

LABORATORY TEST REPORT

Aluminum Balcony Railing
"Railing Type 7C, Side Mounted"
6 mm Tempered Glass Panels

Loading Tests Performed in accordance with
OBC and NBCC *"Loads on Guards"*

Report No. L21-540-6103

Report Date:
June 15, 2021

Prepared for:

Art Aluminum Railing Technologies Ltd.
66 Rivalda Rd.
Toronto, ON M9M 2M3
Canada

Respectfully submitted by:


**CANADIAN BUILDING ENVELOPE
Science and Technology (CAN-BEST)**



Tests Supervised by:

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Project Manager

Report Authorized by:



Elie Alkhoury, M.Eng. (Building Science), P.Eng.
Director, Research and Testing Services

- This report does not constitute certification of the test product. The reported test results refer only to the specimen tested. No representation is made that other samples of similar design will feature like performance.
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1. INTRODUCTION

Canadian Building Envelope Science and Technology (CAN-BEST) was retained by Falbo Aluminum Products to carry out load testing on their aluminum balcony railing system. Testing was performed in accordance with Article 4.1.5.14 "Loads on Guards" of both Ontario Building Code (OBC) 2012 and National Building Code of Canada (NBCC) 2015 requirements.

2. DISCLAIMERS

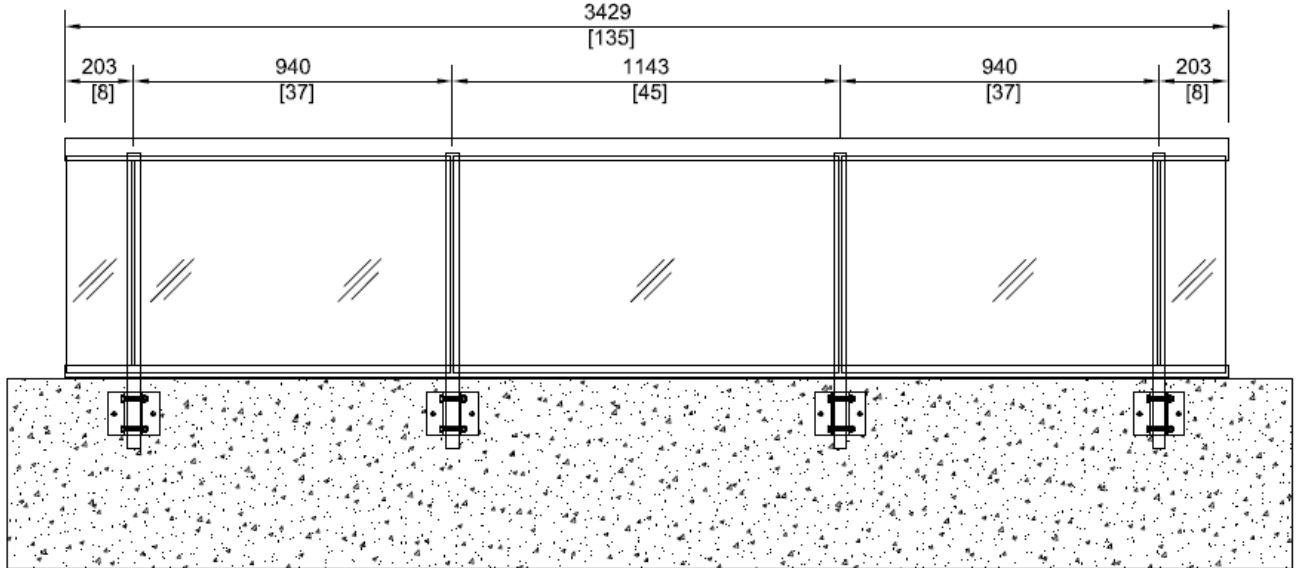
This report covers certain tests carried out on one guard rail specimen having specific properties, configuration and dimensions. Product performance is affected by variations in dimensions, assembly details and installation method. Consequently, the reader is advised to ensure product suitability for the intended application and conformity with all the details of the test sample described in the following section.

This report does not cover the rail's anticipated performance under service environmental conditions, nor the anchoring strength and stability of the substrate. No conclusions regarding concrete anchor performance or glass performance may be drawn from the reported results.

3. RAILING DESCRIPTION

Designation: "Type 7C Aluminum Railing , 6 mm Tempered Glass"

Type: Side mounted, four-post balcony railing system, having 6 mm thick tempered glass panels.



Panels: Glass - 6 mm (0.24") tempered glass, 1143 mm (45") and 940 (37") wide by 660 mm (26") high panels with 203 mm (8") overhang.

Railing Description (Cont'd.)

- Panel Support:** The panels were continuously supported at their respective top and bottom rails using extruded aluminum channels lined with continuous rubber spline.
- Railing:** Top rail height 1067 mm (42") overall and 711 mm (28 mm) above parapet, 3200 mm (126") long, comprised the following:
- **Posts** - Four extruded aluminum posts of rectangular tubular section, 50.8 mm x 38.1 mm (2.0" x 1.5") x 4.8 mm (0.19") thick; the inner posts spaced at 1143 mm (45"), and the outer posts spaced at 940 mm (37").
 - **Top Rail Plate** - One continuous, extruded aluminum top rail plate fastened to the top end of each post by four #10 x 1 1/2" long pan head coated TEK screws.
 - **Top Rail Cap** - One continuous, extruded aluminum top rail cap of irregular section, snapped onto the top rail, and clamped with a total of nine aluminum plates, 25 mm wide x 73 mm long x 0.125" thick (1" x 2 7/8" x 1/8"), positioned two at the ends, two at each side panel and three at center panel. Each plate was fastened from underneath with one 1/4-20 x 1 1/2" long pan head stainless steel machine screw.
 - **Bottom Rail** - One continuous, extruded aluminum bypass bottom rail, fastened to the bottom end of each post by two #10 x 3/4" pan head coated TEK screws.
- Anchoring:** Each post was fastened into a side assembled aluminum shoe using two 3/8" x 2-1/2" stainless steel bolts, each with flat washer, lock washer and nut. The shoe anchoring plate was 125 mm (5") long x 9.5 mm (0.375") thick extruded aluminum. Each shoe was side anchored to a 356 mm (14") high concrete parapet using two 1/2" x 4 1/2" long stainless steel threaded expansion anchors to a minimum embedment depth of 3 1/4" in pre-drilled holes.
- Sampling:** Railing assembly was selected and installed by the client.
- Modifications:** No modifications were performed on the specimen during testing in order to attain the reported results.
- Drawings:** Detailed drawings, provided by the client, verified by CAN-BEST for general conformity, are enclosed with this report (4 pages).

4. TEST LOADS

Static test loads were applied in accordance with the requirements of Article 4.1.5.14. of both OBC and NBCC including a **Load Factor of 1.50**.as outlined in Table (1).

Table (1): Test Load Schedule

OBC-2012/NBC-2015 Article 4.1.5.14 Requirements	
Service Load:	1.00 kN (225lb)
Load Factor:	1.50
<p>4.1.5.14 (1) Horizontal Load at Top of Guard Horizontal point load applied at top rail in the outward direction shall be the greater of:</p> <p>4.1.5.14 (1) (b) a concentrated load of Basic Load of 1.0 kN (225 lb) applied at any point.</p> <p>OR Client specified load factor applied to OBC's Basic Load: Ultimate Load: 1.50 kN (337 lb)</p> <p>OR 4.1.5.14 (1) (c) Basic Load: 0.75 kN/m (51 lb/ft) Ultimate Load: 1.13 kN/m (77 lb/ft) Post Spacing: 1524 mm (60.0") Equivalent Load: 1.20 kN (270 lb)</p>	
<p>4.1.5.14 (2) Horizontal Load at Infill Elements Individual elements within the guard including solid panels and pickets, shall be designed for a load of 0.5 kN (112.5 lb) applied over an area of 100 mm x 100 mm located at any point in the element or elements as to produce the most critical effect.</p> <p>Service Load: 0.5 kN (113 lb) Ultimate Load: 0.75 kN (169 lb)</p>	
<p>4.1.5.14 (4) Vertical Load at Top of Guard Basic Load: 1.5 kN/m (103 lb/ft) Ultimate Load: 2.25 kN/m (154 lb/ft) Post Spacing: 1524 mm (60.0") Equivalent Load: 2.40 kN (540 lb)</p>	

5. TEST RESULTS

Test results for static loading are provided in Table (2).

Table (2): Loading Test Results (Article 4.1.5.14. of the NBC)

Test Date: June 4-8, 2021

TEST REQUIREMENT	Load Location	RESULTS	RATING
Service Load <i>Top of guard at most critical location</i> Service Load: 1.00 kN (225lb) Test Load: 1.00 kN (225lb) Maximum permanent deflection: 5 mm (Not to increase with repeated application of the service load.)	End Post	Post Deflection (mm) <u>Under Load</u> <u>Permanent</u> 33.5 3.2	PASS
	Center Post	Post Deflection (mm) <u>Under Load</u> <u>Permanent</u> 18.1 4.1	PASS
Ultimate Load <i>Top of guard at most critical location</i> Service Load: 1.00 kN (225lb) Load Factor: 1.50 Test Load: 1.50 kN (337 lb) No criteria provided for maximum deflection under load or for permanent deflection after release of load.	End Post	Post Deflection (mm) <u>Under Load</u> <u>Permanent</u> 36.3 3.5	PASS
	Center Post	Post Deflection (mm) <u>Under Load</u> <u>Permanent</u> 20.3 4.5	PASS
Elements Within the Guard <i>Loads applied at most critical location</i> Service Load: 0.50 kN (113 lb) Load Factor : 1.50 Test Load: 0.75 kN (169 lb)	Infill panel at most critical location	Observations: • No glass breakage • No permanent deformation of supporting elements	PASS
Vertical, Top Rail Service Load: 1.50 kN/m (100 lb/ft) Load Factor: 1.50 Ultimate Load: 2.25 kN/m (154 lb/ft) Post Spacing: 1524 mm (60.0") Equivalent Load: 2.40 kN (540 lb) No maximum criteria provided for deflection under load or for permanent deflection after loading.	Mid-span of top rail	Top Rail deflection (mm) <u>Under Load</u> <u>Permanent</u> 6.7 0.7	PASS

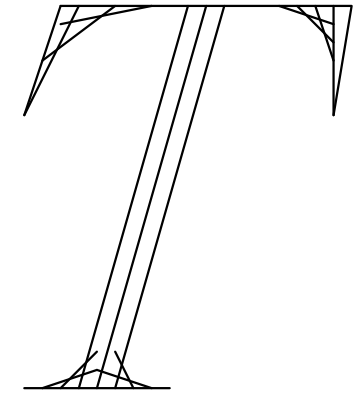
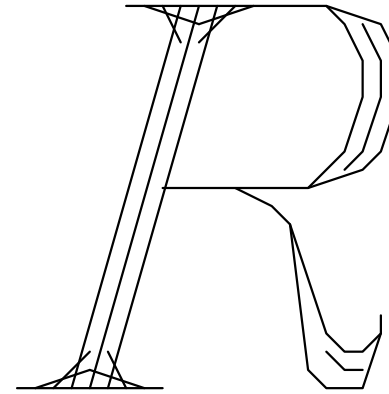
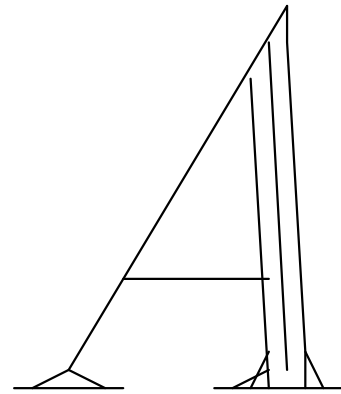
6. CONCLUSION

Based on the observations and obtained test results, the balcony railing system described in this report **DID MEET** the load and impact resistance requirements specified in OBC/NBCC (Article 4.1.5.14).

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Report History

<i>Revision No.</i>	<i>Change and Reason</i>	<i>Date</i>	<i>Approved by</i>
---	Original report issued	June 15, 2021	EA



Aluminum Railing Technologies Ltd.

APPROVAL STAMPS

TEST DRAWINGS

LAB: CAN-BEST LABORATORIES

LOCATION: 38 Regan Road, Unit 4, Brampton, Ontario, Canada, L7A 1C6

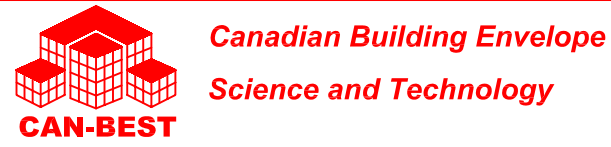
TYPES: RAILING TYPE - 7C

NOTES: _____

 <p>Canadian Building Envelope Science and Technology CAN-BEST</p>	
This document forms part of:	
Report No.:	L21-540-6103
Verified By:	
Date:	JUNE 15, 2021

TEST DRAWING SET DATE: July 04, 2022

TYPE 7C



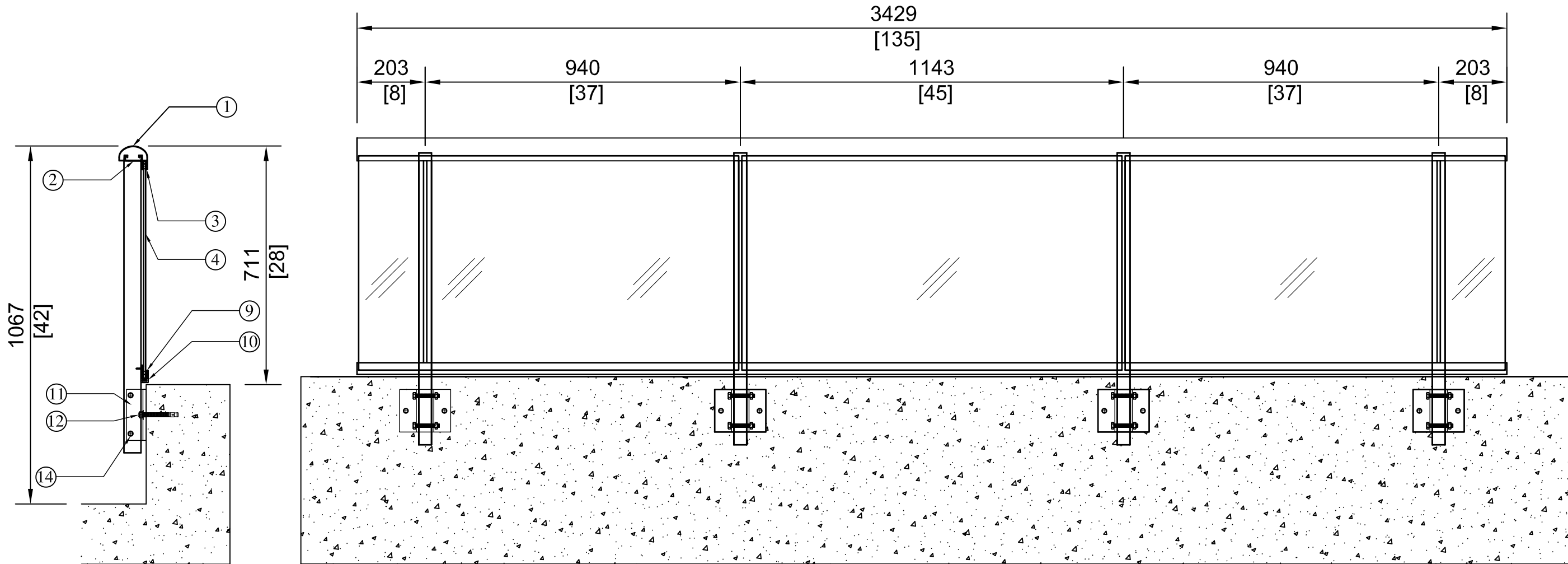
This document forms part of:

Report No.: L21-540-6103

Verified By: *JA*

Date: JUNE 15, 2021

ITEM NO.	DESCRIPTION	PART NUMBER
1	TOP CAP	AS-36124
2	TOP RAIL	AS-36087
3	TOP GASKET	V-858
4	6mm CLEAR TEMPERED GLASS	
5	POST	AH-72863
9	BOTTOM GASKET	V-783
10	BOTTOM GLASS CHANEL	AS-72864
11	SIDE ASSEMBLED SHOE	
12	1/2"Ø x 4 1/2" EXPANSION ANCHORS	STAINLESS STEEL
14	SS 3/8"Ø x 2 1/2" TRU BOLT	Flat washer, lock washer, nut



DRAWN BY: LR	DATE: 4/07/2022
CHECKED BY: EF	SCALE: NTS.

PROJECT:
RAILING TEST

DRAWING TITLE:
TYPE 1
BALCONY RAILING



ART
aluminum railing technologies Ltd.

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DRAWING NO:
RT-04

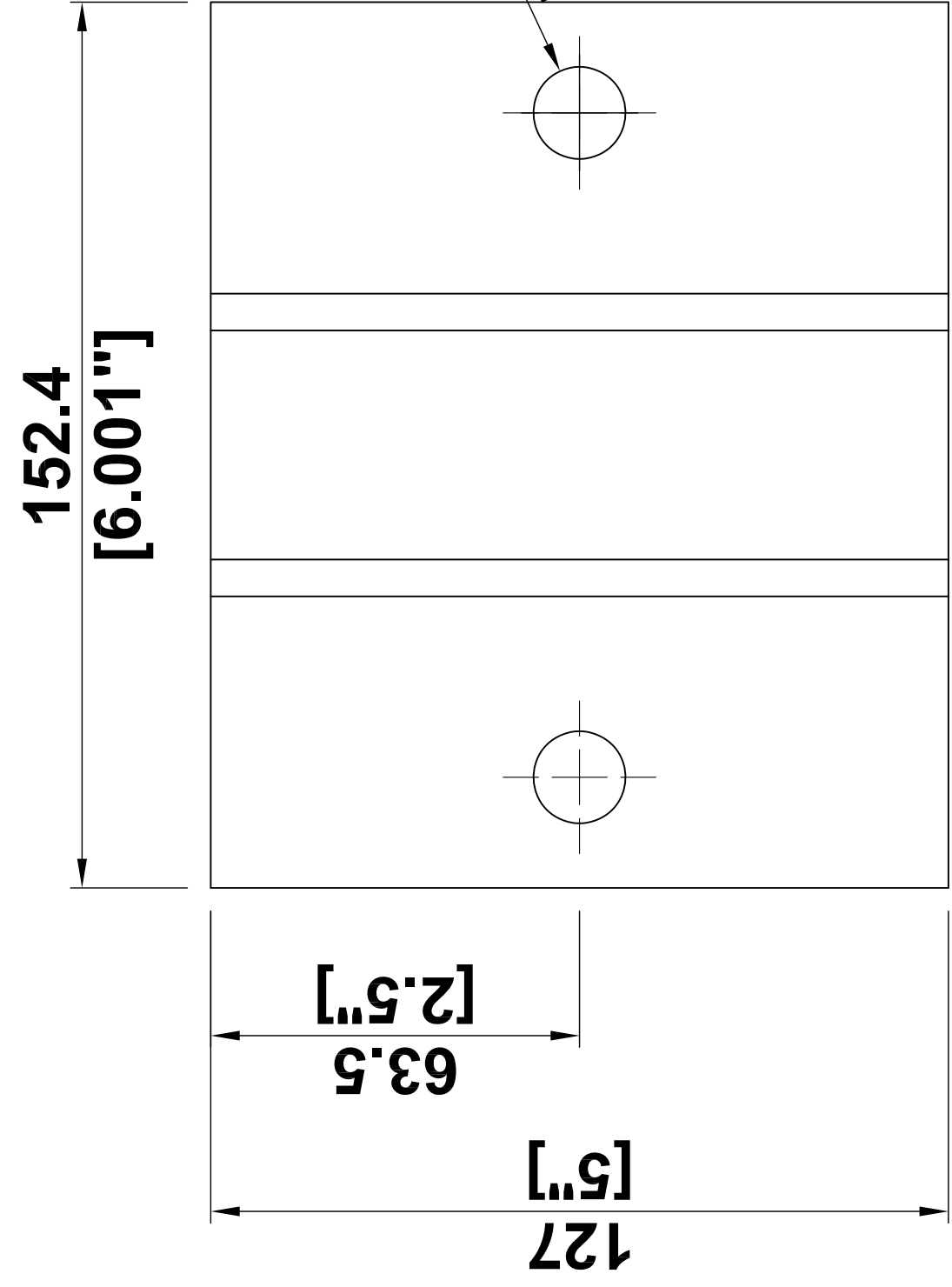
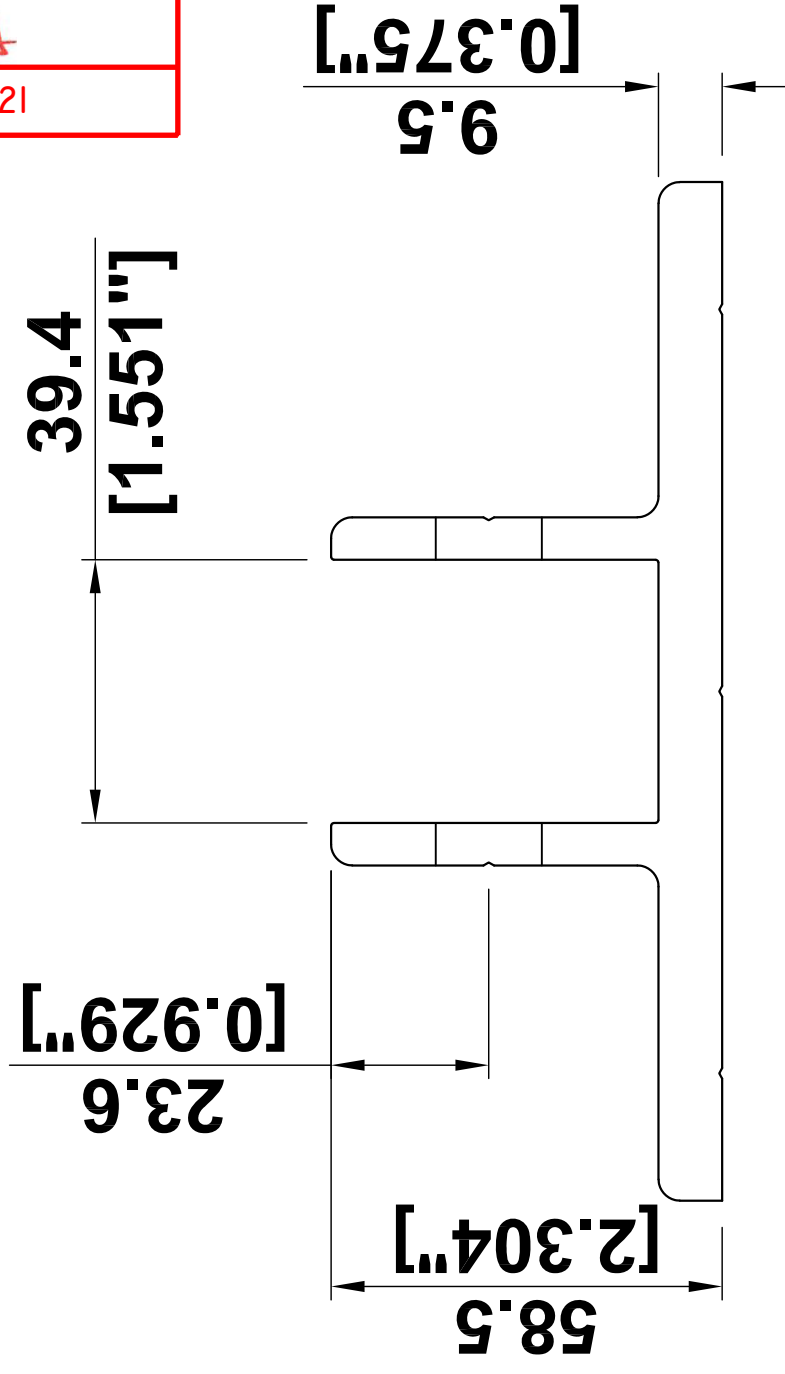
SIDE ASSEMBLED SHOE



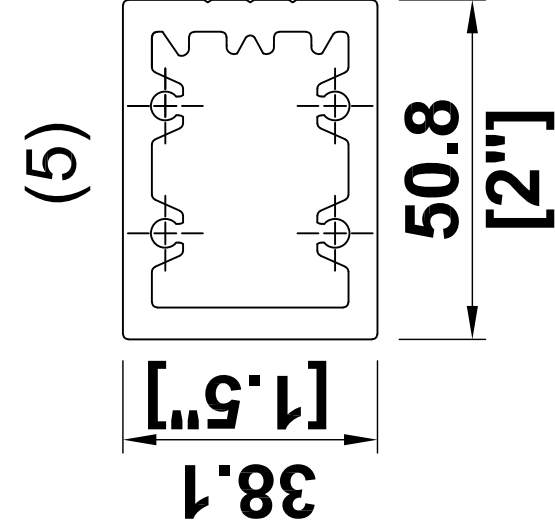
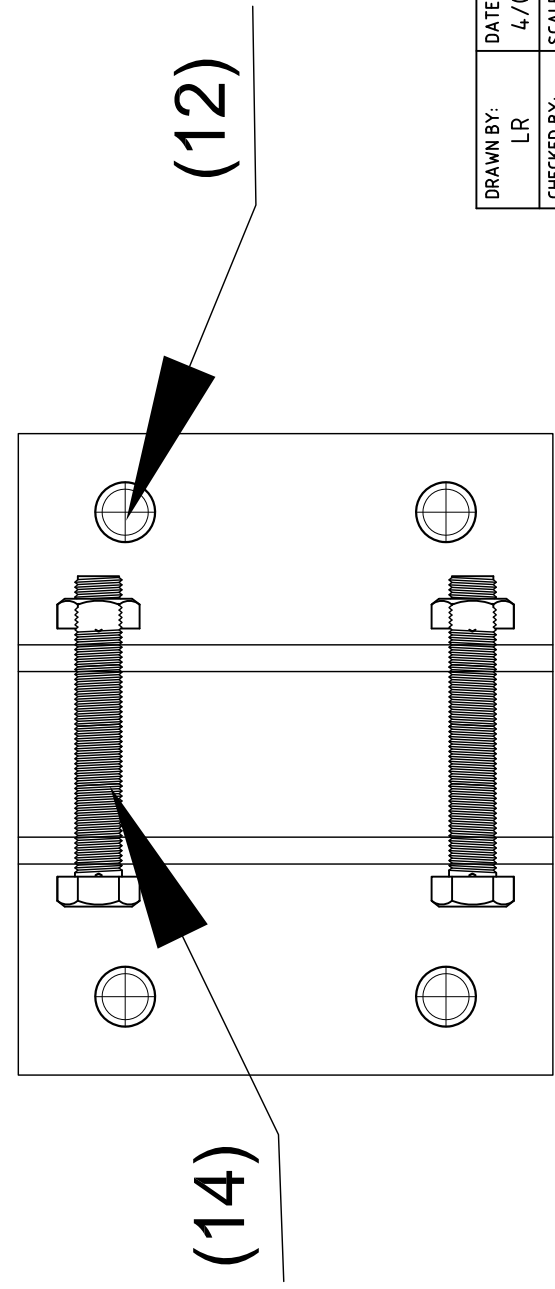
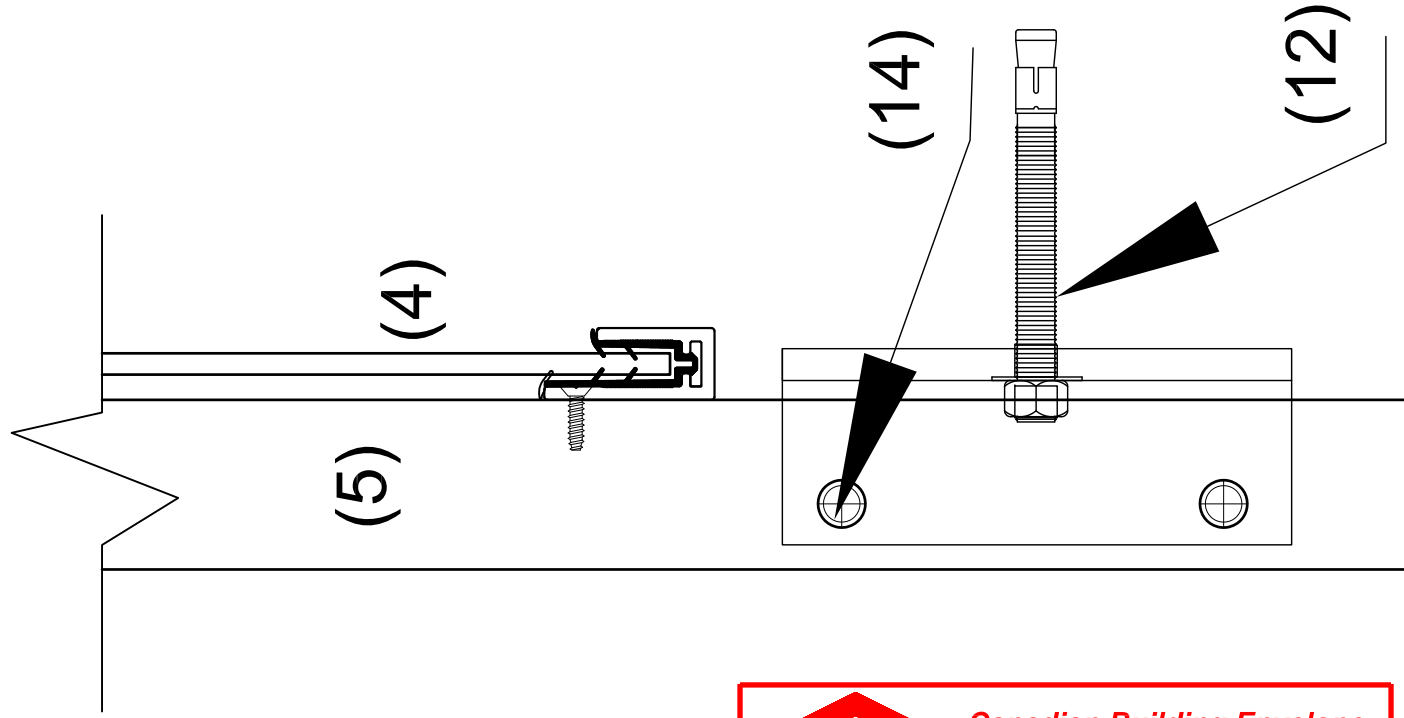
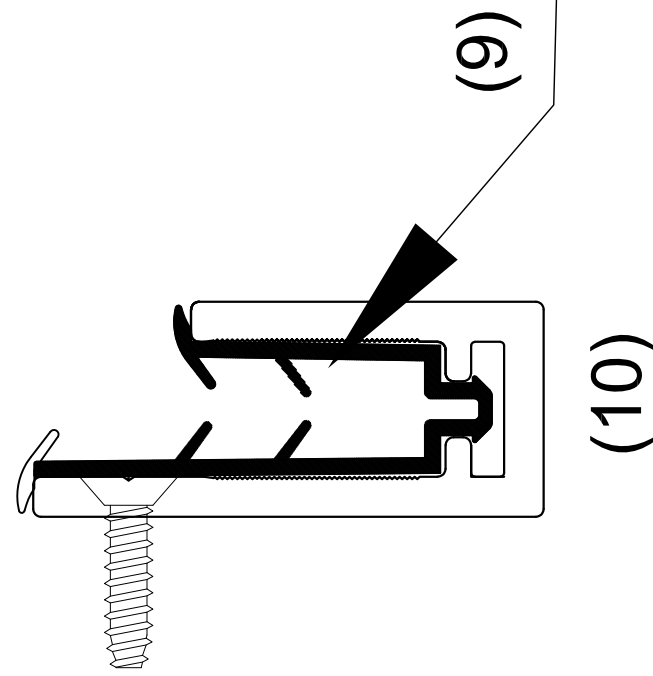
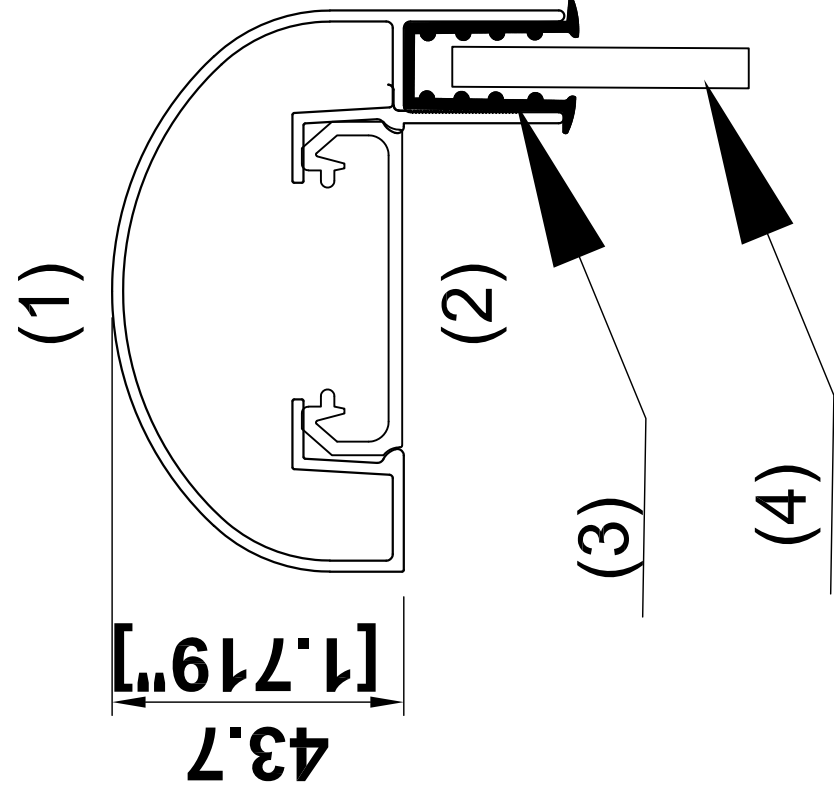
Canadian Building Envelope
Science and Technology

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CHECKED BY:	EF	SCALE:	NTS.
PROJECT:	RAILING TEST		
DRAWING TITLE:	TYPE 1 BALCONY RAILING		
<small>aluminum railing technologies ltd. 66 Rivaidea Rd. Toronto, Ontario M9M 2K3 Tel: (416) 740-9304 Fax: (416) 740-0720 Email:</small>			
DRAWING NO:	RT-D4		



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Verified By:	<i>AK</i>
Date:	JUNE 15, 2021

DRAWN BY: LR	DATE: 4/08/2020
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PROJECT: RAILING TEST	
DRAWING TITLE: TYPE 7C BALCONY RAILING	
 ART aluminum railing technologies ltd. 66 Rivalda Rd. Toronto, Ontario M9M 2H3 Tel: (416) 740-9304 Fax: (416) 740-0720 Email:	
DRAWING NO: RT-D4-A	