONS REV DATE BY DESCRIPTION
	Sheet: 1 OF 1	ITEM #: R3932-10772
		SCALE: 1:8 REV: 4

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3934-03618	AL13 HOME BRACKET CUP	1



GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [mm]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT LINE NOTES PAGE R3900-00001
 5. MATERIAL: ADC12
 6. WEIGHT: 0.11 LBM
 7. WARRANTY: N/A

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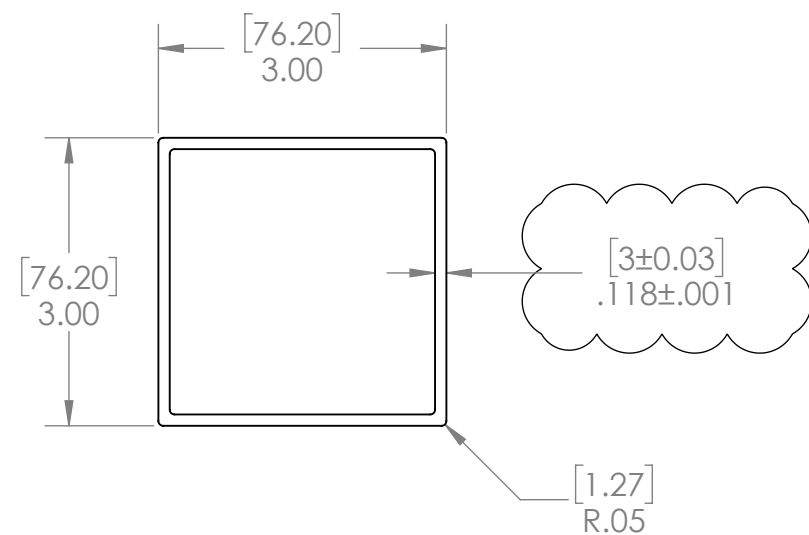
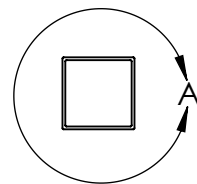
REV	DATE	BY	DESCRIPTION
D	06/18/19	KF	CHANGED LENGTH

DESCRIPTION:
 AL13 HOME BRACKET CUP

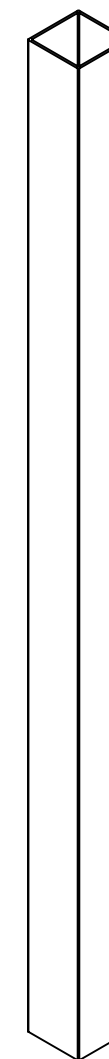
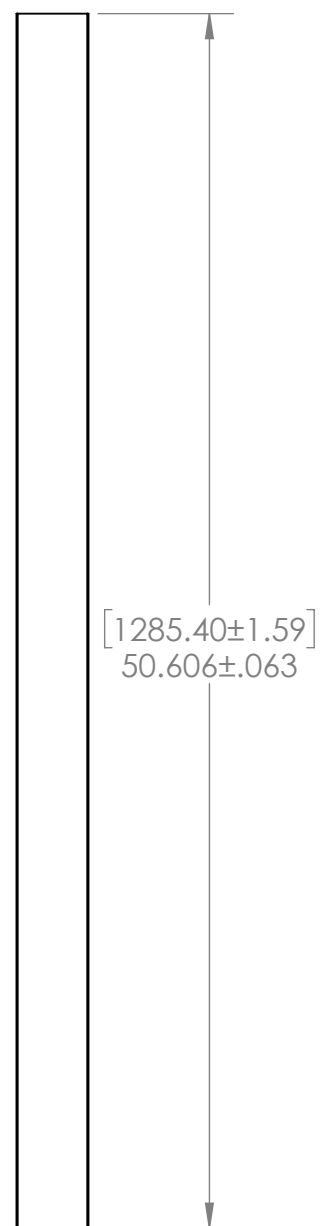
DRAWN BY: evant	SCALE: 3 : 2
DATE: 08/25/2016	DIVISION: RAILING
ITEM #: R3934-03618	REV: D

Sheet: 1 OF 1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3935-06296	AL RES - 3" X 51" POST TUBE	1



DETAIL A
SCALE 1 : 2



FINISHING & PACKAGING NOTES:
 1. NO SHARP OR ROUGH EDGES
 2. MUST BE FREE OF CORROSION

GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [MM]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. MATERIAL: 6061-T5
 5. WEIGHT: 6.72 LBM
 6. WARRANTY:

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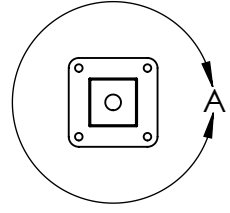
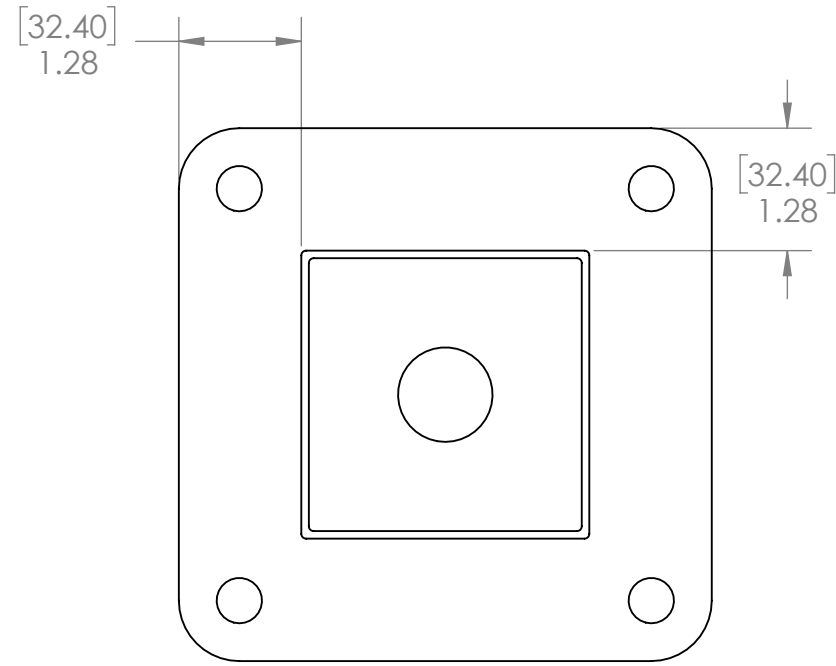
Sheet: 1 OF 1

REV	DATE	BY	DESCRIPTION
A	12/27/17	KB	CHANGED THICKNESS

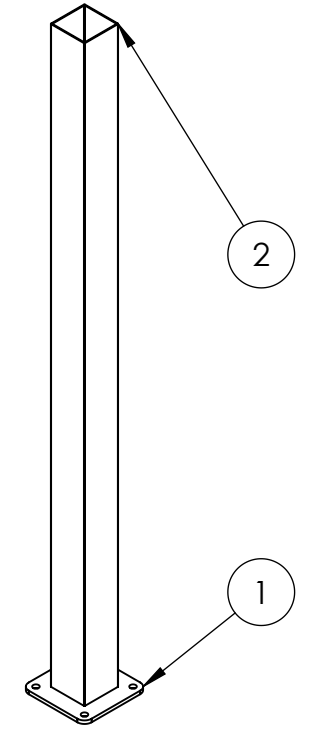
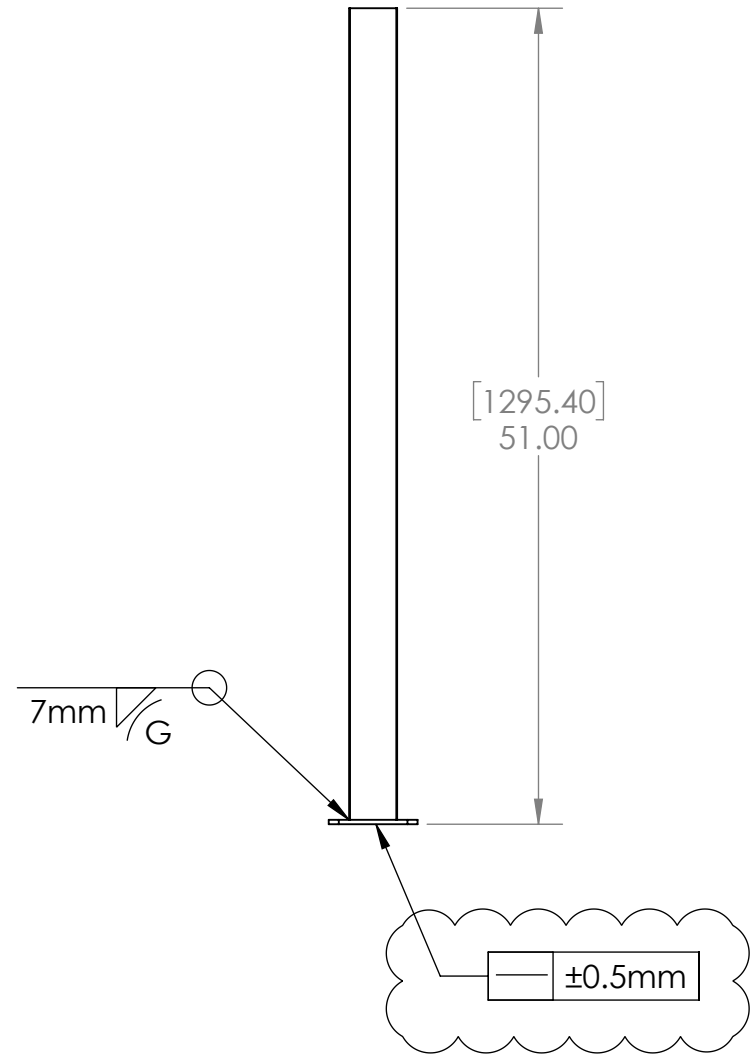
DESCRIPTION:
 AL RES - 3" X 51" POST TUBE

DRAWN BY: evant	SCALE: 1 : 8
DATE: 08/23/2017	DIVISION: Fortress Railing
ITEM #: R3935-06296	REV: A

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3935-03606	AL13 HOME POST BASE PLATE 3"	1
2	R3935-06296	AL RES - 3" X 51" POST TUBE	1



DETAIL A
SCALE 1 : 2



FINISHING & PACKAGING NOTES:
 1. NO SHARP OR ROUGH EDGES
 2. MUST BE FREE OF CORROSION
 3. ASSEMBLY TO BE CHROMATE PRETREATED AND POWDER COATED

GENERAL NOTES:
 1. ALL DIMENSIONS ARE SHOWN IN INCHES [MM]
 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE ± 0.5mm (UNLESS OTHERWISE NOTED)
 4. MATERIAL: NOTED ON INDIVIDUAL COMPONENTS
 5. WEIGHT: 5.33 LBM
 6. WARRANTY:

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FORTRESS
 THE FORTRESS COMPANY
Innovative Building Solutions

Fortress Iron, LP
 1720 N 1st Street
 Garland, Tx 75040

REV	DATE	BY	DESCRIPTION
A	2/28/18	ET	STRAIGHTNESS CALLOUT ADDED

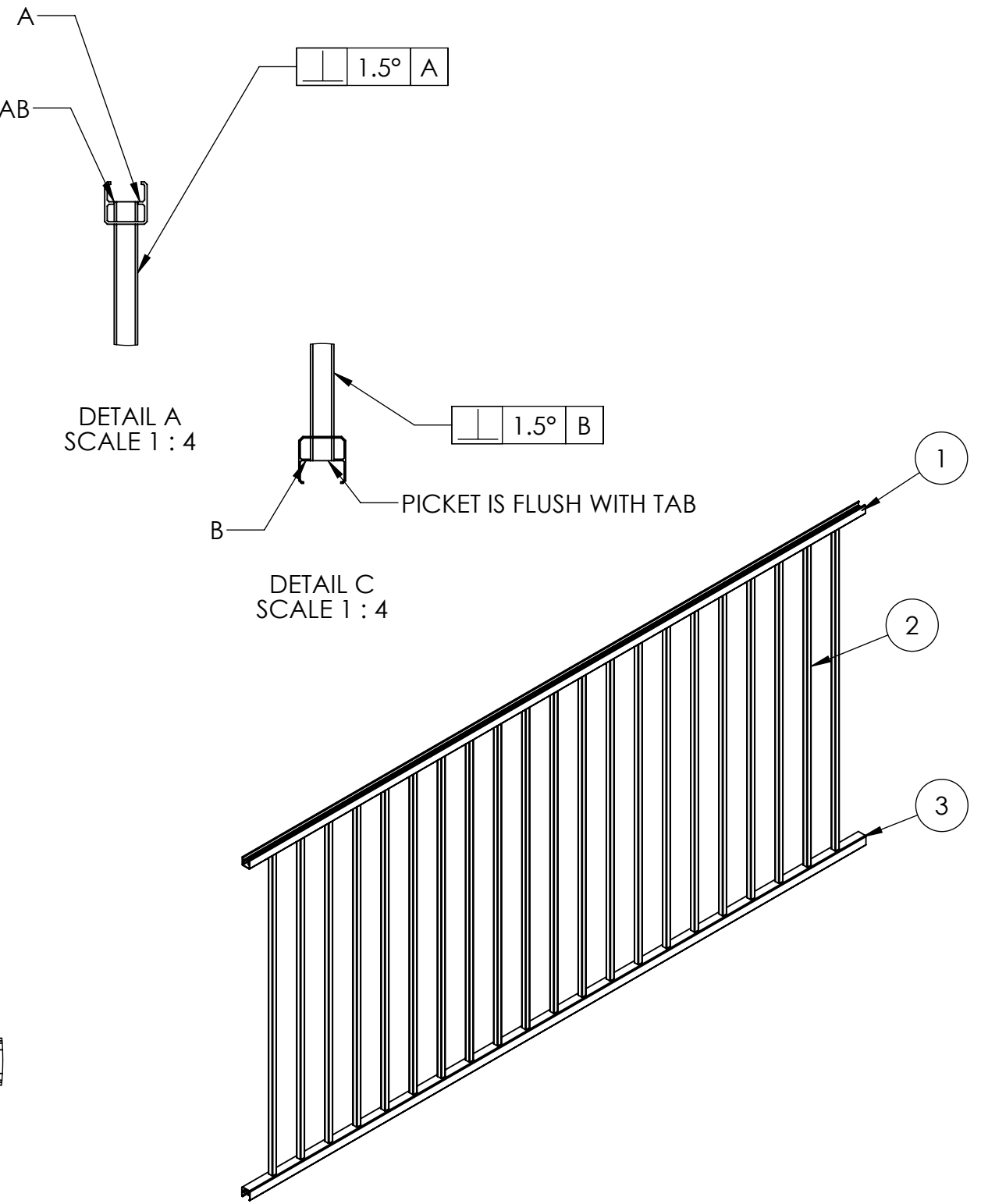
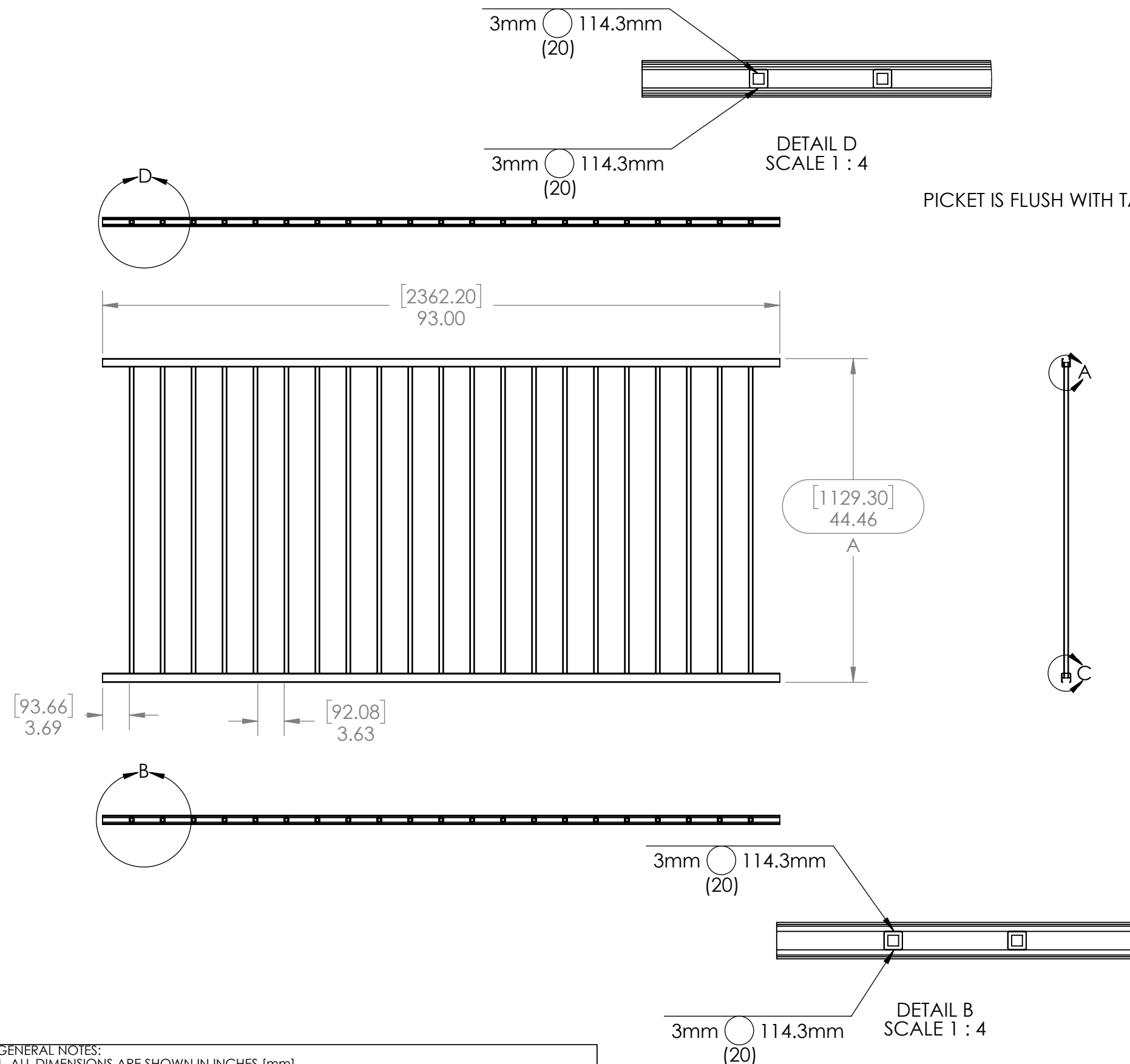
DESCRIPTION:
 AL RES - 3" X 51" POST WELDMENT

DRAWN BY: evant
 DATE: 08/23/2017 DIVISION: Fortress Railing

SCALE: 1 : 12

ITEM #: FILE NAME/PART #: R3935-06297 REV: A

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	R3931-10974	AL13 HOME TOP RAIL 8' CLOSER SPACING	1
2	R3932-10772	AL13 HOME 3.25mm BALUSTER 43.3"	21
3	R3931-10975	AL13 HOME BOTTOM RAIL 8' DECREASED SPACING	1



GENERAL NOTES:
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 2. ALL DIMENSIONS ARE BEFORE ANY FINISHING OR COATING
 3. ALL DIMENSIONS ARE \pm 0.5mm (UNLESS OTHERWISE NOTED)
 4. SEE PRODUCT NOTES PAGE R3900-00001
 5. MATERIAL: NOTED IN INDIVIDUAL COMPONENTS
 6. WARRANTY: N/A

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FORTRESS
BUILDING PRODUCTS

Fortress Iron, LP
1720 N 1st Street
Garland, Tx 75040

2	07/29/20	KF	Initial Drawing
REV	DATE	BY	DESCRIPTION

DESCRIPTION:
AL13 HOME TRADITIONAL 44.5" X 8' WELDMENT

DRAWN BY: KevinF
DATE: 06/23/2020

DIVISION: Fortress Rail

SCALE: 1:16

Sheet: 1 OF 1

ITEM #: R3936-10972

REV: 2

Intertek Structural Performance Report

FORTRESS BUILDING PRODUCTS TEST REPORT

SCOPE OF WORK

STRUCTURAL PERFORMANCE TESTING ON THE *AL13 HOME 44.5 IN (TRADITIONAL)*
GUARDRAIL SYSTEM

REPORT NUMBER

L2777.01-119-19 R0

TEST DATES

09/24/20 - 10/13/20

ISSUE DATE

01/12/21

RECORD RETENTION END DATE

10/13/24

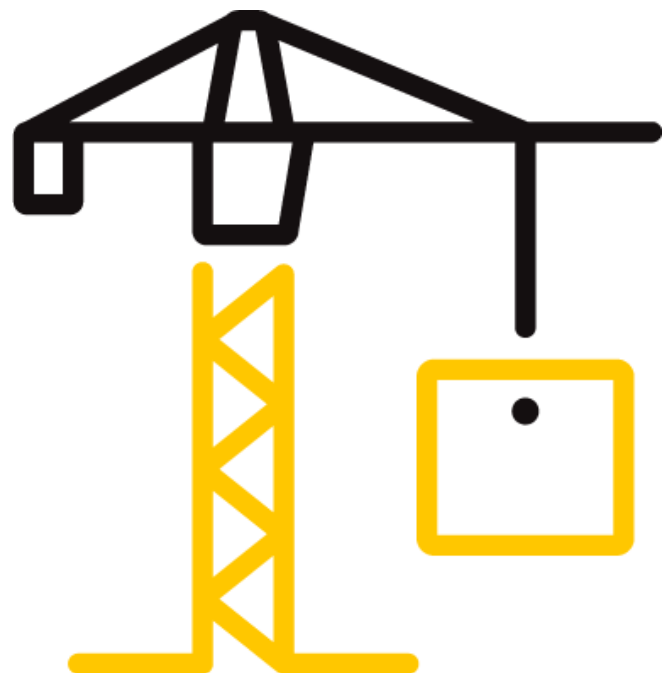
PAGES

25

DOCUMENT CONTROL NUMBER

RT-R-AMER-Test-2846 (02/09/18)

© 2017 INTERTEK



TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

REPORT ISSUED TO

FORTRESS BUILDING PRODUCTS

1720 North First Street

Suite B

Garland, TX 75040

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Fortress Building Products to perform structural performance testing in accordance with the 2015 National Building Code of Canada on their *A13 Home 44.5 in Traditional* aluminum 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 support posts. 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 Intertek test facility in York, Pennsylvania. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2

SUMMARY OF TEST RESULTS

The specimens met the 2015 NBC residential design load performance requirements.

For INTERTEK B&C:

COMPLETED BY:	Adam J. Schrum
TITLE:	Project Manager
SIGNATURE:	
DATE:	01/12/21

REVIEWED BY:	V. Thomas Mickley, Jr., P.E.
TITLE:	Senior Staff Engineer
SIGNATURE:	
DATE:	01/12/21

AJS:vtm/aas

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample(s) tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

SECTION 3

TEST METHODS

The specimens were evaluated in accordance with the following:

2015, National Building Code of Canada, *Canadian Commission on Building and Fire Codes*

Limitations

Testing is limited to satisfying the residential requirements of the 2015 National Building Code of Canada.

Testing reported herein was performed using a safety factor of 2.5. Approval of the testing reported herein, and the use of this safety factor is left up to the authority having jurisdiction.

SECTION 4

MATERIAL SOURCE/INSTALLATION

Test samples were provided by the client.

The guardrail assembly was installed and tested as a single railing section by surface mounting the posts to steel channels (simulated concrete). 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.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

SECTION 6

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Kevin J. Eichelberger	Intertek B&C
Adam J. Schrum	Intertek B&C

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.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

SECTION 8

TEST SPECIMEN DESCRIPTION

Test specimens were assembled by an Intertek technician. Fortress Railing Products provided the test components with the following details:

PRODUCT	<i>AL13 Home Traditional</i>
MATERIAL	Extruded Aluminum (unspecified alloy)
COLORS	- Black - White
RAIL LENGTH	93-1/2 in (inside of post to inside of post)
RAIL HEIGHT	- 47-3/8 in (top of top rail to deck surface) - 45-3/8 in (top of top rail to bottom of bottom rail)
TOP RAIL CAP	- Flat: 1-5/8 in high by 2-3/8 in wide by 0.070 in thick aluminum extrusion - Round: 2-1/16 in high by 2-3/8 in wide by 0.070 in thick contoured aluminum extrusion
TOP RAIL SPACER	- 1-7/16 in high by 2-3/16 in wide by 0.070/0.060 in thick aluminum extrusion (continuous) (used in guardrail system with the Flat top rail) - 1-7/16 in high by 2-3/16 in wide by 1-3/4 in long by 0.070/0.060 in thick aluminum extrusion (seven equally spaced) (used in guardrail system with the Round top rail)
TOP RAIL (UPPER SECTION)	1-1/4 in high by 1-1/4 in wide by 0.045 in wall aluminum extrusion
TOP RAIL (LOWER SECTION)	1-1/8 in high by 1-1/8 in wide by 0.070 in wall aluminum extrusion
BOTTOM RAIL	1-1/4 in high by 1-1/4 in wide by 0.045 in wall aluminum extrusion
IN-FILL	5/8 in square aluminum extrusion with 0.130 in wall
RAIL BRACKETS	1-1/2 in high by 1-5/8 in wide by 1 in deep (0.160/0.200 in wall) cast aluminum brackets
POST	3 in square by 0.125 in thick aluminum tube connected to a 5-1/2 in square by 0.40 in thick aluminum base plate with a 1/4 in continuous fillet weld; the base plate included four 7/16 in diameter holes and one 1 in diameter hole

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Fastening Schedule

CONNECTION	FASTENER
Rail Bracket to Post	Two 1/4-14 by 1" (0.157 in minor diameter) Torx drive, flat-head, self-drilling screws
Rail Bracket to Rail	One 1/4-14 by 1" (0.157 in minor diameter) Torx drive, flat-head, self-drilling screw on the protected side of the rail
Rail Spacer to Rail	#10-16 by 1/2" (0.127 in minor diameter) hex head, self-drilling screws; two per piece (one protected side; one exterior side) when spacer is non-continuous; 2-3/8 in from each end and approximately 18 in on center staggered (protected side/exterior side) when spacer is continuous
Baluster to Top Rail (Lower Section) and Bottom Rail	Slip fit into routing and tack welded to rail section
Top Rail Cap to Top Rail Spacer	Snap fit and adhered with 1 in square pieces of 3M two-sided tape
Steel Post Mount to Substructure	Four 3/8 in Grade 5 hex-head bolts with nut and washer

SECTION 9

TEST RESULTS

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.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Test Series No. 1

8 ft (93-1/2 in) by 47-3/8 in AI13 Home Traditional Level Guardrail with Flat Accent Top Rail Cap

Test No. 1 - 10/13/20

Design Load: 112 lb / 11.81 Square in at Center of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
Initial Load	25	00:00	0.00
2.0x Design Load	225	00:28	2.12
Initial Load	25	02:13	0.15
93% Recovery from 2.0 x Design Load			
2.5x Design Load	284	02:41	Achieved Load without Failure

Test No. 2 - 10/13/20

Design Load: 112 lb / 11.81 Square in at Bottom of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
Initial Load	26	00:00	0.00
2.0x Design Load	226	00:25	2.41
Initial Load	25	01:56	0.10
96% Recovery from 2.0 x Design Load			
2.5x Design Load	285	02:31	Achieved Load without Failure

Test No. 3 - 10/13/20

Design Load: 102.78 plf x (93-1/2 ÷ 12 in/ft) = 800.8 lb Vertical Uniform Load on Top Rail ¹

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)
Initial Load	160	00:00	0.00
2.0x Design Load	1604	01:08	1.67
Initial Load	160	04:11	0.40
76% Recovery from 2.0 x Design Load			
2.5x Design Load	2009	05:07	Achieved Load without Failure

¹ Uniform load was simulated with quarter-point loading.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Test No. 4 - 10/13/20

Design Load: 225 lb Horizontal Concentrated Load at Midspan of Top Rail

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
2.0x Design Load	452	01:02	0.92	2.15	0.82	1.28
Initial Load	50	02:37	0.07	0.08	0.04	0.03
98% Recovery from 2.0 x Design Load						
2.5x Design Load	566	03:43	Achieved Load without Failure			

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

Test No. 5 - 10/13/20

Design Load: 225 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	100	00:00	0.00	0.00
(2.0x Design Load) x 2	905	01:20	2.00	1.93
Initial Load	100	03:08	0.24	0.26
88% Recovery (Rail End #1) and 87% Recovery (Rail End #2) from 2.0 x Design Load				
(2.5x Design Load) x 2	1129	04:35	Achieved Load without Failure	

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

Test No. 6 - 10/13/20

Design Load: 23 lb Applied to Two Adjacent Pickets, in Opposite Directions

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISTANCE BETWEEN PICKETS (in)
Zero Load	0	00:00	3.625
Design Load	23	00:10	3.750
Total Deflection			0.125

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Test Series No. 2

8 ft (93-1/2 in) by 47-3/8 in A113 Home Traditional Level Guardrail with Round Accent Top Rail Cap

Test No. 1 - 09/24/20

Design Load: 112 lb / 11.81 Square in at Center of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
Initial Load	25	00:00	0.00
2.0x Design Load	227	00:17	2.37
Initial Load	25	01:54	0.26
89% Recovery from 2.0 x Design Load			
2.5x Design Load	281	02:13	Achieved Load without Failure

Test No. 2 - 09/24/20

Design Load: 112 lb / 11.81 Square in at Bottom of In-fill (on 2 Pickets)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
Initial Load	25	00:00	0.00
2.0x Design Load	224	00:14	2.26
Initial Load	25	01:53	0.02
99% Recovery from 2.0 x Design Load			
2.5x Design Load	286	02:22	Achieved Load without Failure

Test No. 3 - 09/24/20

Design Load: 102.78 plf x (93-1/2 ÷ 12 in/ft) = 800.8 lb Vertical Uniform Load on Top Rail ¹

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RAIL DISPLACEMENT (in)
Initial Load	160	00:00	0.00
2.0x Design Load	1607	01:14	1.38
Initial Load	160	02:42	0.11
92% Recovery from 2.0 x Design Load			
2.5x Design Load	2014	03:54	Achieved Load without Failure

¹ Uniform load was simulated with quarter-point loading.

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Test No. 4 - 09/24/20

Design Load: 225 lb Horizontal Concentrated Load at Midspan of Top Rail

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
2.0x Design Load	450	00:37	0.73	2.38	0.92	1.56
Initial Load	50	02:18	0.02	0.08	0.05	0.05
96% Recovery from 2.0 x Design Load						
2.5x Design Load	565	03:04	Achieved Load without Failure			

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

Test No. 5 - 09/24/20

Design Load: 225 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	100	00:00	0.00	0.00
(2.0x Design Load) x 2	904	00:42	1.95	2.27
Initial Load	100	02:24	0.27	0.30
86% Recovery (Rail End #1) and 87% Recovery (Rail End #2) from 2.0 x Design Load				
(2.5x Design Load) x 2	1130	03:45	Achieved Load without Failure	

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

Test No. 6 - 09/24/20

Design Load: 23 lb Applied to Two Adjacent Pickets, in Opposite Directions

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISTANCE BETWEEN PICKETS (in)
Zero Load	0	00:00	3.625
Design Load	23	00:10	3.875
Total Deflection			0.250

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

Test No. 7 - 09/24/20

Design Load: 225 lb Concentrated Load at Top of Stand-Alone ¹ 3 in Post Mount (47 in High)

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	POST DISPLACEMENT (in)
Initial Load	50	00:00	0.00
2.0x Design Load	452	00:21	1.37
Initial Load	50	02:03	0.01
99% Recovery from 2.0 x Design Load			
2.5x Design Load	566	02:31	Achieved Load without Failure
Ultimate Load	734	Mode of Failure: Weld Failure	

¹ Post was conservatively tested without a railing attached.

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 guardrails detailed in the following table:

AL13 HOME ALUMINUM GUARDRAIL SYSTEM	GUARDRAIL TYPE	BALUSTER	ACCENT TOP RAIL CAP	SUPPORT POST	CODE OCCUPANCY CLASSIFICATION
8 ft (93-1/2 in) by 47-3/8 in	Level / In-Line Application	5/8 in square aluminum extrusion with 0.130 in wall	Flat	3 in Square A/13 Post Mount	2015 National Building Code of Canada - Residential
			Round		

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

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

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

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21



Photo No. 3
Concentrated Load Test at Midspan of Top Rail



Photo No. 4
Concentrated Load Test at Ends of Top Rail (Brackets)

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21



Photo No. 5

Concentrated Load Test at Top of Stand-Alone 3 in Post Mount (47 in high)



Photo No. 6

Vertical Uniform Test on Top Rail

TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

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Photo No. 7
23 lb Test on Adjacent Pickets



Photo No. 8
Cast Aluminum Rail Bracket



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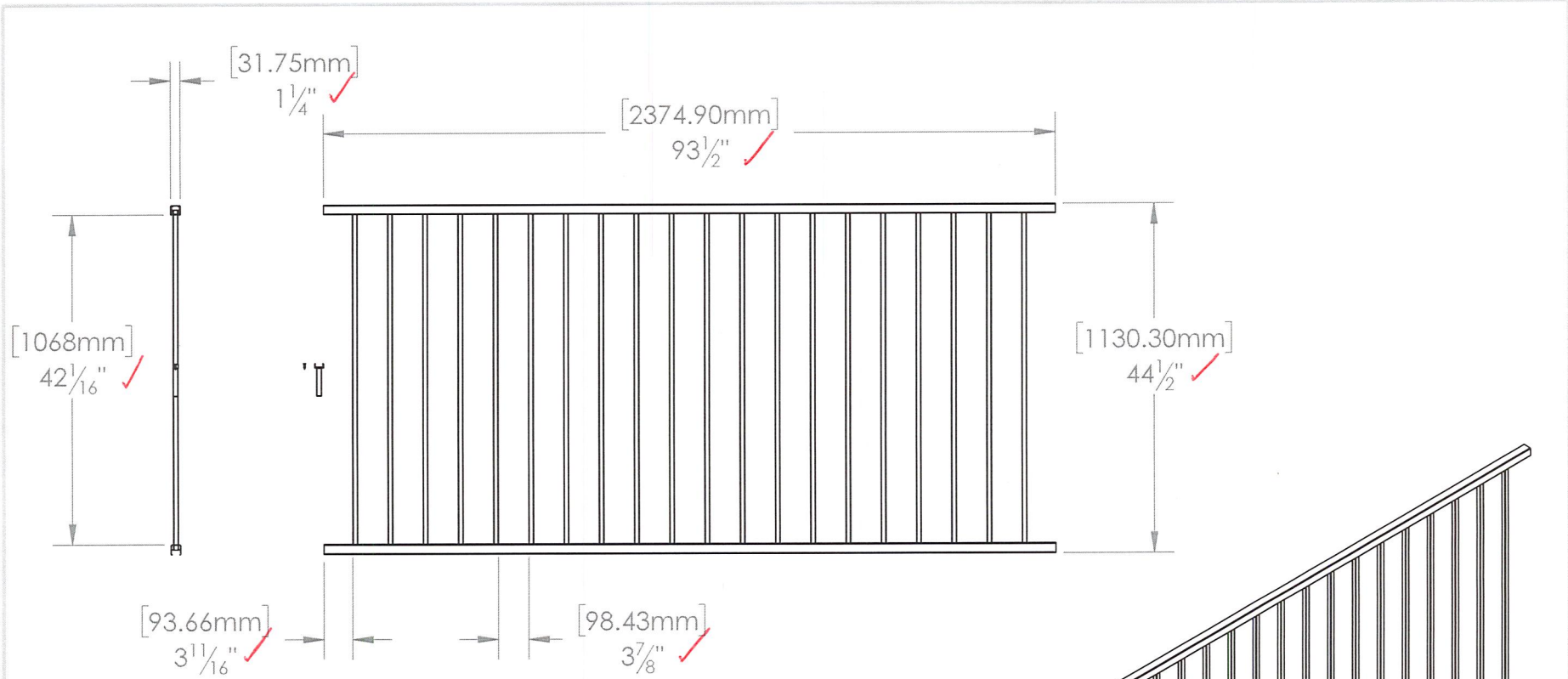
TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

SECTION 12 DRAWINGS

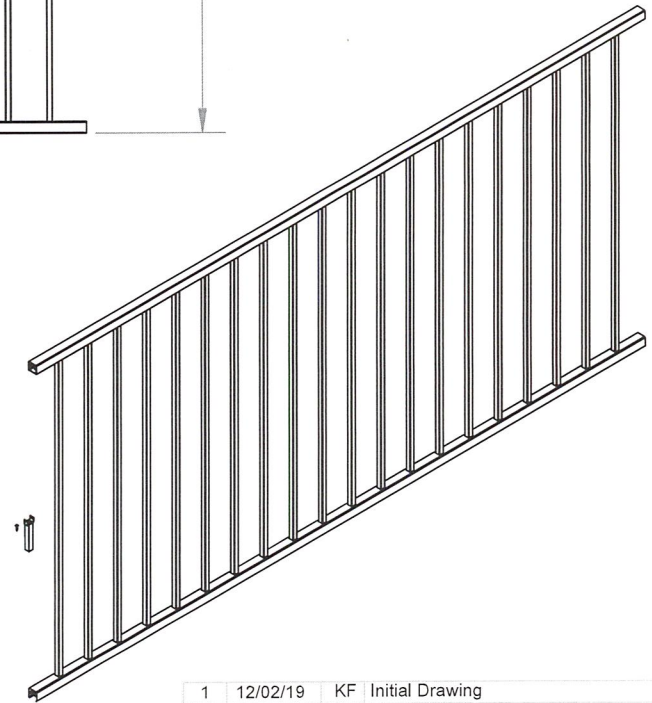
The "As-Built" drawings for the *A113 Home Traditional* which follow have been reviewed by Intertek B&C and are representative of the project reported herein. Project construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.



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Test sample complies with these details.
Deviations are noted.

Report # L2777.01-119-19
Date 1/6/21 Tech ATJ



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Sheet: 1 OF 1

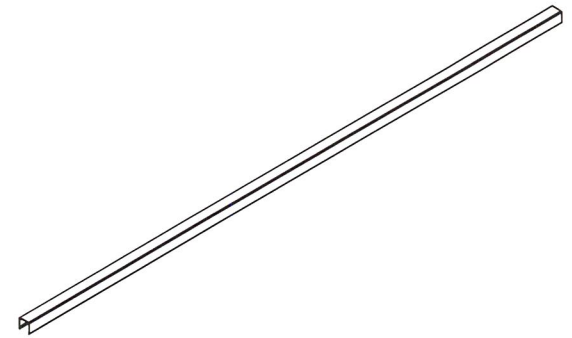
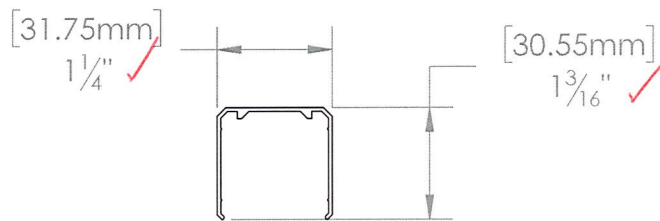
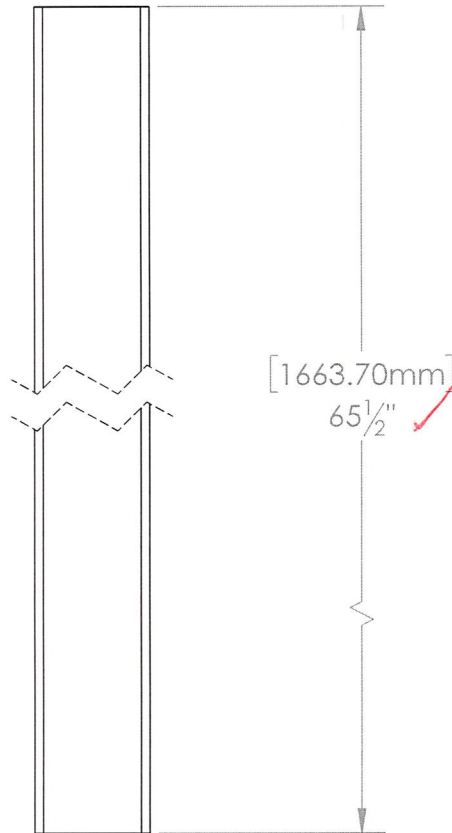
REV	DATE	BY	DESCRIPTION
1	12/02/19	KF	Initial Drawing

DESCRIPTION:
AL13 HOME POOL PANEL 44.5" X 8'

DRAWN BY: KevinF
DATE: 12/02/2019 DIVISION: Fortress Rail

ITEM #: 5914493X
FILE NAME/PART #: R3936-09051A

SCALE:
1:20
REV:
1



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Report # L2777.01-119-19

Date 1/6/21 Tech AJS

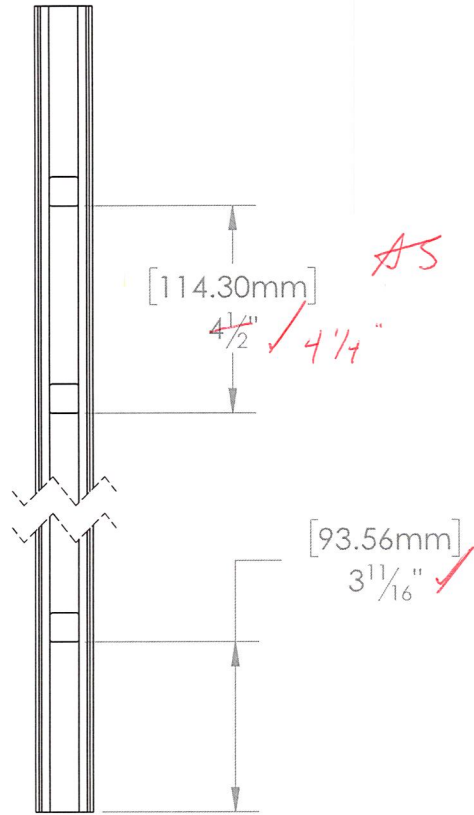
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Sheet: 1 OF 1

E3	07/10/2020	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION:			
AL13 HOME TOP CAP			
DRAWN BY: KevinF		SCALE: AS SHOWN	
DATE: 07/10/2020	DIVISION: Fortress Railing		REV: E
ITEM #:	FILE NAME/PART #:		
	R3931-06236A		

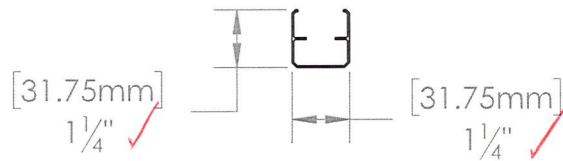


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Sheet: 1 OF 1

REV	DATE	BY	DESCRIPTION
B1	07/10/2020	TF	Initial Drawing

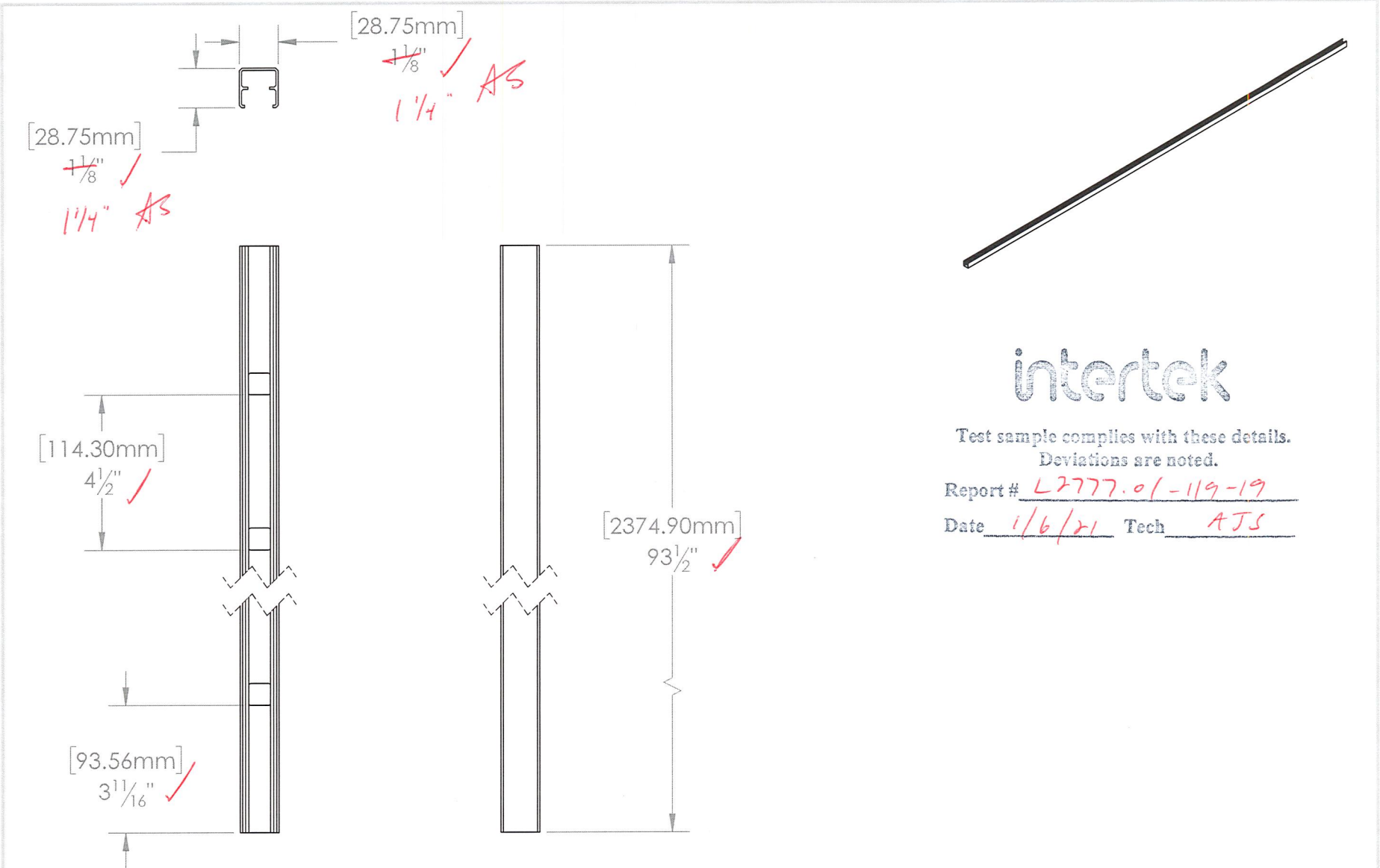
DESCRIPTION:
AL13 HOME BOTTOM RAIL 8'

DRAWN BY: KevinF
DATE: 07/10/2020 DIVISION: Fortress Rail

ITEM #: FILE NAME/PART #:
R3931-06233A

SCALE:
AS SHOWN

REV:
B



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Sheet: 1 OF 1

B1	07/10/2020	TF	Initial Drawing
REV	DATE	BY	DESCRIPTION

DESCRIPTION:
AL13 HOME TOP RAIL 8'

DRAWN BY: KevinF
DATE: 07/10/2020 DIVISION: Fortress Rail

SCALE:
AS SHOWN

ITEM #: FILE NAME/PART #:
R3931-06235A

REV:
B

ITEM NO.	PART NUMBER	DESCRIPTION	REF. X
1	R3932-10772 31.3"	AL13 HOME 31.3" X 32.5mm BALUSTER	31.3 [795.6]
2	R3932-10772 38.8"	AL13 HOME 38.8" X 32.5mm BALUSTER	38.8 [986.1]
3	R3932-10772 43.3"	AL13 HOME 43.3" X 32.5mm BALUSTER	43.3 [1100.4]

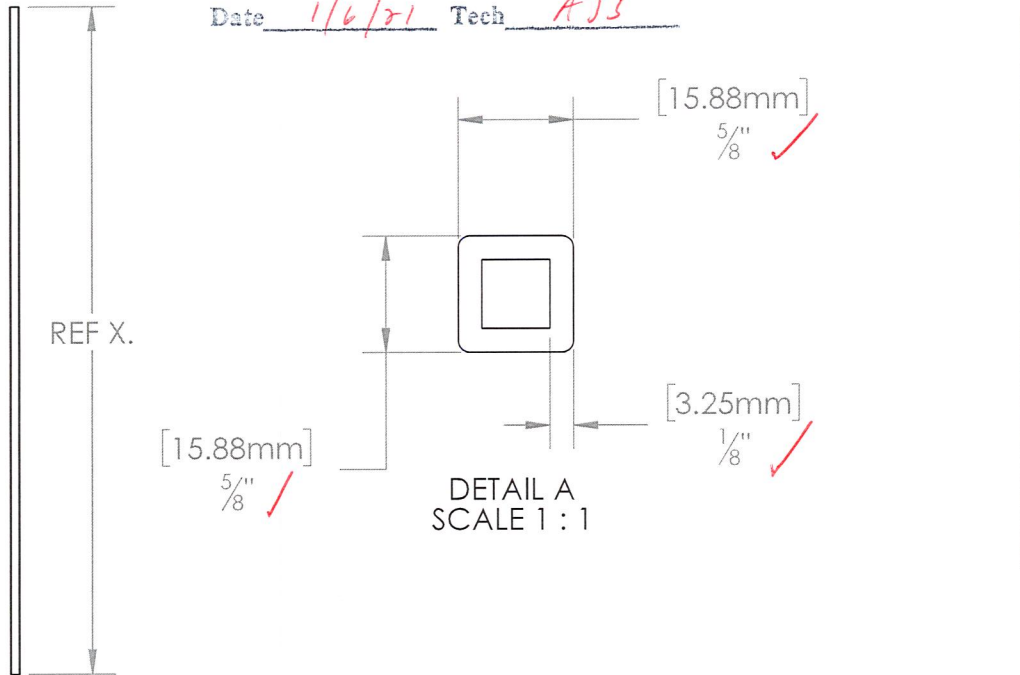
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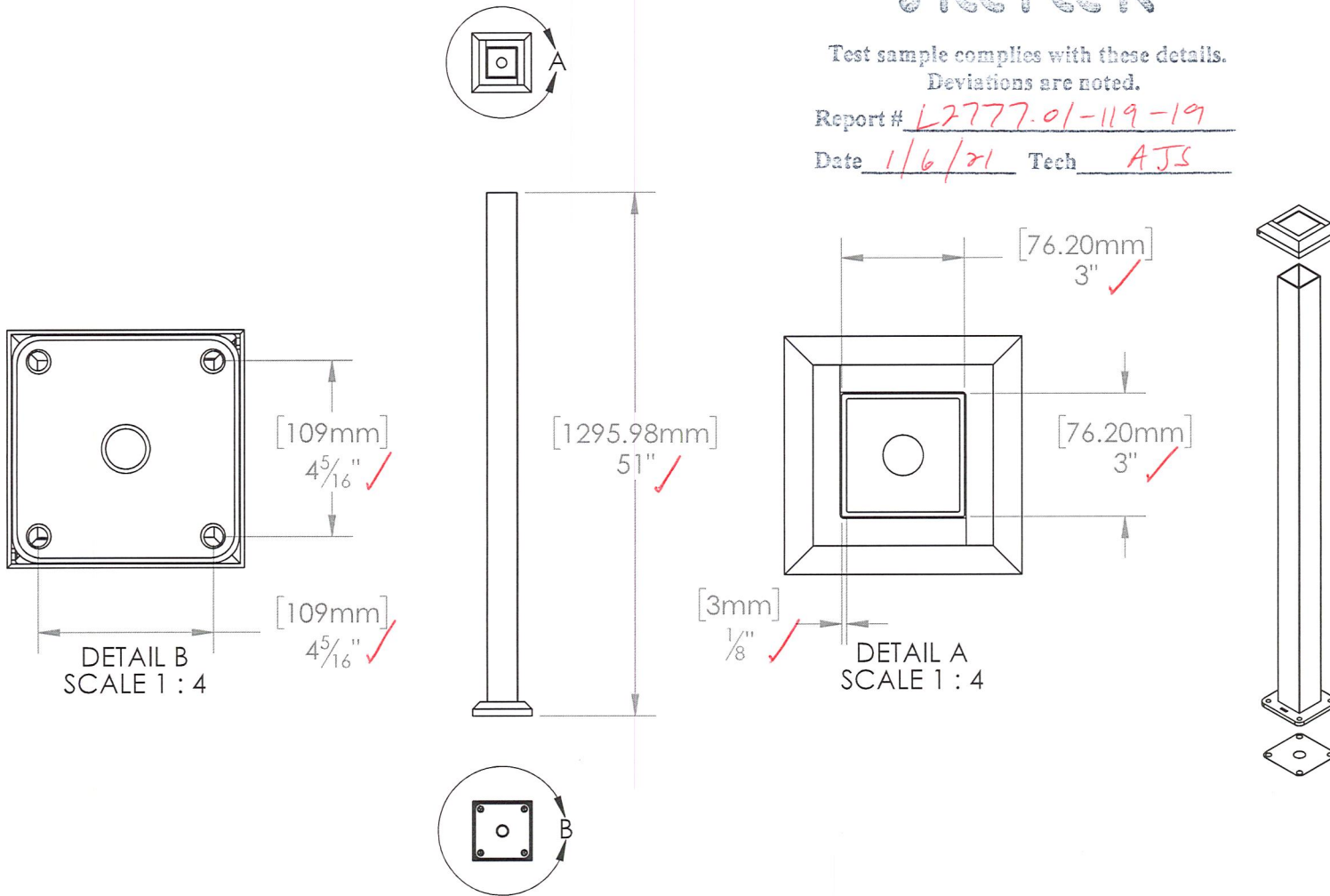
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REV	DATE	BY	DESCRIPTION
DESCRIPTION: AL13 HOME 3.25mm BALUSTER			
DRAWN BY: KevinF		SCALE: AS SHOWN	
DATE: 01/06/2021		DIVISION: Fortress Rail	
ITEM #:	FILE NAME/PART #:	REV:	
	R3932-10772A	4	

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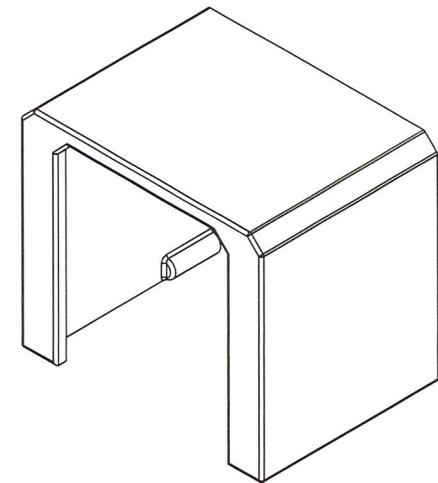
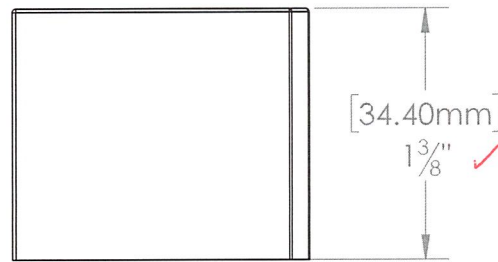
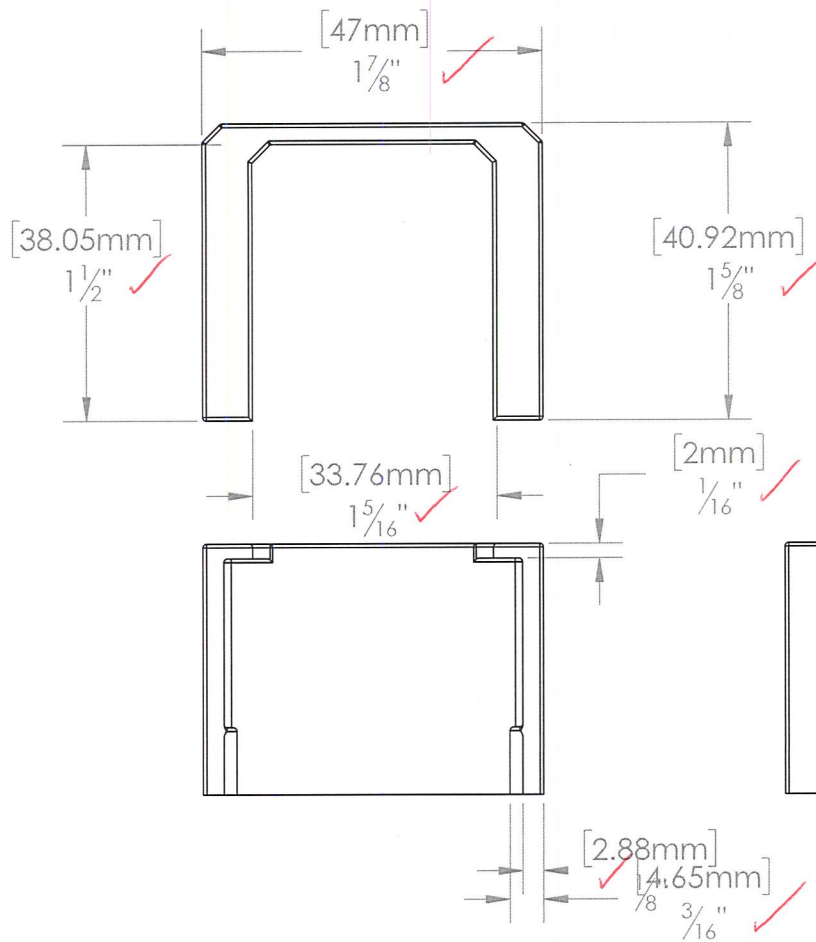
REV	DATE	BY	DESCRIPTION	SCALE:
A	12/03/19	KF	Initial Drawing	AS SHOWN
DESCRIPTION:				
AL13 HOME POST 3" X 51" BLANK w/ BASE CVR				
DRAWN BY: KevinF			SCALE:	
DATE: 12/03/2019			AS SHOWN	
DIVISION: Fortress Railing			REV:	
ITEM #:	FILE NAME/PART #:		A	
5935103X	R3935-06298A			

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Sheet: 1 OF 1

REV	DATE	BY	DESCRIPTION
F	01/07/20	KF	Initial Drawing

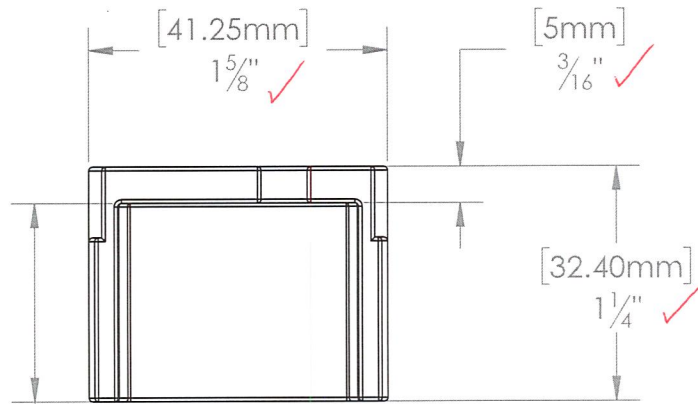
DESCRIPTION:
AL13 HOME BRACKET CAP

DRAWN BY: KevinF
DATE: 01/07/2021 DIVISION: RAILING

SCALE:
AS SHOWN

ITEM #: FILE NAME/PART #:
R3934-03621A-OLD

REV:
F

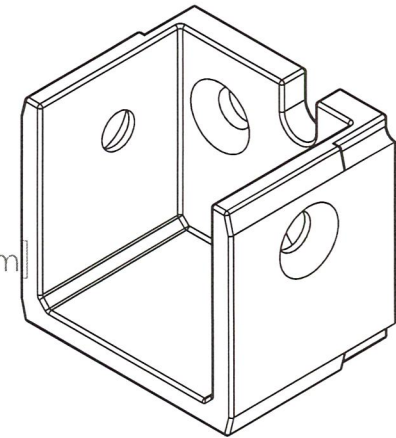
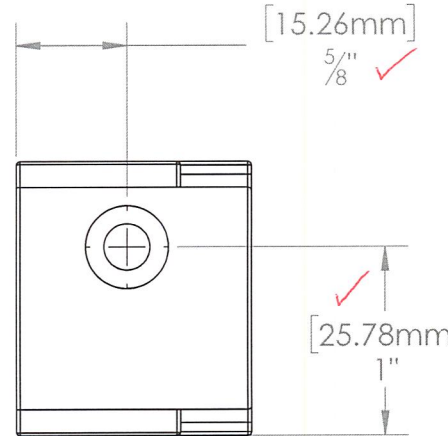
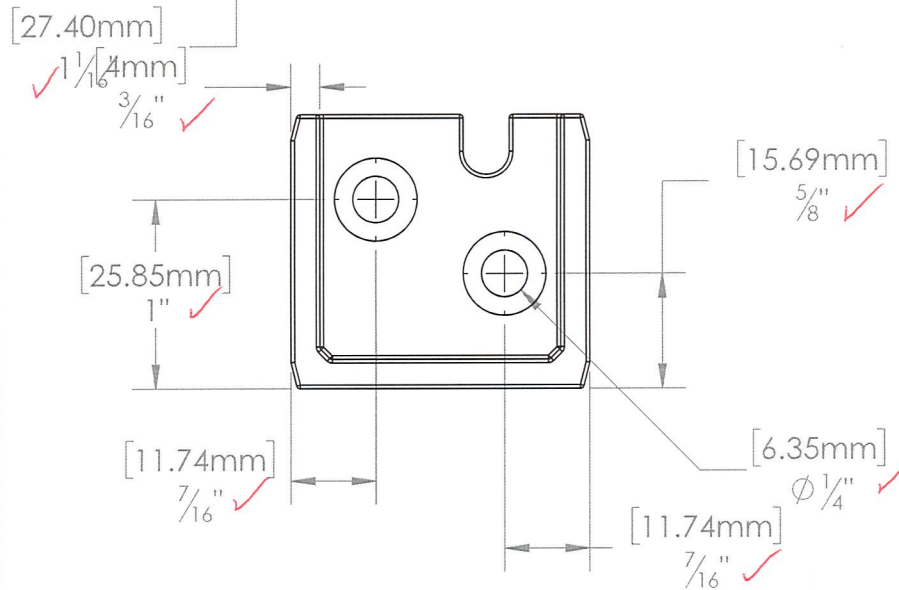


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Sheet: 1 OF 1

F	01/17/20	KF	Initial Drawing
REV	DATE	BY	DESCRIPTION
DESCRIPTION:			
AL13 HOME BRACKET CUP			
DRAWN BY: KevinF		SCALE: AS SHOWN	
DATE: 01/07/2021		DIVISION: RAILING	
ITEM #:	FILE NAME/PART #:	REV:	
	R3934-03618A-OLD	F	



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TEST REPORT FOR FORTRESS BUILDING PRODUCTS

Report No.: L2777.01-119-19 R0

Date: 01/12/21

SECTION 13

REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	01/12/21	N/A	Original Report Issue