

CENDEK RAILINGS LTD.

TEST REPORT

SCOPE OF WORK

REPORT OF 8 FT. CENTURY ROUND WELDED PANEL – WB MOUNT (3.5 IN. PICKET SPACING) TESTED IN ACCORDANCE WITH ASTM E935-13E¹, *STANDARD TEST METHODS FOR PERFORMANCE OF PERMANENT METAL RAILING SYSTEMS AND RAILS FOR BUILDINGS*

REPORT NUMBER

104715588COQ-002C

TEST DATE

07/23/21

ISSUE DATE

08/05/21

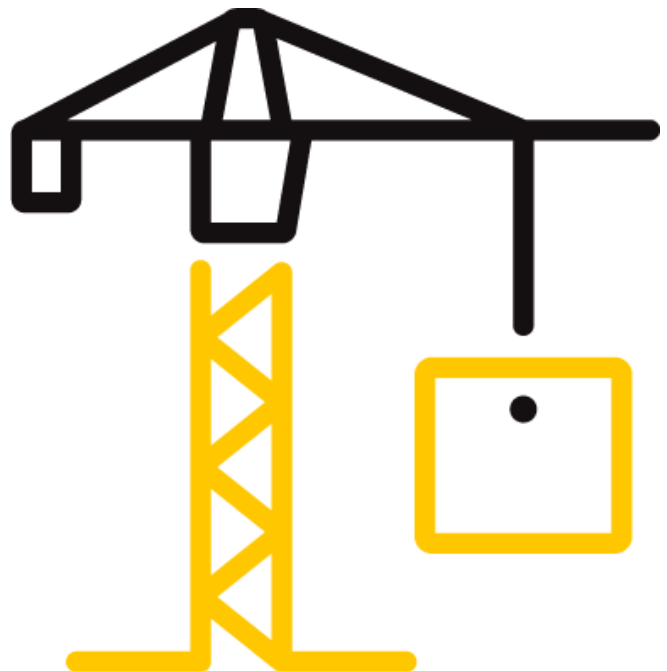
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DOCUMENT CONTROL NUMBER

GFT-OP-10c (09/29/20)

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TEST REPORT FOR CENDEK RAILINGS LTD.

Report No.: 104715588COQ-002C

Date: 08/05/21

REPORT ISSUED TO CENDEK RAILINGS LTD.

9685 Agur St.
Summerland, BC, V0H 1Z2
Canada



SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Cendek Railings Ltd., 9685 Agur St., Summerland, BC, V0H 1Z2, Canada, to perform testing on the 8 ft. Century Round Welded Panel – WB Mount (3.5 in. Picket Spacing) railing system in accordance with ASTM E935-13e¹, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*. The scope of the testing as requested by Cendek Railings Ltd., was to assess the ability of the guard system to resist the load requirements of Section 4.1.5.14 and Section 9.8.8.2 of the 2015 NBC, 2012 OBC, 2019 NBC-AE, and 2018 BCBC. Results obtained are tested values. Testing was conducted at the Intertek test facility in Coquitlam, BC, Canada on July 23, 2021.

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

For INTERTEK B&C:

COMPLETED BY:	Chris Chang	REVIEWED BY:	Baldeep Sandhu
TITLE:	Sr. Tech – Building & Construction	TITLE:	Manager – Building & Construction
SIGNATURE:		SIGNATURE:	
DATE:	08/05/21	DATE:	08/05/21

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TEST REPORT FOR CENDEK RAILINGS LTD.

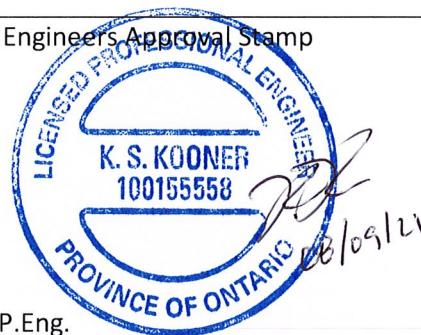
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Engineer's Disclaimer:

- Intertek Engineers do not assume professional responsibility of Engineer of Record.
- Compliance to Building Codes must be approved by the Engineer of Record or Authority Having Jurisdiction.
- Intertek Engineer's seal and signature is limited to the review of applicable code required loads, review of test setup, and witnessing of laboratory testing.
- Additional disclaimers are shown in Notes of Section 7 and Section 8

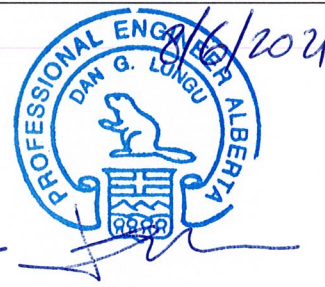
Engineers Approval Stamp



Kal Kooner, P.Eng.
Director, Building & Construction
Intertek



Dan Lungu, P.Eng.
Engineer, Building & Construction
Intertek



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SECTION 2

SUMMARY OF TEST RESULTS

SYSTEM DESCRIPTION	TEST	PASS/FAIL
8 ft. Century Round Welded Panel – WB Mount (3.5 in. Picket Spacing)	In-fill Load	Pass
	Vertical Uniform Load Test	Pass
	Horizontal Uniform Load Test	Pass
	Horizontal – Mid-Span Concentrated Load	Pass
	Horizontal – Adjacent to Wall Mount Concentrated Load	Pass
	Size of Opening	Pass

Refer to Appendix B for photos of testing.

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SECTION 3

TEST LOADS

The guard specimen was evaluated in accordance with the following:

ASTM E935-13e¹, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*

The required test loads were based on the Specified Loads per the following Building Code articles with the Safety Factors applied as indicated in this report:

2015 National Building Code of Canada (NBC)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

2012 Ontario Building Code (OBC)

- Section 4.1.5.14 *Loads on Guards*
- Section 9.8.8.2 *Loads on Guards*

2019 National Building Code – Alberta Edition (NBC-AE)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

2018 British Columbia Building Code (BCBC)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

SECTION 4

MATERIAL SOURCE

The client submitted the railing system to the Evaluation Center on July 22, 2021 (Coquitlam ID# VAN2107220908-001). The sample was received in good condition and was suitable for testing unless noted otherwise. The sample was not independently selected for testing.

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SECTION 5 EQUIPMENT

Calibration of test equipment was performed by Intertek B&C in accordance with ISO 17025 requirements.

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
P60692	Artech 5k lb S-Type Load Cell	20210-5k	10/22/21
P60688	Artech 1k lb S-Type Load Cell	20210-1k	06/04/22
P60554	T&D Temperature and Humidity Indicator	TR-72Ui	09/10/21
P60444	Extech Stopwatch	365515	03/05/22
P60494	Stanley Tape Measure	FatMax	09/08/21
52650	Mitutoyo 8 in. Digital Caliper	CD-8	06/08/22
D7810	Micro Mule	Intertek-York	12/07/21
D7820	Tyco Electronics Linear Transducer	PT1MA-20-UP-420E-M6	07/30/21

SECTION 6 LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Kevin Penner	Intertek B&C
Chris Chang	Intertek B&C
Kal Kooner	Intertek B&C
Dan Lungu	Intertek B&C

The above observer(s) witnessed part of the test program.

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SECTION 7**TESTING PROCEDURE**

The evaluation was conducted in accordance with the testing procedures of ASTM E935-13e1, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*. The test specimen was loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The specified test loads were held for one minute before the load was released. For each test, deflection measurements were taken at the point of load application. Testing was conducted with reference to the specified load requirements of the following:

2015 NBC / 2012 OBC / 2019 NBC-AE / 2018 BCBC: SECTION 4.1.5.14 LOADS ON GUARDS AND HANDRAILS / LOADS ON GUARDS

- 1) The minimum specified horizontal load applied inward or outward at the minimum required height of every guard shall be 0.75 kN/m or a concentrated load of 1.0 kN applied at any point.
- 2) The minimum specified horizontal load applied inward at the minimum required height of every required guard shall be half that specified in Sentence (1).
- 3) Individual elements within the *guard*, including solid panels and pickets, shall be designed for a concentrated load of 0.5 kN applied over an area of 100 mm x 100 mm located at any point in the element or elements so as to produce the most critical effect.
- 4) The size of the opening between any two adjacent vertical elements within a *guard* shall not exceed 100 mm when each of these elements is subjected to a specified *live load* of 0.1 kN applied in opposite directions in the in-plane direction of the *guard* so as to produce the most critical effect. (2015 NBC, 2019 NBC-AE, and 2018 BCBC only)
- 5) The minimum specified load applied vertically at the top of every required *guard* shall be 1.5 kN/m.
- 6) None of the loads specified above need be considered to act simultaneously.

2015 NBC / 2012 OBC / 2019 NBC-AE / 2018 BCBC: SECTION 9.8.8.2 LOADS ON GUARDS

- 1) The minimum specified horizontal load applied inward or outward at the top of every required guard shall be 0.5 kN/m or a concentrated load of 1.0 kN applied at any point
- 2) Individual elements within the *guard*, including solid panels and pickets, shall be designed for a concentrated load of 0.5 kN applied over an area of 300 mm x 300 mm located at any point in

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the element or elements so as to engage 3 balusters when possible.

- 3) The minimum specified load applied vertically at the top of every required *guard* shall be 1.5 kN/m.
- 4) None of the loads specified above need be considered to act simultaneously.

Note 1: A safety factor of 1.67-2.5 was applied to the above loads, based on an assumed failure mode and tested material. The safety factor was calculated by dividing the live load factor of 1.5 by the material resistance factors below, as defined in the CAN/CSA S157, *Strength Design in Aluminum* standard.

- $\phi=0.90$ resistance factor for bending failure mode, resulting safety factor = 1.67
- $\phi=0.75$ resistance factor for ductile failure mode, resulting safety factor = 2.0
- $\phi=0.67$ resistance factor for brittle failure mode, resulting safety factor = 2.24
- $\phi=0.60$ resistance factor for wood fastener connections, resulting safety factor = 2.5

IN-FILL LOAD TEST

A test load was applied using a 100 mm x 100 mm square block on the center of the railing system normal to the in-fill. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

UNIFORM LOAD TEST

Uniform test loads were applied vertically to the top of the guardrail system and horizontally to the top of the guardrail system. The test loads were applied using quarter point loads. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

CONCENTRATED LOAD TEST

Concentrated test loads were applied horizontally outwards at the midspan of the top of the guard and at the top rail adjacent to the wall connection to verify the connection capacity. As there were no posts in the railing system, the concentrated load at the top of post was not evaluated.

After completion of the above load tests, the concentrated load at the top rail adjacent to the wall connection was loaded until failure. The maximum load was recorded and reported in the test data sheets of Appendix A.

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SIZE OF OPENING

The opening between adjacent vertical elements was subjected to a specified live load of 0.1 kN applied in opposite directions and measured.

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SECTION 8

TEST SPECIMEN DESCRIPTION

The sample was identified as the following:

TABLE 1. RAILING CONFIGURATION							
PART NAME	PART NUMBER	QTY	PART DIMENSIONS				REPORTED MATERIAL
			LENGTH	WIDTH	HEIGHT	NOMINAL THICKNESS	
8 FT. CENTURY ROUND WELDED PANEL – WB MOUNT (3.5 IN. PICKET SPACING)							
Top Rail Wall Bracket	4104-WAL-10100	2	3.5 in.	2.5 in.	1.375 in.	0.125 in.	Aluminum
Bottom Rail Wall Bracket	4100-WAL-10100	2	2.38 in.	1.75 in.	1.03 in.	0.125 in.	Aluminum
Top Rail	N/A	1	96.0 in.	2.36 in.	1.89 in.	0.08 in.	Aluminum
Bottom Rail	N/A	1	96.0 in.	1.32 in.	1.41 in.	0.07 in.	Aluminum
Support Leg	4600-LEG-60100	2	2.50 in.	1.00 in.	2.92 in.	0.125 in.	Aluminum
Infill - Picket	N/A	23	0.625 in.	0.625 in.	39.0 in.	0.050 in.	Aluminum

Note 3: The railing had two (2) support legs positioned under the bottom rail spaced 32.75 in. from each end and were set on a steel test frame. For detailed drawings of the test samples and components, refer to Appendix C.

Note 4: As the railing systems had no posts, the assemblies were attached to a wood support through wall brackets. Per the client's request, the guard assemblies were attached using supplied #12 x 2 in. long Pan Head Robertson steel sheet metal screws (0.416 in. head diameter x 0.158 in. shank diameter). The wood support was constructed from 2 layers of nominal 2 in. x 12 in. SPF lumber.

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SECTION 9**TEST RESULTS**

A full set of test results is included in Appendix A.

SECTION 10**CONCLUSION**

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Cendek Railings Ltd. on the 8 ft. Century Round Welded Panel – WB Mount (3.5 in. Picket Spacing) railing system per ASTM E935-13e1, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*. The scope of the testing as requested by Cendek Railings Ltd., was to assess the ability of the guard system to resist the loads as prescribed in the following building code articles:

2015 National Building Code of Canada (NBC)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

2012 Ontario Building Code (OBC)

- Section 4.1.5.14 *Loads on Guards*
- Section 9.8.8.2 *Loads on Guards*

2019 National Building Code – Alberta Edition (NBC-AE)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

2018 British Columbia Building Code (BCBC)

- Section 4.1.5.14 *Loads on Guards and Handrails*
- Section 9.8.8.2 *Loads on Guards*

The Cendek Railings Ltd. 8 ft. Century Round Welded Panel – WB Mount (3.5 in. Picket Spacing) railing system identified and evaluated in this report has met the load requirements using the safety factors as defined in Section 7, Note 1 of this report. Overall compliance with the Building Codes must be evaluated and approved by the Engineer of Record and Authority Having Jurisdiction.

The conclusions of this test may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

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SECTION 11

APPENDIX A – TEST DATA (2 PAGES)

Company	Cendek Railings Ltd.	Technician(s)	Kevin Penner
Project No.	G104715588	Reviewer	Baldeep Sandhu
Models	8 ft. Century Round Welded Panel – WB Mount	Start/End Date	July 23, 2021
Product Name	Same as above	Sample ID	VAN2107220908-001
Standard	2015 NBC/2018 BCBC/2019 NBC-AE/2012 OBC, Section 4.1.5.14		

Test Data Package

Table of Contents

Sheet	Page
Table of Contents (This Sheet)	1
Loads on Guards	2

Test: **Loads on Guards - Section 4.1.5.14**
 Date: 23-Jul-21
 Client: Cendek Railings Ltd.
 Product: **8 ft. Century Round Welded Panel – WB Mount (3.5 in. Picket Spacing)**
 Post Spacing: 8.04 ft 2.45 m
 Height of Guard: 42.1 in 1070 mm
 Opening in Guard: 3.50 in 89 mm (between glass and wall)
 2.25 in 57 mm (under bottom rail)
 Method: ASTM E935-13e1, *Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*
 2015 National Building Code of Canada, Section 4.1.5.14 *Loads on Guards and Handrails*
 2012 Ontario Building Code, Section 4.1.5.14 *Loads on Guards*
 2019 National Building Code of Canada - Alberta Edition, Section 4.1.5.14 *Loads on Guards and Handrails*
 2018 British Columbia Building Code, Section 4.1.5.14 *Loads on Guards and Handrails*
 Safety Factor: 1.67 (based on a resistance factor $\phi = 0.9$ for aluminum)
 2.50 (based on a resistance factor $\phi = 0.6$ for wood fastener connection)
 Equipment: Artech 5000 lbf Load Cell (Intertek ID# P60692, cal due October 22, 2021)
 Artech 1000 lbf Load Cell (Intertek ID# P60688, cal due June 4, 2022)
 T&D TR-72Ui Temperature and Humidity Logger (Intertek ID# P60554, cal due September 10, 2021)
 Stopwatch (Intertek ID# P60444, cal due March 5, 2022)
 Stanley Tape Measure (Intertek ID# P60494, cal due September 8, 2021)
 Mitutoyo Digital Caliper (Intertek ID# 52650, cal due June 8, 2022)
 Micro Mule Measurement System (Intertek ID# D7810, cal due December 7, 2021)
 Tyco Electronics Linear Transducer (Intertek ID# D7820, cal due July 30, 2021)
 Time/Temp/RH: 1:15PM / 22.8°C / 48.0%

Direction	Test	Design Load (Inward/Outward) (lbf)	Factored Load	Calculated Moment (lbf-ft)	Equivalent Quarter-Point Load (lbf)	Required Proof Load (lbf)	Deflections (in.)	Pass/Fail
Outward	Individual Elements (over 4 in. x 4 in.)	112	187	-	-	187	2.224	Pass
	Vertical Uniform Load (per ft)	103	257	2076	1033	2066	0.235	Pass
	Horizontal Uniform Load (per ft)	51	128	1038	516	1033	3.604	Pass
	Midspan Horizontal Concentrated Load	225	375	-	-	375	1.852	Pass
	Adjacent to Post Concentrated Load	225	562	-	-	562	0.061	Pass
	Adjacent to Post Concentrated Load Ultimate Load	Maximum load of 2710.5 lb; circular part of bracket and weld holding it to flat plate both broke.						
In-plane	Size of Opening	22.5	-	-	-	22.5	3.816	Pass

Direction	Test	Design Load (Inward/Outward) (kN)	Factored Load	Calculated Moment (kNm)	Equivalent Quarter-Point Load (kN)	Required Proof Load (kN)	Deflections (mm)	Pass/Fail
Outward	Individual Elements (over 100 mm in. x 100 mm)	0.5	1.25	-	-	1.25	56.5	Pass
	Vertical Uniform Load (per m)	1.5	3.75	2.82	4.60	9.19	6.0	Pass
	Horizontal Uniform Load (per m)	0.75	1.88	1.41	2.30	4.60	91.5	Pass
	Midspan Horizontal Concentrated Load	1	1.67	-	-	1.67	47.0	Pass
	Adjacent to Post Concentrated Load - Mid Post	1	2.50	-	-	2.50	1.5	Pass
	Adjacent to Post Concentrated Load Ultimate Load	Maximum load of 12.1 kN; circular part of bracket and weld holding it to flat plate both broke.						
In-plane	Size of Opening	0.1	-	-	-	0.10	96.9	Pass

ULTIMATE LOAD: Maximum load of 2710.5 lb (12.1 kN); circular part of bracket and weld holding it to flat plate both broke.

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APPENDIX B – PHOTOS (2 PAGES)

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Date: 08/05/21

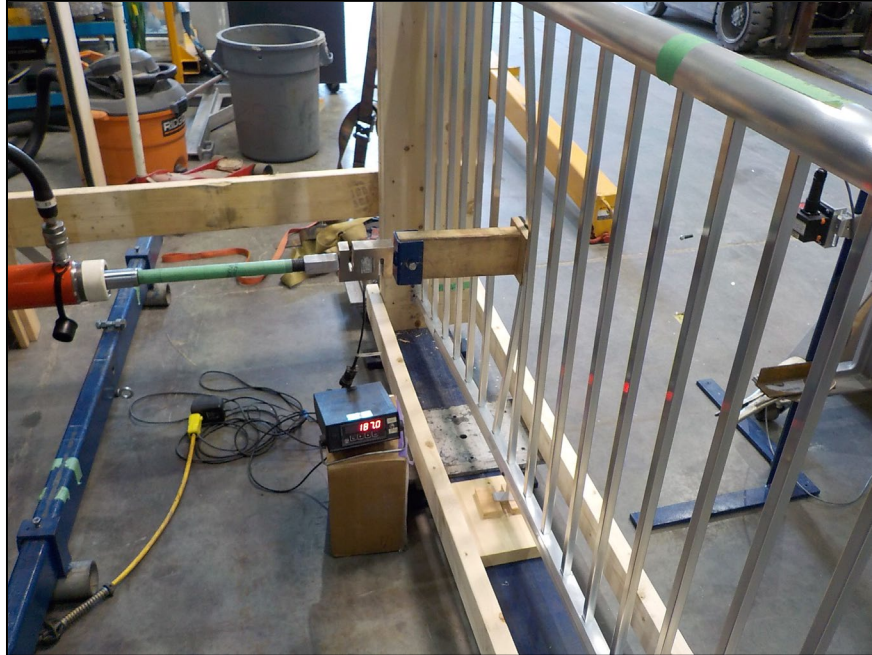


Figure 1 – 8 ft. Century Round Welded Panel – In-fill Load Test



Figure 2 – 8 ft. Century Round Welded Panel – Uniform Load (Horizontal)

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Figure 3 – 8 ft. Century Round Welded Panel – Uniform Load (Vertical)

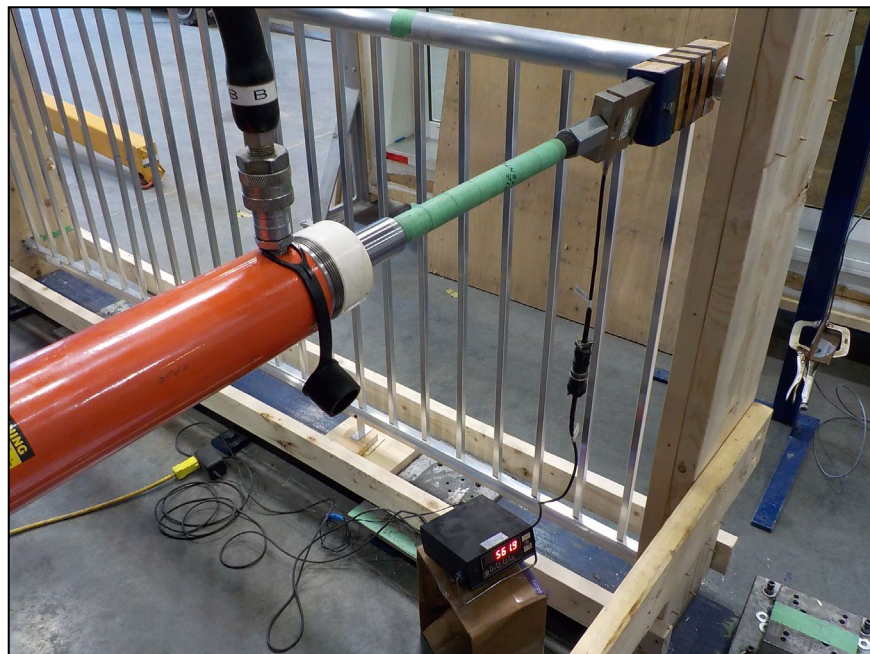


Figure 4 – 8 ft. Century Round Welded Panel – Concentrated Load (Adjacent to Wall Connection)

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APPENDIX C – CENTURY ROUND WELDED PANEL DRAWINGS (7 PAGES)

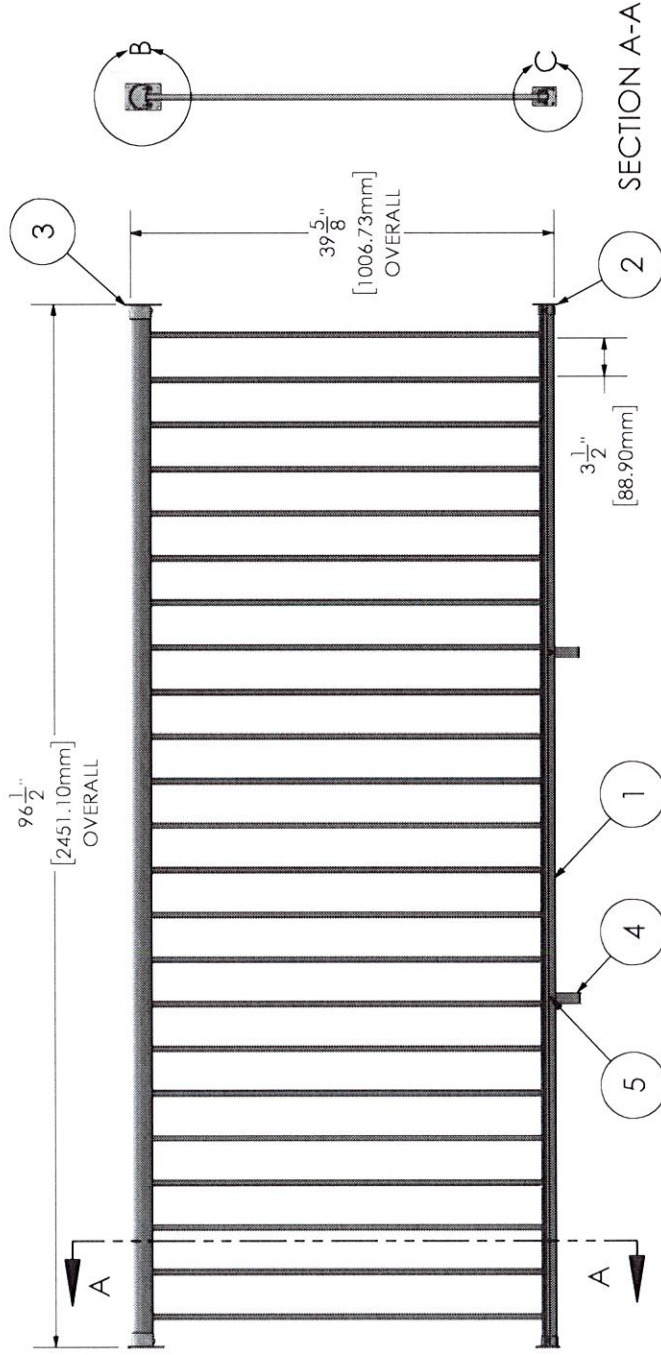
intertek

Test sample complies with these details.
Deviations are noted.

Report #: 104715588CQ-002C

Date: 08/05/21 Tech: C.C.

ITEM NO.	Eng No.	Part No.	DESCRIPTION	QTY.
1	2590A	NA	5/8" Picket Panel 42" Round 8' - 3.5in Spacing	1
2	0033A	4100-WAL-10100	Bottom Wall Bracket	2
3	0032AA	4104-WAL-10100	Top Wall Bracket Round	2
4	0060PA	4600-LEG-60100	Surface Support Leg - SL	2
5	0096PB	9000-SLB-21001	Screw #10x3/4" P/H Soc Tek Stainless	12



CenDek
Railings Ltd.

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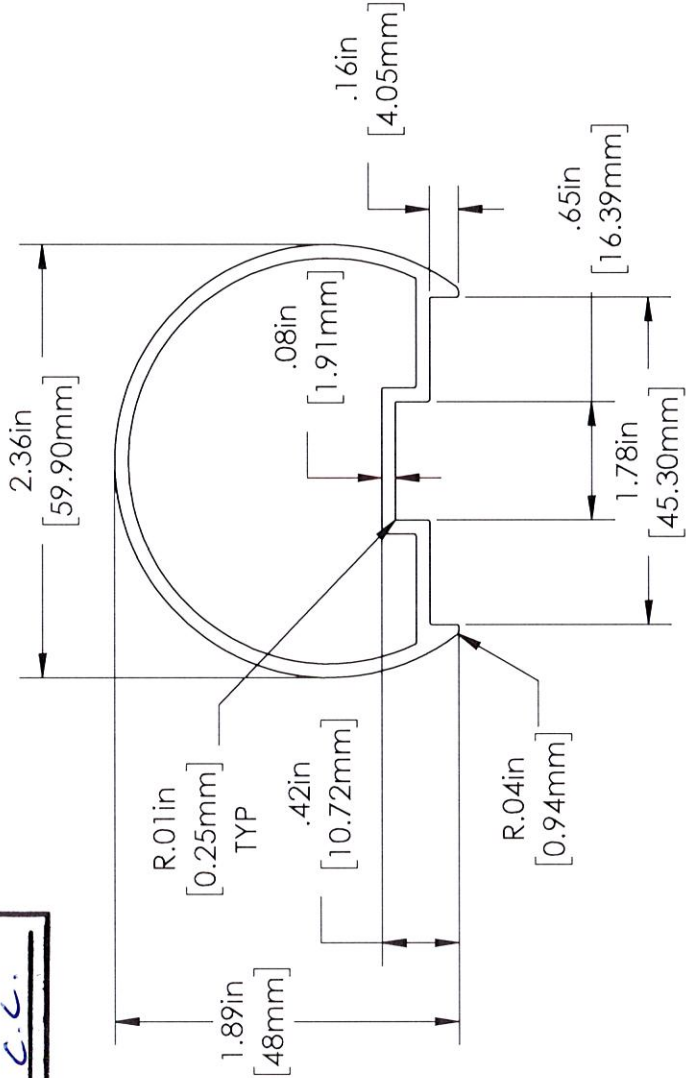
DRAWN BY	Engl
CREATED	2021-08-04
MATERIAL	
DIE NO.	
ALL DIMENSION IN INCHES/mm	

DESCRIPTION	
Century Welded Panel 8ft 5/8in Picket - 3.5in Picket Spacing	
Part No. NA	Eng No. 2595A
Weight 17.84 lbs	SHEET 1 OF 1
	Rev -

Test sample complies with these details.
Deviations are noted.

Report #: 10471558800Q-002C

Date: 08/05/24 Tech: C.C.



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DRAWN BY	Admin
CREATED	2017-08-11
MATERIAL	6063-T5
DIE NO.	
ALL DIMENSION IN INCHES/MM	

DESCRIPTION
Century TR Weld

Part No.	Weight	lbs	Eng No.	0042P
SHEET 1 OF 1			Rev	

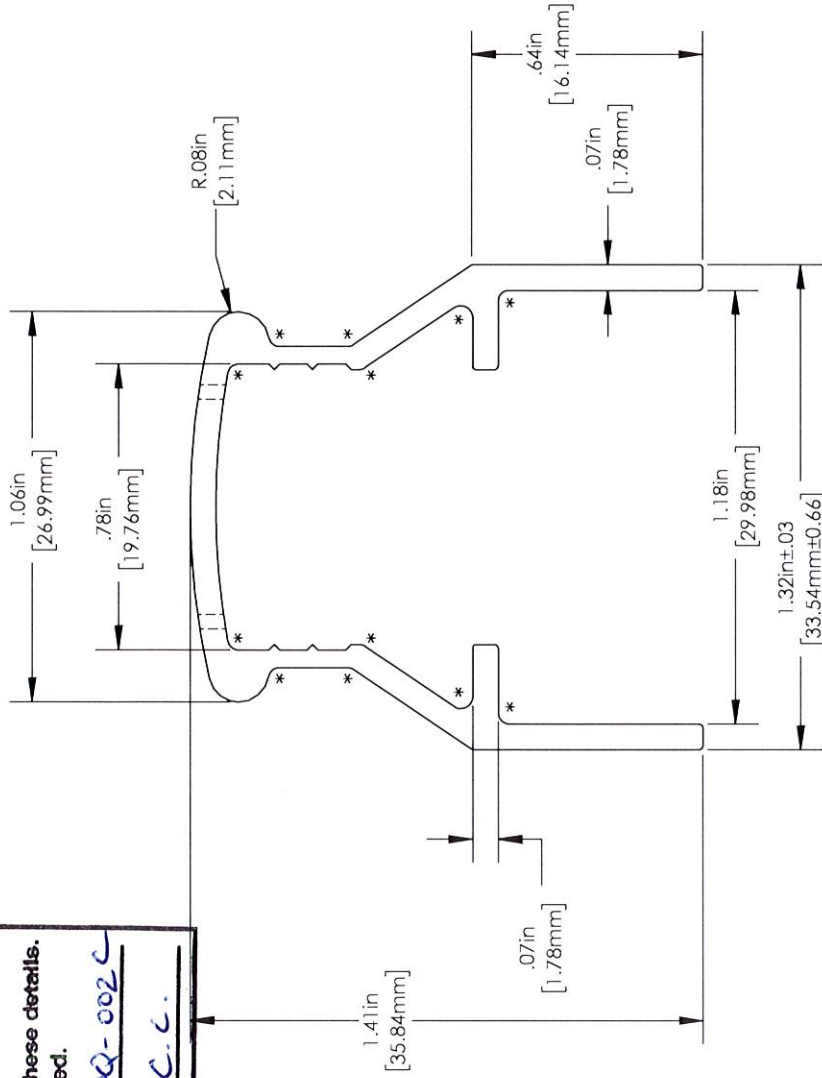
REVISIONS		DATE	INITIALS
REV.	DESCRIPTION		

intertek

Test sample complies with these details.
Deviations are noted.

Report #: 104715588CQ-002C

Date: 08/05/21 Tech: C.C.



* R0.3in [0.80mm]



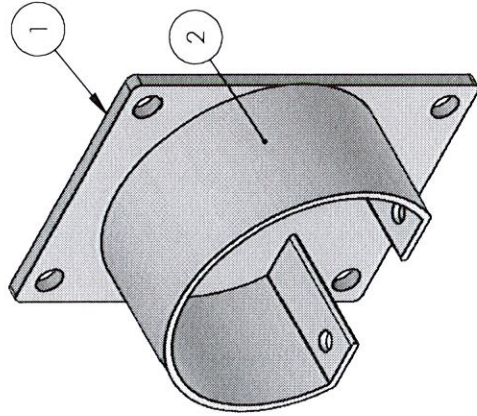
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DESCRIPTION

5/8" Punched Welded Bottom Rail
20'6"

DRAWN BY	cchislett	7/21/2021
CHECKED		
MATERIAL	6063-T5 - CenDek	
DIE NO.		
ALL DIMENSION IN INCHES/MM		

Part No.	1200-BOT-17246	Eng. No.	0317PE
Weight	6.97 lbs/ft	SHEET 1 OF 1	Rev

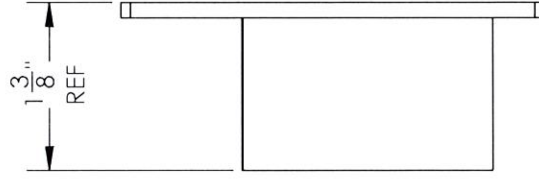
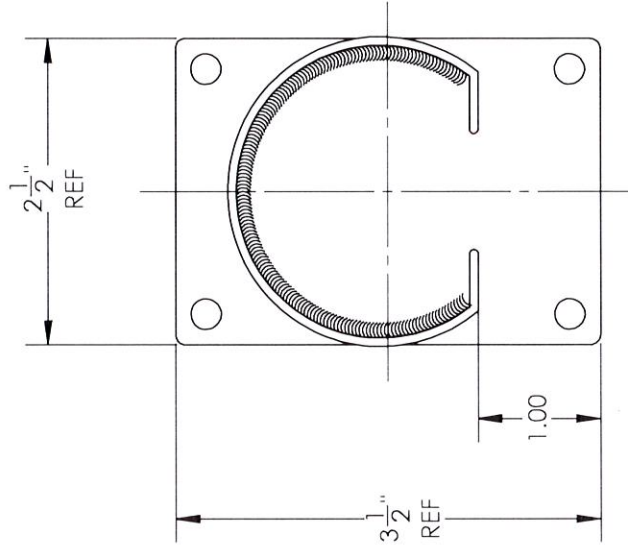


intertek

Test sample complies with these details.
Deviations are noted.

Report #: 104715588C02-002C

Date: 08/05/21 Tech: C.C.



ITEM NO.	Eng No.	Part No.	DESCRIPTION	QTY.
1	0014PE	1700-FLA-16007	Flat Bar Cut 1/8" x 2-1/2" x 3-1/2" Uni/Rnd WB, 90° WB x4	1
2	0012PA	1604-SLE-20025	Top Rail Sleeve Round cut WB, Post Sleeve	1




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DRAWN BY	cchislett	2/19/2021
CHECKED		
MATERIAL	Material <not specified>	
DIE NO.		
ALL DIMENSION IN INCHES/mm		

DESCRIPTION
Top Wall Bracket Round

Part No. 4104-WAL-10100	Eng No. 0032AA
Weight 0.16 lbs	SHEET 1 OF 2 Rev 1

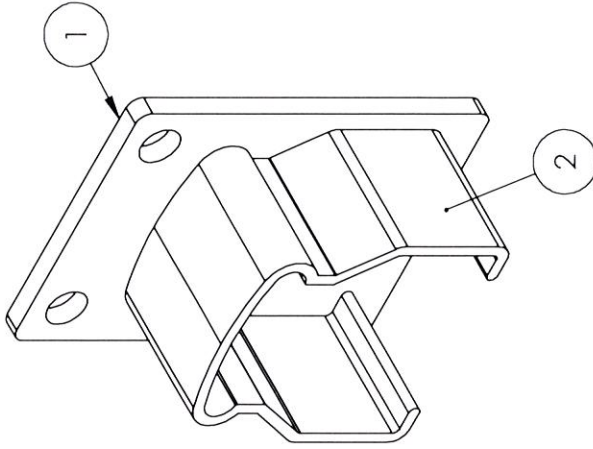
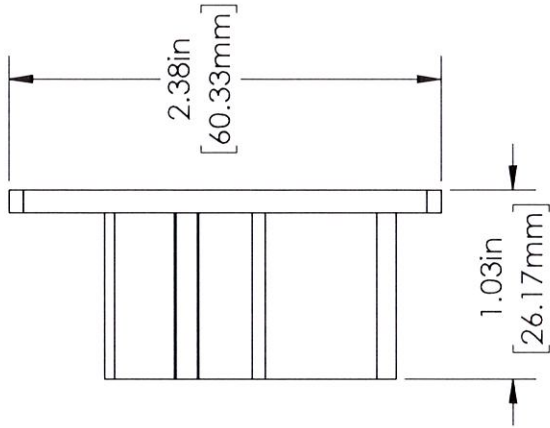
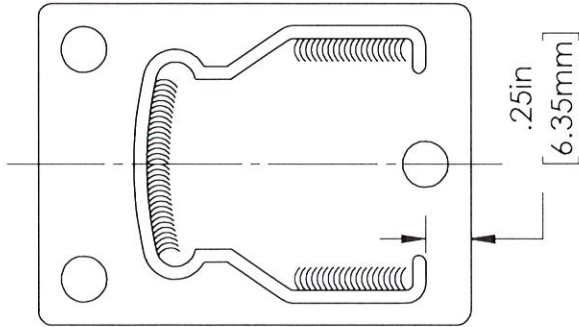


Test sample complies with these details.
Deviations are noted.

Report #: 104715588000-002C

Date: 08/05/21 Tech: C.C.

ITEM NO.	Eng No.	Part No.	DESCRIPTION	QTY.
1	0014PH	1700-FLA-13002	Flat Bar Cut 1/8" x 1-3/4" x 2-3/8" BR WB, BR 90° WB x3	1
2	0051PA	1600-SLE-10011	Bottom Rail Sleeve Welded Cut WB	1



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OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION
OF CENDEK RAILINGS LTD IS PROHIBITED.

DRAWN BY	Admin	DESCRIPTION
CREATED	10/3/2017	Bottom Wall Bracket
MATERIAL	Material <not specified>	
DIE NO.		
ALL DIMENSION IN INCHES/mm		
Port No.	4100-WAL-10100	Eng No. 0033A
Weight	0.08 lbs	SHEET 1 OF 2
		Rev -

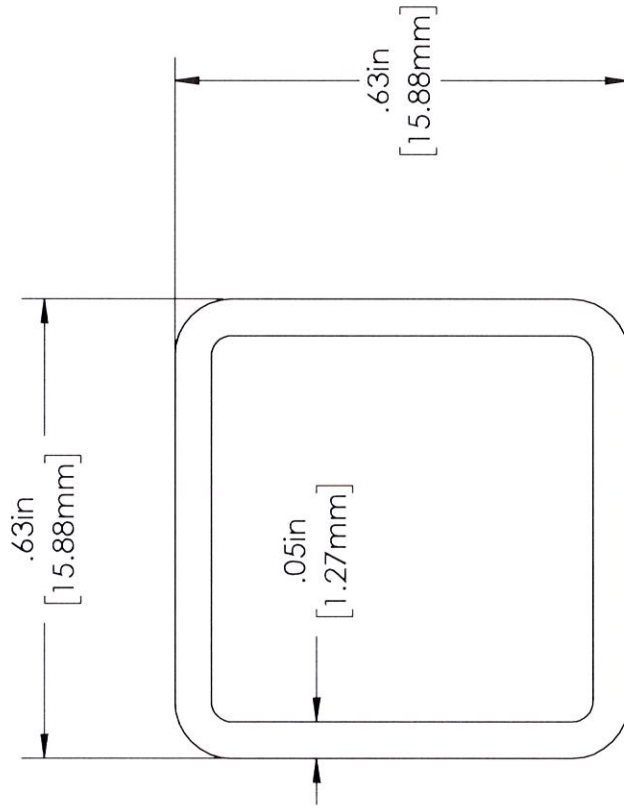
REV.	DESCRIPTION	DATE	INITIALS
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intertek

Test sample complies with these details.
Deviations are noted.

Report #: 104715588 COQ-002C

Date: 08/05/21 Tech: C-C



CenDek
Railings Ltd.

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DESCRIPTION
5/8" Picket

DRAWN BY Admin

CREATED 9/19/2017

MATERIAL 6063-T5

DIE NO.

ALL DIMENSION IN INCHES/MM

Port No. Bug No.

Weight 0.41 lbs

SHEET 1 OF 2

Rev -

REVISIONS

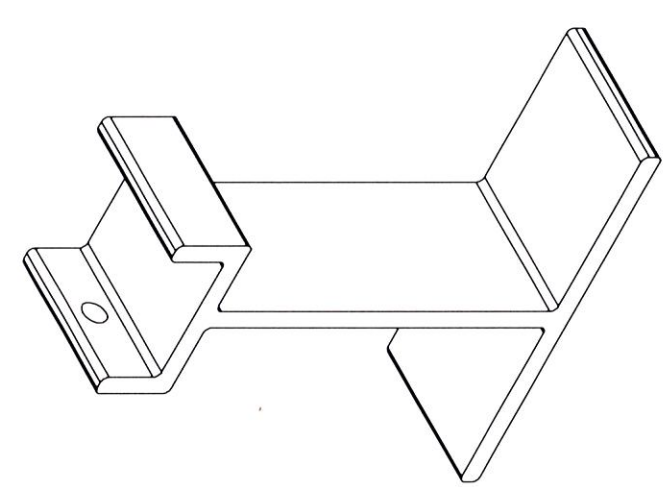
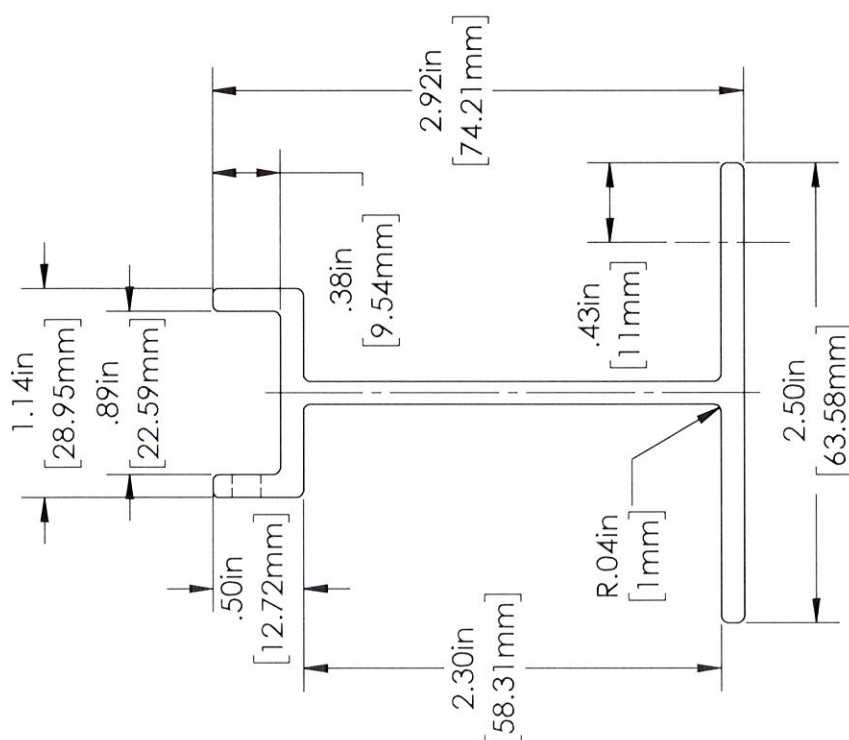
DESCRIPTION

DATE

INITIALS

SB


07/21/2021



Test sample complies with these details.
Deviations are noted.

Report #: 10471558SCDQ-002C

Date: 08/05/21 Tech: C.C.

<div><div>PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPERTY OF CENDEK RAILINGS LTD. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF CENDEK RAILINGS LTD IS PROHIBITED.</div></div>	DRAWN BY	Admin	<div>DESCRIPTION</div> <div>Surface Support Leg - SL</div> <div>Part No. 4600-LEG-60100Eng. No. 0060PA</div> <div>Weight 0.08 lbsSHEET 2 OF 2Rev</div>		
	CREATED	10/2/2017			
	MATERIAL	6063-T5			
	DIE NO.				
	ALL DIMENSION IN INCHES/mm				

TEST REPORT FOR CENDEK RAILINGS LTD.

Report No.: 104715588COQ-002C

Date: 08/05/21

SECTION 12

REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	08/05/21	N/A	Original Report Issue