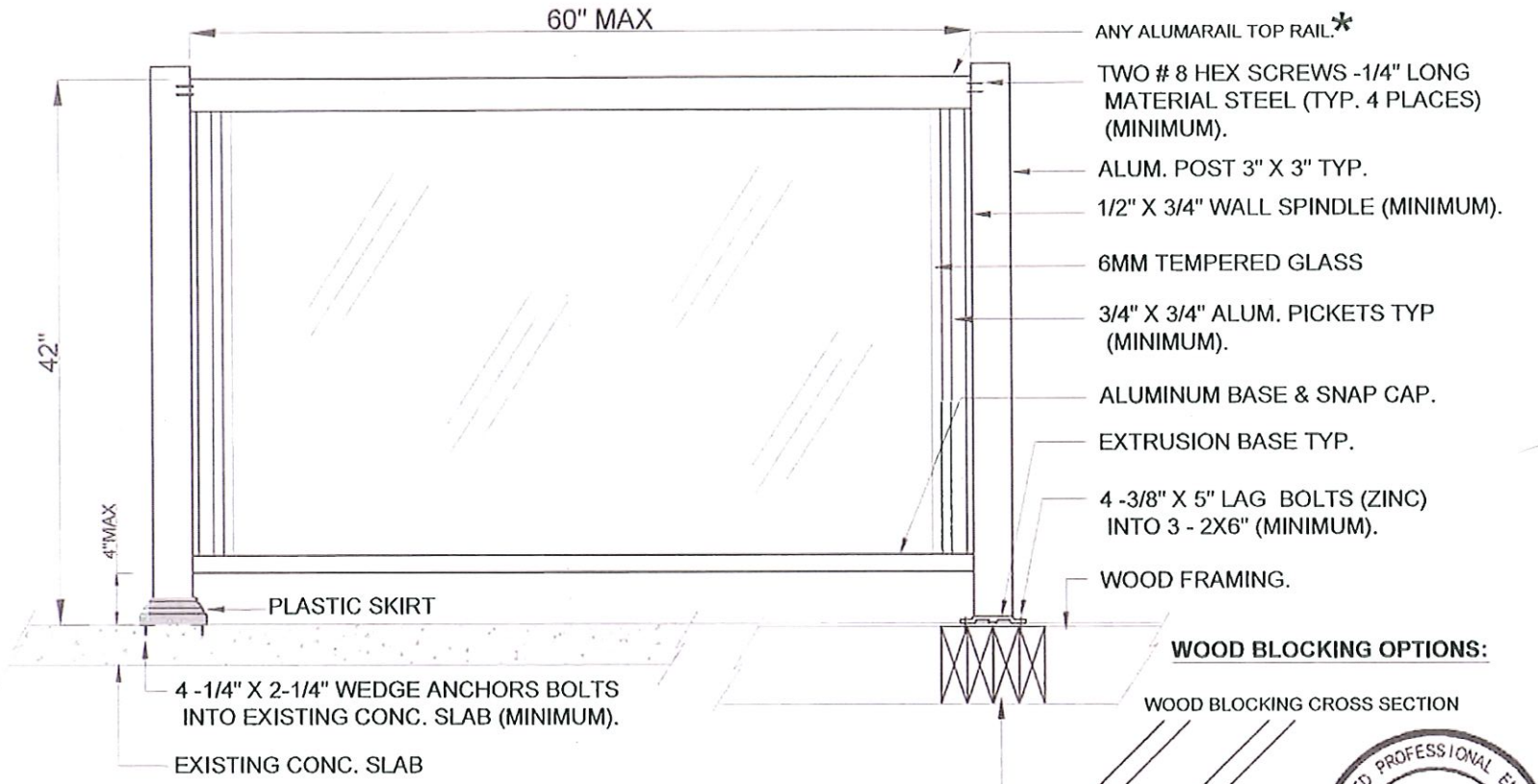
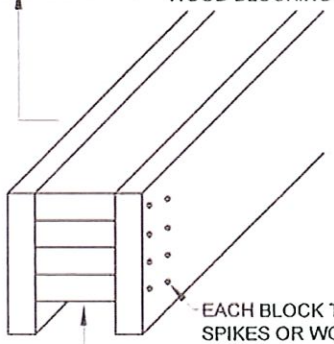
* PLATINUM
EMPRESS
ALUMA
SPRINT
ELITE
PRIMO

# ALUMARAIL MFG INC.




**WOOD BLOCKING OPTIONS:**

WOOD BLOCKING CROSS SECTION




LICENSED PROFESSIONAL ENGINEER
SIU H. E. LEUNG
2016-03-31
PROVINCE OF ONTARIO

NOTES:

1. RAILING DESIGN IN ACCORDANCE WITH 2010 NATIONAL BUILDING CODE & 2012 ONTARIO BUILDING CODE + SB13 , PART 9 RESIDENTIAL
2. ALL RAILING MATERIAL ALUMINUM ALLOY 6063-T5
3. ALL COMPONENTS SHOULD BE FROM ALUMARAIL MFG INC. OTHERWISE THIS DRAWING IS VOIDED.

Aluma Rail

City of Ottawa
Building Services Branch
FEB 26 2024
Building Code Reviewed
Signature

SITE COPY
City of Ottawa

| | |
|---|---|
| DATE: 18 / 01 / 2016 | PROJECT NO. |
| SCALE: 1 / 2" = 1'-0' | DWG NO. GR1 |
| DRAWN BY: ALUMARAIL MFG INC | |

City of Ottawa
FEB 09 2024
BCSB
580 Terry Fox Dr.

Intertek

# TEST REPORT

**REPORT NUMBER: 102063807TOR-002b**
ISSUE DATE: March 30, 2015

**EVALUATION CENTER**
Intertek Testing Services NA Ltd.
6225 Kenway Drive
Mississauga, Ontario L5T 2L3



**RENDERED TO**

**Alumarail Manufacturing Inc.**
**291 Trowers Road**
**Woodbridge, Ontario L4L 6A2**



**PRODUCT EVALUATED:**
GR1 Guardrail System with Glass Infill

**EVALUATION PROPERTY:**
Load Tests on Guards

**Report of load testing of a GR1 Guardrail System with Glass Infill for compliance with the applicable requirements of 2010 National Building Code of Canada and 2012 Ontario Building Code (Part 9)**

# 1 Table of Contents

## 2 Introduction

Intertek Testing Services NA Ltd. has conducted testing for Alumarail Manufacturing Inc. on a GR1 guardrail with glass infill.

Testing was conducted in March 2015, in order to include within the scope of testing, evaluation to the following:

- 2010 National Building Code of Canada, Article 9.8.8.2
- 2012 Ontario Building Code, Article 9.8.8.2

The scope of this project also includes the evaluation of the post anchoring method into SPF wood and concrete.

In addition, factored loads (based on the appropriate resistance factors) were applied to the load specifications. This evaluation was conducted on March 12, 2015.

# 3 Test Samples

## 3.1. SAMPLE SELECTION

The guardrail specimens were assembled by the client and shipped to the Intertek laboratory in Mississauga, Ontario.

## 3.2. SAMPLE AND ASSEMBLY DESCRIPTION

A guardrail system was evaluated, affixed to 3"×3" aluminum posts. The guardrail contained a tempered glass infill panel.

When installed, the guardrail length (inside-to-inside span) measured 1524 mm (60") long (the posts were spaced 1600 mm apart on centre).

As installed, the top of the handrail is 1220 mm up from the floor surface. The components are described as follows and are also shown on the appended drawings.

## 3.3. POST DESCRIPTION

Each post was mounted on an extruded aluminum base measuring 127 mm by 124 (5" ×4-7/8"). The aluminum base was held in place to the post by four Grade 5 #14-14×2-1/2" hex-head zinc-coated screws, fastened into the screw port. The base plate contained four 10 mm diameter holes at the corners of the base plate to anchor the posts, approximately 102 mm on center.

In concrete, the post base was bolted to the concrete substrate with four 1/4" × 2-1/4" concrete wedge-bolt anchors.

In wood, the post base was screwed to 3 layers of pressure-treated SPF (perpendicular to the grain) with four 3/8"×5" lag screws (4" thread) (pre-drilled with a 1/4" diameter wood bit).

| Part | Supplier | Catalogue / Die Number |
|---|---|---|
| Extruded aluminum base for 3"×3" post | sapa | AS-69826 |
| 3"×3" aluminum square tube posts | sapa | AH-58407 |
| 14-14×2-1/2" hex-head zinc-coated screws (Grade 5) | -- | -- |
| 1/4" × 2-1/4" concrete wedge-bolt anchors | -- | -- |
| 3/8"×5" lag screws (4" thread). | -- | -- |

### 3.4. PRIMO GUARDRAIL ASSEMBLY DESCRIPTION

The railing assembly identified as a GR1 Series guardrail with glass infill assembly consisted of top and bottom rail assemblies with the associated trim pieces, tempered glass infill panel, two pickets and two spindles for attachment of the top and bottom rail to the aluminum posts on either end.

The components are described as follows and are also shown on the appended drawings:

**Spindles**

An extruded aluminum spindle spanning the top and bottom rail was fastened to the post with four self-drilling, self-tapping #8×1/2"hex-head tek screws, two located at the top and two at the bottom of the spindle. The spindle served as the attachment mechanism of the railing to the posts.

| Part | Supplier | Catalogue / Die Number |
|---|---|---|
| Extruded aluminum spindle | sapa | AH-51336 |

**Top Rail**

The top rail consisted of three components; an extruded aluminum top rail and two identical extruded aluminum snap-in rail covers.

The top rail was mounted to the spindles (that were affixed to the posts) and fastened with four #8×1/2" self-drilling tek screws (two on each side of the spindle).

| Part | Supplier | Proposal Number |
|---|---|---|
| Top Handrail (Primo) | sapa | AH-59928 |
| Rail Cover | sapa | AS-50576 |

**Bottom Rail**

The five-component bottom rail consisted of the following:

- Two D-Bar base aluminum extrusions spanned the posts and was affixed to the spindle with four #8×1/2" self-drilling tek screws (two on each side of the spindle);
- A glass channel extrusion mounted onto a 3/4"×3/4" extrusion (that was as long as the length of the infill glass panel);
- Two identical extruded aluminum snap-in rail covers were also installed to the bottom rail.

The glass channel extrusion and 3/4"×3/4" extrusion was fastened to the D-bar base aluminum extrusion by (24) 8×1/2" self-drilling tek screws fastened from the D-bar base extrusion and into the glass channel extrusion and 3/4"×3/4" extrusion.

| Part | Supplier | Proposal Number |
|---|---|---|
| Glass Channel aluminum extrusion | sapa | AH-50579 |
| 3/4"×3/4" square extrusion | sapa | AH-50578 |
| D-Bar Base aluminum extrusion rail | sapa | AS-50577 |
| Rail Cover | sapa | AS-50576 |

**Infill Panel**

The 6 mm thick tempered glass infill panel measured 1346 mm wide by 987 mm high and was fitted into an integral glazing channel in the top and bottom extruded aluminum rails. Each glazing channel was fitted with a flexible PVC gasket into which the tempered glass panel fitted into.

| Part | Material | Supplier | Die Number |
|---|---|---|---|
| 8 mm gasket. | Flexible PVC | Prasad Plastics Limited | 8 mm |
| 6 mm glass panel infill | Tempered Glass | -- | -- |
| 3/4"×3/4" square baluster | Extruded aluminum | sapa | AH-50578 |

### 3.5. OPTIONAL HANDRAIL DESCRIPTION

The guardrail was tested using the Primo handrail which in Intertek's professional judgment is the weakest (least stiff) handrail. All other handrails systems (listed below) are considered to be stiffer and would perform equal to or better than the Primo handrail.
The components are described as follows and are also shown on the appended drawings:

| Part | Supplier | Part/Product Number |
|---|---|---|
| Top Handrail (Sprint) | sapa | AH-52993 |
| Top Handrail (Elite) | sapa | AH-66220 |
| Top Handrail (Aluma) | sapa | AH-50575 |
| Top Handrail (Empress) | sapa | AH-50581 |

### 3.6. DRAWINGS

Extruded Base, Die No. AS-69826, Dated 14/01/21
3X3 Post, Die No. AH-58407, Rev A, dated 08/01/16
Spindle, Die No. AH-51336, Rev A, dated 05/12/07
Primo Handrail, Die No. AH-59928, Rev A, dated 08/03/11
Aluma Handrail, Die No. AH-50575, Rev B, dated 07/02/27
Elite Handrail, Die No. AH-66220, dated 03/05/28
Empress Handrail, Die No. AH-50581, Rev C, dated 07/02/27
Sprint Handrail, Die No. AH-52993, Rev B, dated 07/02/27
Snap-On Cover, Die No. AS-50576, dated 03/04/28
D-Bar Base, Die No. AS-50577, Rev B, dated 05/12/07
Glass Channel, Die No. AH-50579, dated 04/02/11
3/4" x 3/4" Picket, Die No. AH-50578, Rev A, dated 05/07/27
3/4" x 1" Picket, Die No. AH-50580, Rev A, dated 05/12/07
Prasad Plastics Limited, Die No. FS-____, dated Sept 23/2013

# 4 Testing and Evaluation Methods

## 4.1. SPECIMEN PREPARATION

The guardrail specimens were assembled by the client and shipped to the Intertek laboratory in Mississauga, Ontario

## 4.2. CONDITIONING

The guard specimens were tested in the laboratory under ambient conditions. No specific conditioning parameters were required before testing.

## 4.3. CODE REFERENCES

The test loads applied were as set forth in the following:

- 2010 National Building Code of Canada, Section 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.
- 2012 Ontario Building Code, Section 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.
- ASTM E2353-06, "*Standard Test Methods for Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades*"

Appropriate factored loads were applied to the load specifications. Due to the limited number of samples, the guardrail may have been tested at a higher safety factor than what was required based on calculations from Limit States Design (section 4.1.3 of the 2012 OBC and 2010 NBC) and Resistance Factors listed in CSA S157-05, "*Strength Design in Aluminum*", Section 5.5 and CAN/CGSB-12.20-M89, "*Structural Design of Glass for Buildings*".

## 4.4. PRODUCT QUALIFICATION

The following statements are a summary of Intertek's professional opinions that can be applied to the GR1 Series guardrail system.

- The guardrail with a handrail height of 1220 mm (48") was submitted (as the client also wanted to qualify the guardrail to other standards not reported herein). Testing a 1220 mm (48") high guardrail is identical to or more severe than testing on a 1070 mm (42") or 900 mm (36") high guard. Therefore testing on a 1220 mm high guard will serve to represent testing on the 1070 mm and 900 mm high guard.
- The guardrail system is symmetrical therefore load testing is required in one direction only.
- Successful testing of a guardrail measuring 1.52 m (60") (not including posts) will qualify a guardrail system with a lesser span.

## 4.5. TEST PROCEDURES

Qualification of the GR1 guardrail system with a Primo, Sprint, Elite, Aluma or Empress handrail affixed to 3"×3" aluminum posts is based on successful testing of the following:

- Load testing on post anchoring in SPF and concrete substrate to qualify tributary load and concentrated load requirements (irrespective of the handrail). A concentrated horizontal load at the 3"×3" aluminum post 1070 mm up from the deck floor, anchored in SPF wood (perpendicular to the grain) and anchored in concrete. Testing of the aluminum posts was conducted in May 2014.

For qualification to 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units, the GR1 Series guardrail system with the Primo handrail and 6 mm tempered glass panel infill was tested to the following:

- uniform vertical load at top rail
- uniform horizontal load at top rail
- concentrated horizontal load at top rail at the post
- concentrated horizontal load at top rail at midspan
- concentrated horizontal load at top rail end connector (to qualify the requirement on the end connector).
- horizontal load on infill panel (using 100 × 100 mm platen)
- shot bag impact resistance (impacted with 45.4 kg lead shot soft body impactor)

Results are reported herein:

### 4.5.1 Tributary Load Requirements - Horizontal Concentrated Load on Post

The tributary load test of the post will determine the maximum post spacing.

A concentrated load delivered by means of a calibrated load cell/single ram/pump system with a 100 mm by 100 mm platen was applied at the top of an individual post anchored in SPF and concrete (not connected to a railing system) to ultimate failure. The failure mode and subsequently an appropriate material resistance factor (and a combined factor of safety) is then determined

From that, a maximum post spacing is then determined. This applies to the guardrail installed in a SPF wood and concrete.

### 4.5.2 Vertical Uniform Load on Top Rail

*2.5 Factored Load (2012 OBC)*

Quarter-point loading (deemed by Intertek to be equivalent to uniform loading) was applied to the top rail in a vertical direction by means of the loading system comprised of a calibrated load cell/single ram/pump system and load distributing steel bar. A test load of 3.75 kN/m resulting in a total load of 6.00 kN (factored load of 2.50) was applied to the top rail at full load and held for 1 minute.

After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component. The load was based on a post span length of 1.60 m (63 in.).

### 4.5.3 Horizontal Uniform Load at Top Rail

*Basic Load (2012 OBC and 2010 NBC)*

Quarter-point loading (deemed by Intertek to be equivalent to uniform loading) was applied to the top rail of the guardrail system in a horizontal direction by means of the loading system comprised of a calibrated load cell/single ram/pump system and load distributing steel bar. The initial position of the top of the rail at midspan was measured. A test load of 0.5 kN/m resulting in a total load of 0.8 kN was applied to the top rail at the handrail, 1220 mm up from the deck floor load and held for 1 minute, whereupon the position of the rail was measured. After release of the load, the system was evaluated for residual deflection, failure, evidence of disengagement of any component and visible cracks in any component. The load was based on an overall guardrail length of 1.60 m.

*2.5 Factored Load*

A test load of 2.0 kN (factored load of 2.5) was applied to the top rail of the guardrail system. After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component.

### 4.5.4 Horizontal Concentrated Load at Top Rail at Midspan

*Basic Load (2012 OBC and 2010 NBC)*

The initial position of the top rail (at mid span) was measured. A concentrated horizontal load of 1.0 kN (delivered with a 100 mm by 100 mm platen) was applied to mid span of the top rail by means of a calibrated load cell/single ram/pump system and held for 1 minute, whereupon the position of the rail was measured. The position of the top railing was measured. The load was then released and the residual position of the top rail was again measured.

*2.5 Factored Load*

A test load of 2.5 kN (factored load of 2.5) was applied to mid span of the top rail and the rail movement was measured at full load and after removal of the test load. After release of the load, the system was evaluated for residual deflection, failure, evidence of disengagement of any component and visible cracks in any component.

### 4.5.5 Horizontal Concentrated Load at Top Rail End Connector

*2.5 Factored Load (2012 OBC)*

The post was fixed in place and prevented from moving. A concentrated horizontal load of 2.5 kN (factored load of 2.5) (delivered with a 100 mm by 100 mm platen) was applied to the top rail adjacent the post by means of the loading system comprised of a calibrated load cell/single ram/pump system. A test load of was applied and held for 1 minute.

After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component.

### 4.5.6 Horizontal Concentrated Load on Post

*Basic Load (2012 OBC and 2010 NBC)*

The initial position of the top rail (at mid span) was measured. A concentrated horizontal load of 1.0 kN (delivered with a 100 mm by 100 mm platen) was applied to mid span of the top rail by means of a calibrated load cell/single ram/pump system and held for 1 minute, whereupon the position of the rail was measured. The position of the top railing was measured. The load was then released and the residual position of the top rail was again measured.

*2.5 Factored Load*

A test load of 2.5 kN (factored load of 2.5) was applied to mid span of the top rail and the rail movement was measured at full load and after removal of the test load. After release of the load, the system was evaluated for residual deflection, failure, evidence of disengagement of any component and visible cracks in any component.

### 4.5.7 Horizontal Load on Glass Panel Infill

*2.67 Factored Load (2012 OBC and 2010 NBC)*

The concentrated factored test load of 1.33 kN (300 lbs) (factored load of 2.67) load (delivered with a 100 mm by 100 mm platen) was applied to three locations on the glass infill panel (top corner, centre and opposite bottom corner) by means of a calibrated load cell/single ram/pump system and held for 1 minute. After release of the load, the system was evaluated for failure, evidence of disengagement of any component and visible cracks in any component.

### 4.5.8 Shot Bag Impact Resistance

A test apparatus capable of supporting a 45.4 kg (100 lbs) and allowing unimpeded swinging was set up. A 45.4 kg (100 lbs) shot bag was suspended from the overhead support via a 1.83 m (6') cable and positioned to impact the geometric centre of the glass infill panel. The shot bag was pulled back and upwards through an arc shaped trajectory to the required test height and then released impacting the glass infill panel. The test was performed at 2 levels, 203 J (150 ft·lbs) and 540 J (400 ft·lbs).

# 5 Testing and Evaluation Results

## 5.1. Tributary Load Results - Horizontal Concentrated Load on Post

**Table 1. – Ultimate Failure Mode on Horizontal Concentrated Load on 3"×3" Post anchored to SPF substrate**

| Aluminum Base Type and Size | Failure Mode at Ultimate Load | Measured Ultimate Load | Combined Factor of Safety | Result |
|---|---|---|---|---|
| Extruded aluminum base for 3"×3" post anchored in SPF wood | Fastener withdrawal from wood substrate | 2.51 kN (565 lbf) | 2.5 | Satisfies the minimum requirements for tributary load for 1.60 m (63") guardrail span |
| Extruded aluminum base for 3"×3" post anchored in concrete | Aluminum post bend and buckled near base | 2.53 kN (568 lbf) | 2.0 | Satisfies the minimum requirements for tributary load for 1.60 m (63") guardrail span |

Based on an ultimate load of the post system (anchored to SPF wood and concrete substrate), and the appropriate resistance factor, the post anchoring satisfies the minimum requirements for tributary load for a 1.60 m (53") guardrail span as specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.

## 5.2. Vertical Uniform Load on Top Rail

**Table 2. – Vertical Uniform Load on Top Rail**

| Load | | Test Result |
|---|---|---|
| Factored 2.5 X | 3.75 kN/m (300 lbf/ft) | After release of the load there was no evidence of disengagement or visible cracks in any component of the guard rail system |

Based on the appropriate resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for vertical uniform load on the top rail.

## 5.3. Horizontal Uniform Load at Top Rail

**Table 3. - Horizontal Uniform Load at Top Rail**

| Load | | Net Deflection (mm) | Residual Deflection (mm) | Test Result |
|---|---|---|---|---|
| Basic | 0.75 kN/m (51.4 lbf/ft) | 19 | 0 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |
| Factored 2.5 X | 1.88 kN/m (128 lbf/ft) | 49 | 1 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |

Based on the resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for horizontal uniform load on the top rail.

## 5.4. Horizontal Concentrated Load at Top Rail at Midspan

**Table 4. - Horizontal Concentrated Load at Top Rail at Midspan**

| Load | | Net Deflection (mm) | Residual Deflection (mm) | Test Result |
|---|---|---|---|---|
| Basic | 1.0 kN (225 lbf) | 30 | 1 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |
| Factored 2.5 X | 2.5 kN (562 lbf) | 79 | 7 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |

Based on the appropriate resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for Horizontal concentrated load (load at top rail midspan).

## 5.5. Horizontal Concentrated Load at Top Rail End Connector

**Table 5. - Horizontal Concentrated Load at Top Rail End Connector (adjacent to post)**

| Load | | Test Result |
|---|---|---|
| Factored 2.5 X | 2.5 kN (562 lbf) | After release of the load there was no evidence of disengagement or visible cracks in any component of the guard rail system |

Based on the appropriate resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for Horizontal concentrated load (load at top rail end connector).

## 5.6. Horizontal Concentrated Load on Post

**Table 6. - Horizontal Concentrated Load on Post**

| Load | | Net Deflection (mm) | Residual Deflection (mm) | Test Result |
|---|---|---|---|---|
| Basic | 1.0 kN (225 lbf) | 22 | 0 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |
| Factored 2.5 X | 2.5 kN (562 lbf) | 69 | 4 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |

Based on the appropriate resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for Horizontal concentrated load (load on post).

### 5.7. Horizontal Load on Infill Panel

**Table 7 Horizontal Load on Infill Panel**

| Location of Load | Load | | Net Deflection (mm) | Test Result |
|---|---|---|---|---|
| Top corner of panel | Factored 2.67 X | 1.33 kN (300 lbf) | 12 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |
| Middle of panel | Factored 2.67 X | 1.33 kN (300 lbf) | 13 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |
| Opposite bottom corner of panel | Factored 2.67 X | 1.33 kN (300 lbf) | 7 | After release of the load there was no evidence of disengagement or visible cracks in any component of the guardrail system |

Based on the resistance factor applied, the guardrail system satisfied the requirements specified in the 2012 Ontario Building Code and 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units for Horizontal concentrated load on the infill panel.

### 5.8. Shot Bag Impact Resistance

When tested for shot bag impact test (using a 45.4 kg (100 lbs shot bag)), the guardrail system with glass panel infill achieved a safety impact performance of 203 J (150 ft·lbs). The 540 J (400 ft·lbs) level was not achieved.

## 6 Test Equipment

| Description | Inventory Number |
|---|---|
| Enerpac RC 1010 hydraulic ram | 280-01-0688 |
| Powerfist 24" stroke hydraulic ram | -- |
| Electric Hydraulic Pump | -- |
| 5k Load Cell | 273-01-1207B Cal Due Aug 13/15 |
| Read Out | 273-01-1207AB Cal Due Aug 13/15 |
| Stop Watch | 273-01-1202 Cal Due Dec 06/2015 |
| Tape Measure | 273-01-1223 Cal Due Dec 20/2015 |
| Scale | 280-01-1228-Cal Due Dec 23/2015 |

## 7 Conclusion

The GR1 guardrail system with glass panel infill, described herein satisfied the basic and factored horizontal and vertical loads (including tributary loads) as set forth in the following:

- 2012 Ontario Building Code, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units
- 2010 National Building Code of Canada, Article 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units

The scope of this report includes the evaluation of the GR1 guardrail system with glass panel infill anchored to a concrete and SPF substrate at a maximum post inside spacing of 1.52 m (60")

The conclusions of this test report 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.

**INTERTEK TESTING SERVICES NA LTD.**

LICENSED PROFESSIONAL ENGINEER
C. SACILOTTO
90560848
March 30/15
PROVINCE OF ONTARIO

Tested and
Reported by:

Claudio Sacilotto, P.Eng.
**Senior Project Engineer – Building Products**
**Intertek**

Reviewed by:

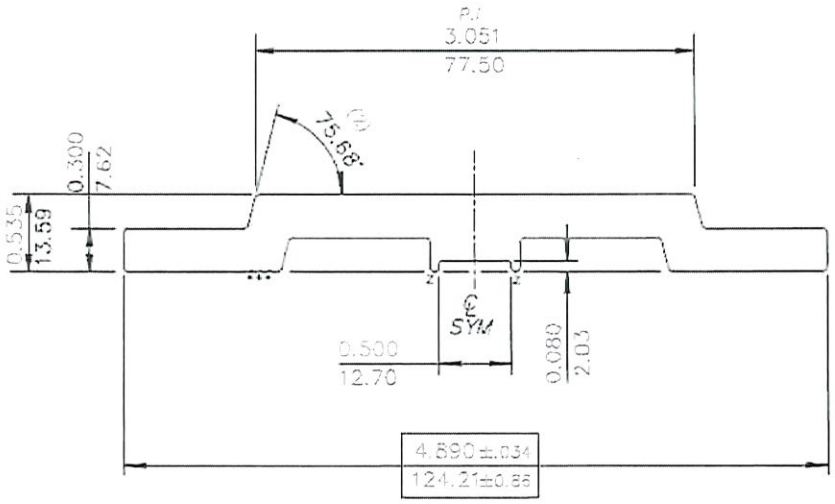
Robert Giona
**Team Leader – Building Products**
**Intertek**

# 8 Appendix A – Product Drawings

PRODUCT DRAWINGS (14 pages)

\\MIS01-MIS001\MIS\TEAMS\MIS_DIE\DWGS\69000\AS69826.DWG

| CUSTOMER: Alumarail | PART NO: – | DIE NO.: AS–69826 | DASH: 1 |
|---|---|---|---|
| DESCRIPTION: – | TARRIF# 7604.29.10.00 | PROPOSAL#: 30833–1B | |
| SAPA 5875 Kennedy Road Mississauga, Ontario L4Z 2H9 | DATE | SYM | REVISION |




UNMARKED RADII = RADIUS TO SUIT
BREAK CORNERS = 0.031 (0.79) R.
(≥) = 0.030 (0.76) R. (2)

(*) = 0.010(0.25) R. X 0.010(0.25)D. SAPA I.D. MARKS

sapa:

UNSPECIFIED WALL THICKNESS
0.300(7.62)
±0.008(0.20)

| | | | |
|---|---|---|---|
| EST. AREA 1.681 IN² 1084 MM² | | CUT PER. – IN – MM | |
| EST. WT. 2.017 LBS/FT. 3.002 KG/M | | FACTOR 6 | |
| EST. PER. 11.560 IN 294 MM | | O.C.D. 4.896 IN 124 MM | |
| DWN BY Hilda | ALLOY 6061–T6 | SCALE 1:1 | DATE 14–01–21 |

BREAK ALL CORNERS .015"R (0.41 mm)R UNLESS OTHERWISE NOTED

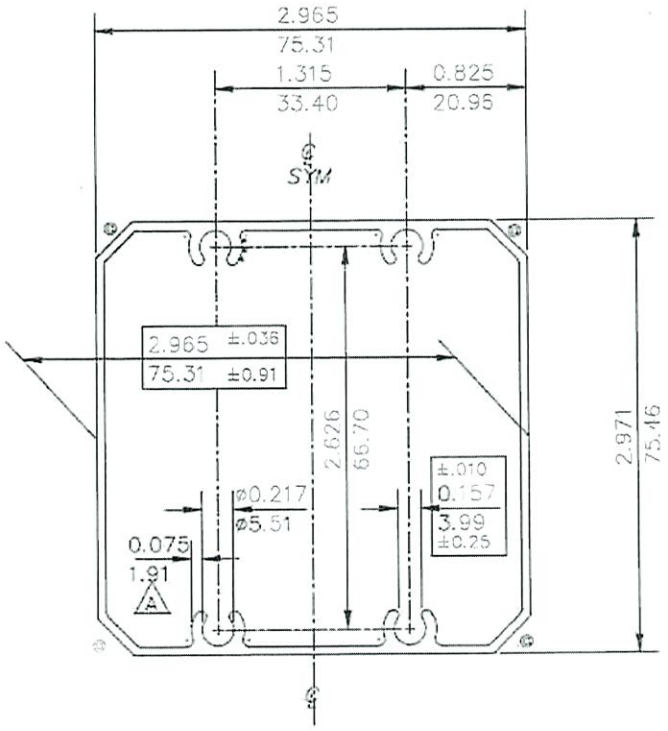
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

| CUSTOMER | PART NO. | DIE NO. | DASH |
|---|---|---|---|
| ALUMARAIL , LTD. | – | AH–58407 | 1 |
| DESCRIPTION: 3 X 3 POST | TARRIF# 7604.21.00.00 | PROPOSAL# 14246–1 | |
| INDALEX LIMITED 5675 Kennedy Road Mississauga, Ontario L4Z 2H9 | | | |

| DATE | SYM | REVISION | BY |
|---|---|---|---|
| 06/01/16 | A | WAS .050" | S.B. |

(*) = 0.010(0.25) R. X 0.010(0.25)H. INDALEX I.C. MARKS

EXPOSED SURFACE
ALL AROUND




(⊛) = 0.250(6.35) CHAMFER (4)
(·) = 0.040(1.02) R. (8)
UNMARKED RADII = RADIUS TO SUIT

INDALEX ALUMINUM SOLUTIONS

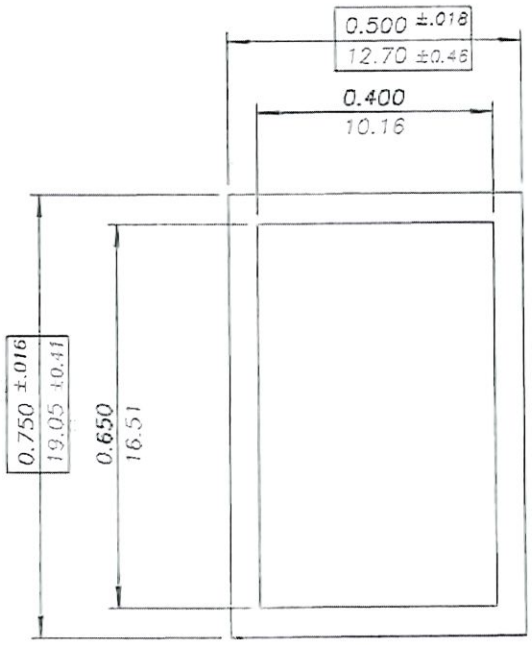
UNSPECIFIED WALL THICKNESS
±.010 ±0.25
0.061(1.55)

| | | | |
|---|---|---|---|
| EST. AREA 0.825 IN² 533 MM² | | CUT PER 11.275 IN 286 MM | |
| EST. WT. 0.991 LBS/FT. 1.474 KG/M | | FACTOR 25 | |
| EST. PER. 25.079 IN 637 MM | | C.C.D. 3.856 IN 98 MM | |
| DWN BY J.S. | ALLOY 6063–T5 | SCALE 1:1 | DATE 07/06/14 |

BREAK ALL CORNERS .016"R (0.41 mm)R UNLESS OTHERWISE NOTED.

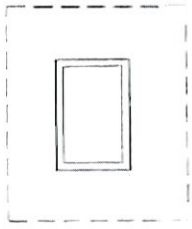
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

| CLIENT | CLIENT No. | No DE PROFILE/DIE No. | DASH |
|---|---|---|---|
| INDALEX | MH-40111 | AH-51336 | 1 |
| DESCRIPTION: 1/2" X 3/4" WALL SPINDLE | TARRIF# 7604.21.00.00 | PROPOSAL# 19238-2 | |
| INDALEX LIMITED 325 Ave. Pointe-Claire, Quebec H9R 5W3 (514) 697-5120 | DATE / SYM / REVISION / BY | | |
| | 05/12/07 / A / DESCRIPTION CHANGE / G.S. | | |




NITRO-GROOVED BACKER
ZERO BEARINGS

ACTUAL SIZE
GRANDEUR ACTUELLE



EXPOSEE TOUT LE TOUR

EXPOSED SURFACE ALL AROUND

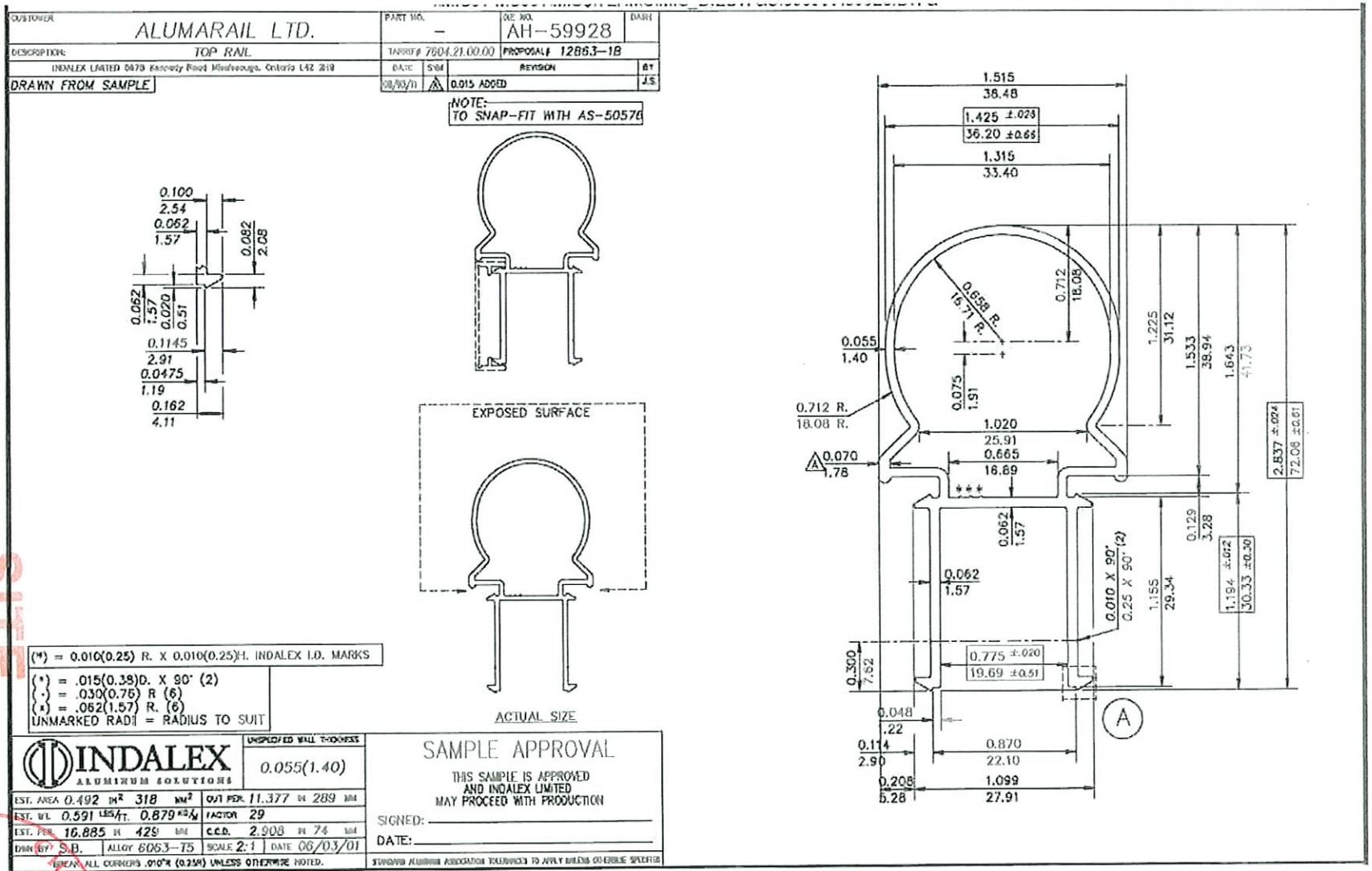
INDALEX ALUMINUM SOLUTIONS

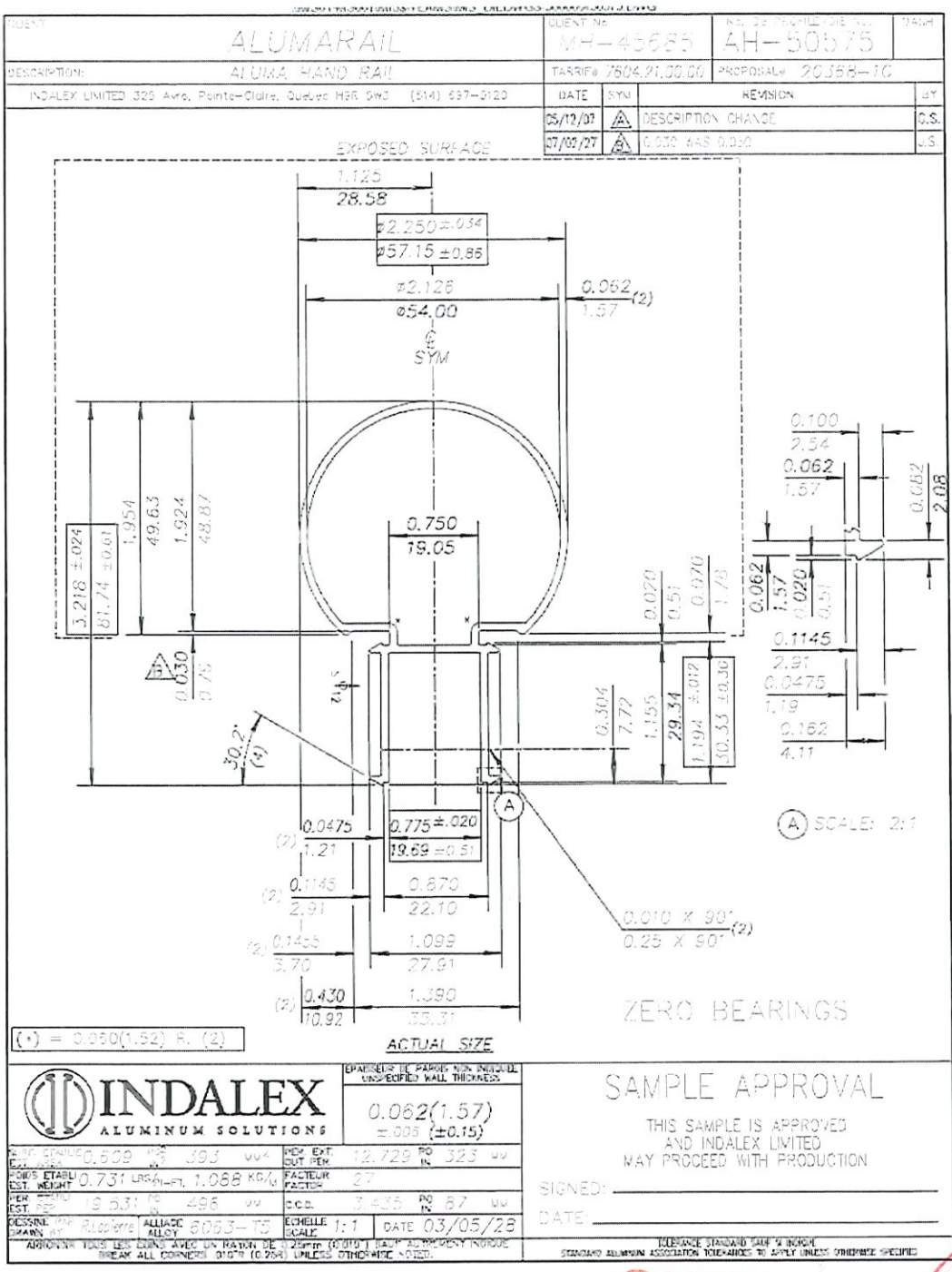
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AIRE ETABLIE EST. AREA | 0.115 | PO² IN² | 74 | MM² | PER. EXT OUT PER. | 2.500 PO IN | 64 MM |
| POIDS ETABLI EST. WEIGHT | 0.138 LBS/PI-FT. | | 0.205 | KG/M | FACTEUR FACTOR | 33 | |
| PER. ETABLI EST. PER. | 4.600 | PO IN | 117 | MM | c.c.d. | 0.901 PO IN | 23 MM |
| DESSINE PAR DRAWN BY | SM | ALLIAGE ALLOY | 6063-T5 | | ECHELLE SCALE | 4:1 | DATE 01/04/20 |

EPAISSEUR DE PAROIS NON INDIQUE
UNSPECIFIED WALL THICKNESS
0.050(1.27)
±.010 ±0.25

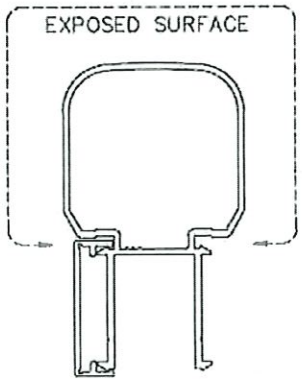
TOUS LES COINS AVEC UN RAYON DE 0.25mm (0.010") SAUF AUTREMENT INDIQUE
BREAK ALL CORNERS .010"R (0.25R) UNLESS OTHERWISE NOTED.

TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

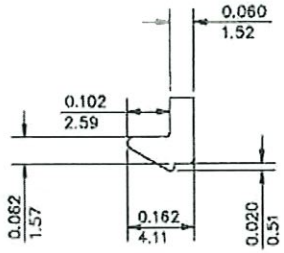




| CUSTOMER | PART NO. | DIE NO. | DASH |
|---|---|---|---|
| ALUMARAIL | – | AH–66220 | 1 |
| DESCRIPTION: TOP RAIL | TARIFF# 7604.21.00.00 | PROPOSAL# 17164–1A | |
| SAPA 5675 Kennedy Road Mississauga, Ontario L4Z 2H9 | DATE / SYM / REVISION | | |

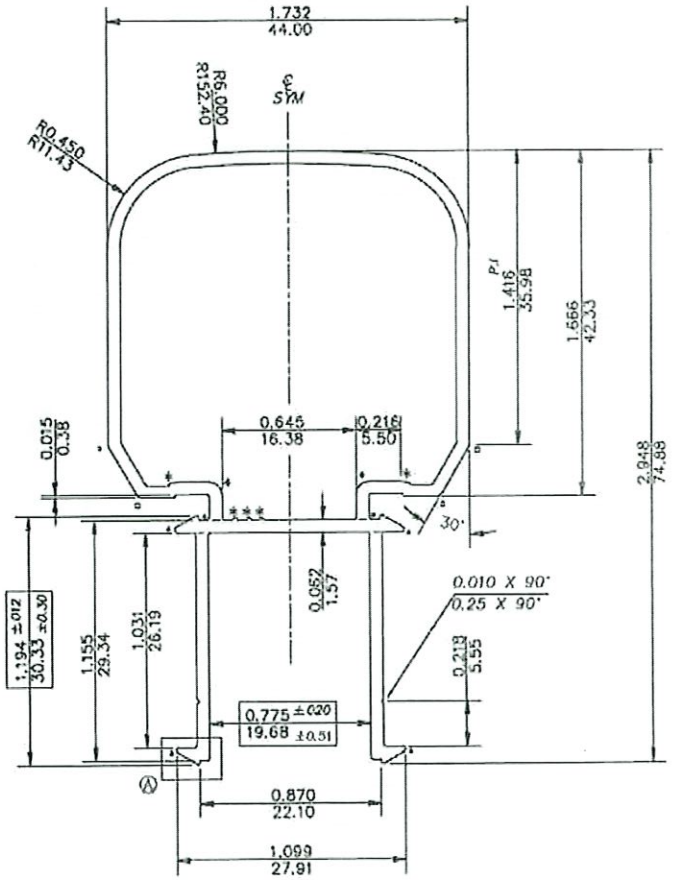



MATES WITH AS–50576




SCALE 4:1
DETAIL A

PAINTED MATERIAL



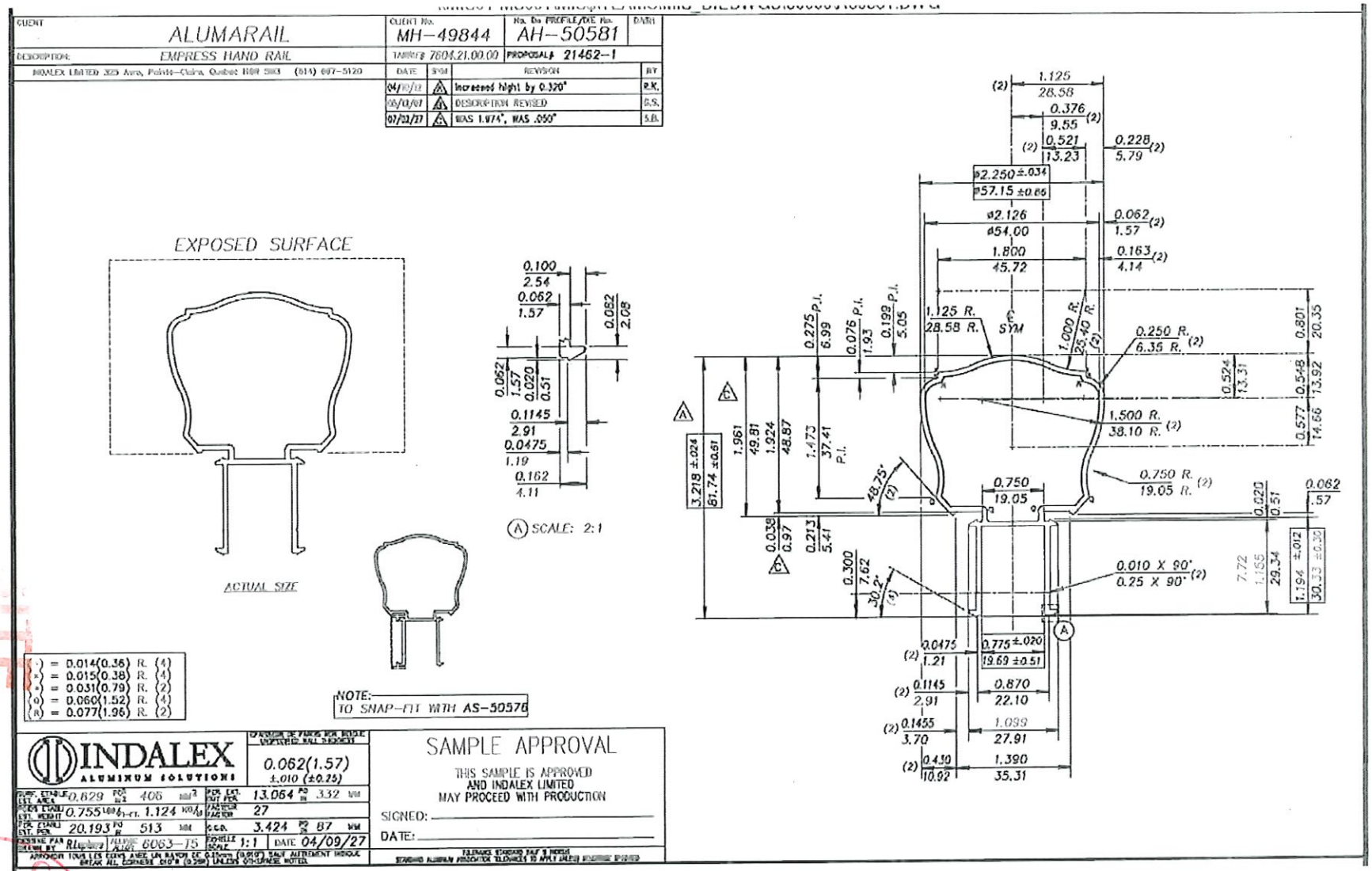

UNMARKED RADII = RADIUS TO SUIT
BREAK CORNERS = 0.010 ( 0.25) R.
(•) = 0.014( 0.36) R.( )
(•) = 0.016( 0.41) R.( )
(•) = 0.030( 0.76) R.( )
(•) = 0.062( 1.57) R.( )
(•) = 0.070( 1.78) R.( )
(*) = 0.010(0.25) R. X 0.010(0.25)H. SAPA I.D. MARKS

sapa:

| UNSPECIFIED WALL THICKNESS |
|---|
| ±0.006(0.15)S |
| 0.060(1.52) |
| ±0.010(0.25)H |

| | | | |
|---|---|---|---|
| EST. AREA 0.542 IN² 350 MM² | | OUT PERI. 11.868 IN 301 MM | |
| EST. WT. 0.650 LBS/FT. 0.968 KG/M | | FACTOR 28 | |
| EST. PERI. 17.987 IN 457 MM | | C.C.D. 3.081 IN 78 MM | |
| DWN BY TOE | ALLOY 6063–T5 | SCALE 2:1 | DATE 11–05–04 |

BREAK ALL CORNERS .015"R (0.41 mm)R UNLESS OTHERWISE NOTED. STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED



| CUSTOMER | ALUMARAIL | PART NO. | – | DIE NO. | AH–52993 | DASH | 1 |
|---|---|---|---|---|---|---|---|
| DESCRIPTION: | SPRINT HAND RAIL | TARIFF# 7604.21.00.00 | | PROPOSAL# | 12375–1 | | |
| INDALEX LIMITED 5675 Kennedy Road Mississauga, Ontario L4Z 2H9 | | DATE | SYM | REVISION | | BY | |
| | | 05/12/01 | 2 | DESCRIPTION REVISED | | G.S. | |
| | | 01/22/27 | 1 | WAS 1.974", WAS .050" | | S.B. | |

EXPOSED SURFACE

ACTUAL SIZE

Ⓐ SCALE: 2:1

NOTE:
TO SNAP-FIT WITH AS-50576

(·) = 0.014(0.36) R. (4)
(·) = 0.015(0.38) R. (4)
(·) = 0.031(0.79) R. (4)
(·) = 0.060(1.52) R. (2)
(·) = 0.250(6.35) R. (2)

INDALEX ALUMINUM SOLUTIONS

UNSPECIFIED WALL THICKNESS: 0.062(1.57)

| | | | |
|---|---|---|---|
| EST. AREA | 0.603 IN² 389 MM² | OUT PER. | 12.603 IN 320 MM |
| EST. WT. | 0.724 LBS/FT. 1.077 KG/M | FACTOR | 26 |
| EST. PER. | 19.040 IN 484 MM | C.C.D. | 3.286 IN 83 MM |
| DWN BY | G.S. | ALLOY | 6063–T5 |
| SCALE | 1:1 | DATE | 05/08/05 |

BREAK ALL CORNERS .010"R (0.25R) UNLESS OTHERWISE NOTED.

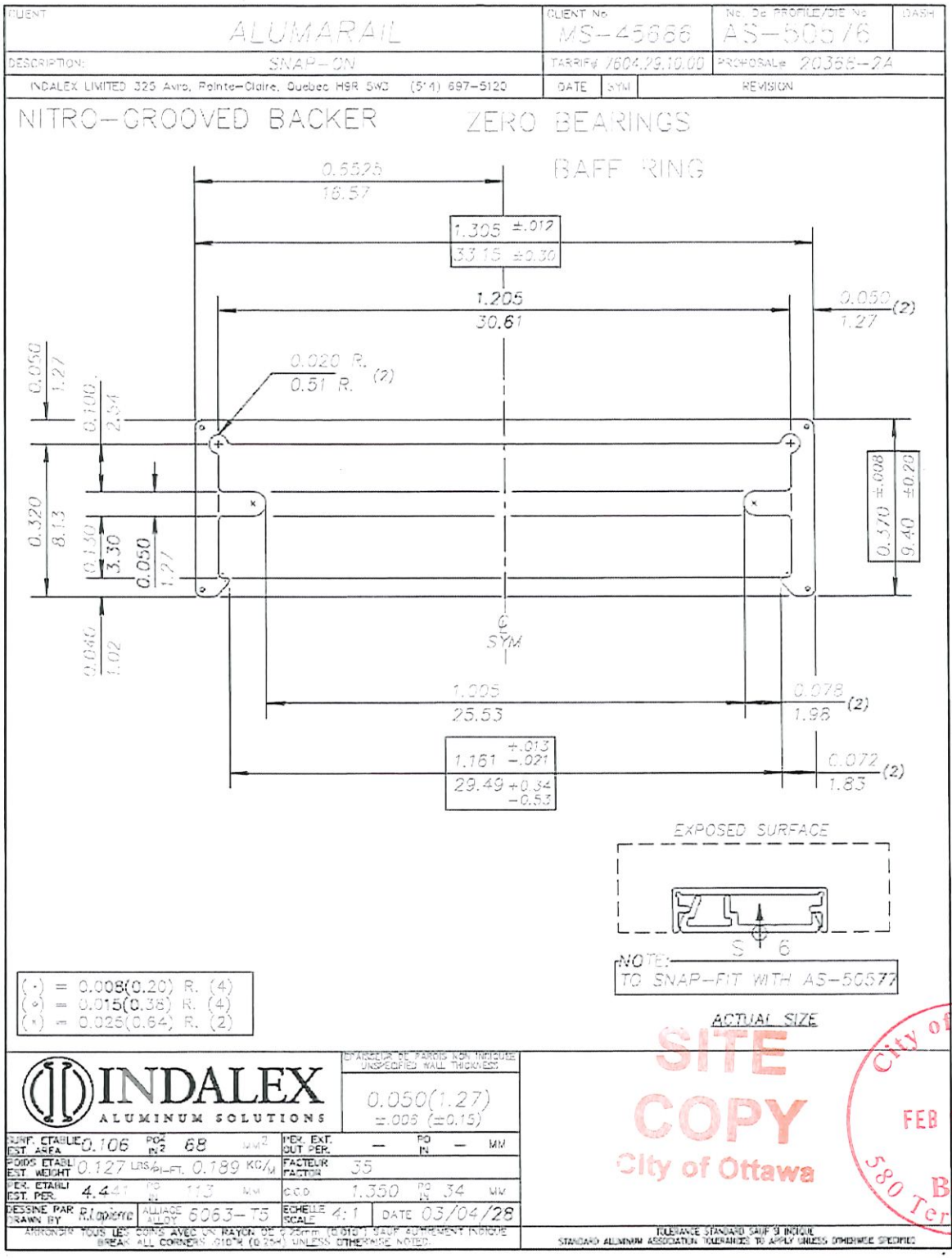
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

SAMPLE APPROVAL

THIS SAMPLE IS APPROVED AND INDALEX LIMITED MAY PROCEED WITH PRODUCTION

SIGNED: _____

DATE: _____


CLIENT
ALUMARAIL
CLIENT No.
MS-45666
No. De PROFILE/DIE No.
AS-50516
DASH
DESCRIPTION:
SNAP-ON
TARRIF# 7604.29.10.00
PROPOSAL# 20366-2A
INDALEX LIMITED 325 Ave. Pointe-Claire, Quebec H9R 5W3 (514) 697-5120
DATE
SYM
REVISION
NITRO-GROOVED BACKER
ZERO BEARINGS
BAFF RING
0.5525
14.57
1.305 ±.012
33.15 ±0.30
1.205
30.61
0.050 (2)
1.27
0.020 R.
0.51 R. (2)
0.050
1.27
0.100
2.54
0.320
8.13
0.130
3.30
0.050
1.27
0.040
1.02
0.370 ±.008
9.40 ±0.20
C
SYM
1.005
25.53
0.078 (2)
1.98
1.161 +.013 -.021
29.49 +0.34 -0.53
0.072 (2)
1.83
EXPOSED SURFACE
S 6
NOTE:
TO SNAP-FIT WITH AS-50577
ACTUAL SIZE
(·) = 0.008(0.20) R. (4)
(·) = 0.015(0.38) R. (4)
(·) = 0.025(0.64) R. (2)
INDALEX
ALUMINUM SOLUTIONS
EPAISSEUR DE PAROIS NON INDIQUEE
UNSPECIFIED WALL THICKNESS
0.050(1.27)
±.005 (±0.15)
SURF. ETABLIE EST. AREA 0.106 PO² IN² 68 MM²
PER. EXT. OUT PER. — PO IN — MM
POIDS ETABLI EST. WEIGHT 0.127 LBS/PI-FT. 0.189 KG/M
FACTEUR FACTOR 35
PER. ETABLI EST. PER. 4.441 PO IN 113 MM
c.c.d. 1.350 PO IN 34 MM
DESSINE PAR DRAWN BY R.Lapierre
ALLIAGE ALLOY 6063-T5
ECHELLE SCALE 4:1
DATE 03/04/28
ARRONDIR TOUS LES COINS AVEC UN RAYON DE 0.25mm (0.010") SAUF AUTREMENT INDIQUE
BREAK ALL CORNERS .010"R (0.25R) UNLESS OTHERWISE NOTED.
TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED
SITE
COPY
City of Ottawa
City of Ottawa
FEB 09 2024
BCSB
580 Terry Fox Dr.

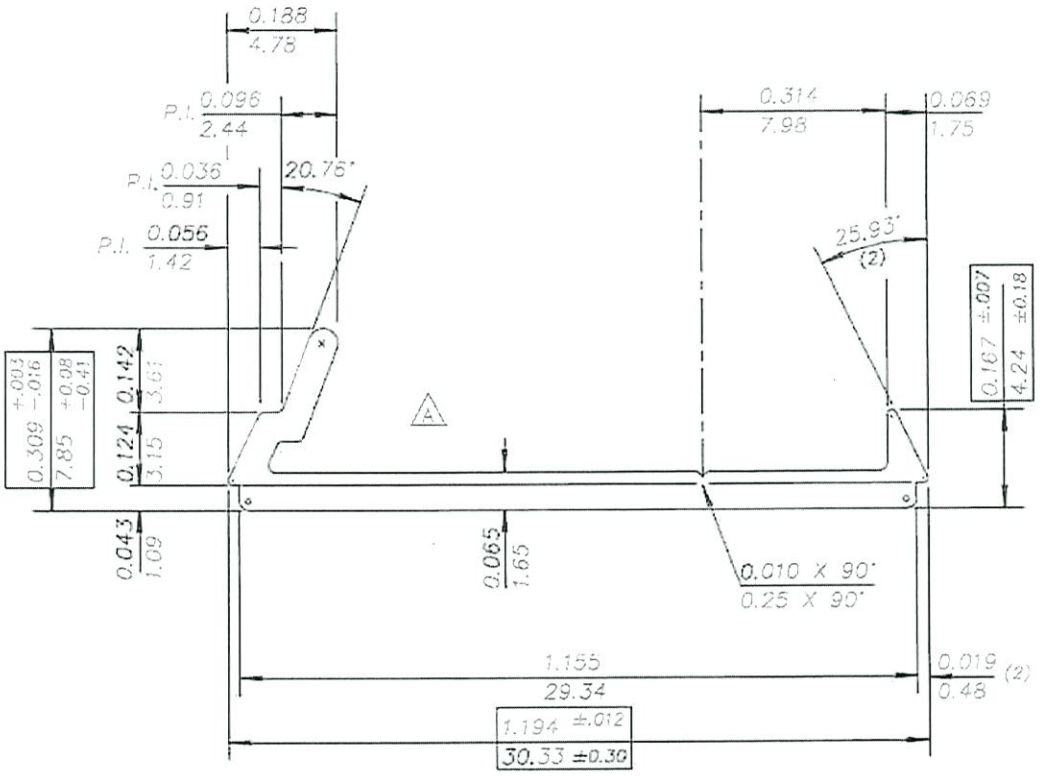
| CLIENT | CLIENT No. | NO. DE PROFILE/DIE No. | DASH |
|---|---|---|---|
| ALUMARAIL | MS-45687 | AS-50577 | |

DESCRIPTION: D-BAR BASE — TARRIF# 7604.29.10.00 — PROPOSAL# 20368-3A

INDALEX LIMITED 325 Ave. Pointe-Claire, Quebec H9R 5W3 (514) 697-5120

| DATE | SYM | REVISION | BY |
|---|---|---|---|
| 05/03/08 | A | LEG REMOVED | GFG |
| 05/12/07 | A | DESCRIPTION CHANGE | G.S. |

# NITRO-GROOVED BACKER




ZERO BEARINGS
BAFF RING

NO SURFACES EXPOSED.

S 6

(·) = 0.008(0.20) R. (3)
(o) = 0.015(0.38) R. (2)
(×) = 0.025(0.64) R. (1)

NOTE:
TO SNAP-FIT WITH AS-50576

ACTUAL SIZE

INDALEX ALUMINUM SOLUTIONS

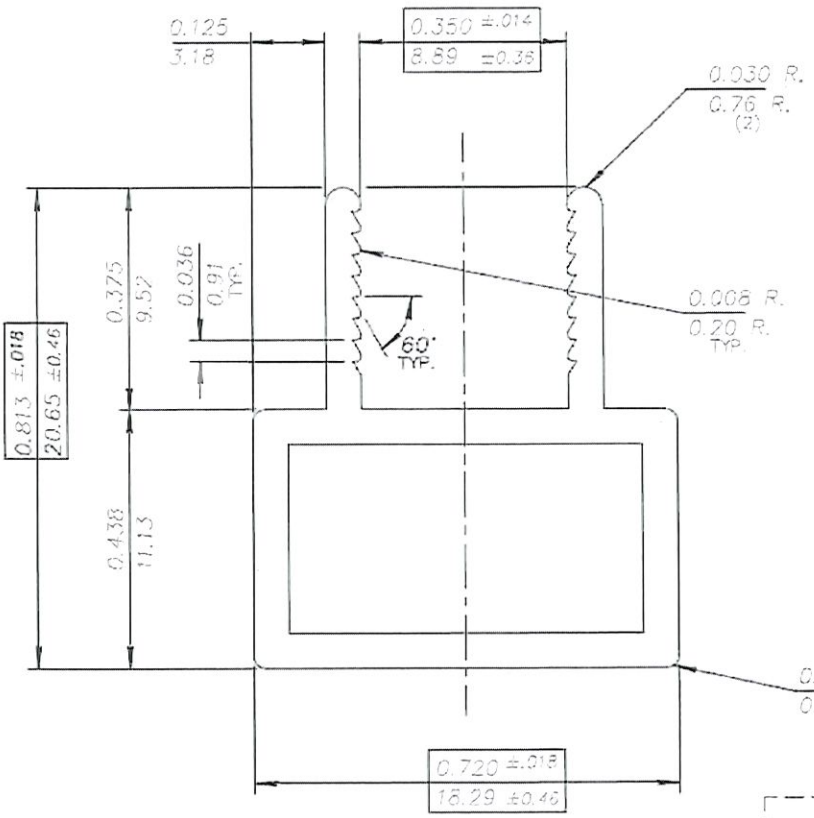
| | | | | | |
|---|---|---|---|---|---|
| SURF. ETABLIE EST. AREA | 0.094 PO IN² 61 MM² | PER. EXT. OUT PER. | — PO IN | — MM |
| POIDS ETABLI EST. WEIGHT | 0.113 LBS/FT. 0.169 KG/M | FACTEUR FACTOR | 28 | |
| PER. ETABLI EST. PER. | 3.206 PO IN 81 MM | C.C.D. | 1.209 PO IN 31 MM | |
| DESSINE PAR DRAWN BY | R.Lapierre | ALLIAGE ALLOY | 6063-T5 | ECHELLE SCALE 4:1 DATE 03/04/28 |

EPAISSEUR DE PAROIS NON INDIQUEE UNSPECIFIED WALL THICKNESS: 0.050(1.27) ±.006 (±0.15)

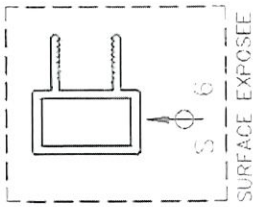
ARRONDIR TOUS LES RAYONS AVEC UN RAYON DE 0.250in (0.010") SAUF AUTREMENT INDIQUE
RADIUS ALL CORNERS .010"R (0.254) UNLESS OTHERWISE NOTED.

TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

| CLIENT | CLIENT No | No. De PROFILE/DIE No. | DASH |
|---|---|---|---|
| ALUMARAIL | MH-48119 | AH-50579 | |
| DESCRIPTION: CLASS CHANNEL | TARRIF# 7604.21.00.00 | PROPOSAL# 21006-3 | |
| INDALEX LIMITED 325 Ave. Pointe-Claire, Quebec H9R 5W5 (514) 697-5123 | DATE / SYM | REVISION | |




AGAINST MATRICE FOR NITROGEN
VATRICE LAID NULLES




ACTUAL SIZE

INDALEX ALUMINUM SOLUTIONS

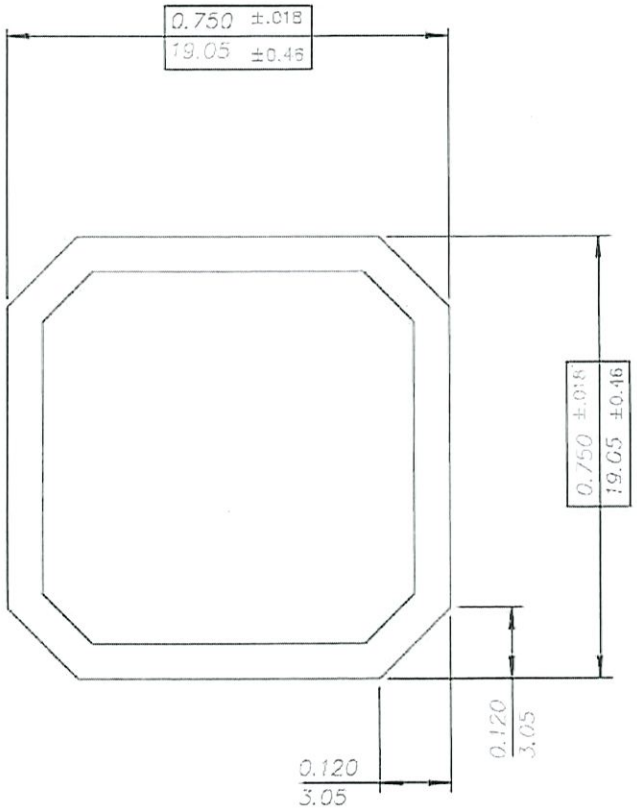
EPAISSEUR DE PAROIS NON INDIQUE
UNSPECIFIED WALL THICKNESS
0.060(1.52)
±.010 ±0.25

| | | | | | |
|---|---|---|---|---|---|
| AIRE ETABLIE EST. AREA | 0.165 PO²/IN² 107 MM² | PER. EXT. OUT PER. | 3.976 PO IN 101 MM | | |
| POIDS ETABLI EXT. WEIGHT | 0.198 LBS/PI-FT. 0.295 KG/M | FACTEUR FACTOR | 29 | | |
| PER ETABLI EST. PER. | 5.814 PO IN 148 MM | C.C.D. | 1.004 PO IN 25 MM | | |
| DESSINE PAR DRAWN BY | SM | ALLIAGE ALLOY | 6063-T5 | ECHELLE SCALE | 4:1 |
| | | | | DATE | 04/02/1 |

ARRONDIR TOUS LES COINS AVEC UN RAYON DE 0.25mm (0.010") SAUF AUTREMENT INDIQUE
BREAK ALL CORNERS .010"R (0.25R) UNLESS OTHERWISE NOTED

TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

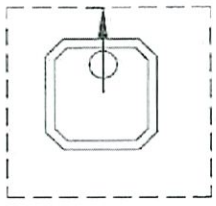
| CLIENT | | CLIENT No | No. De PROFILE/DIE No | DASH |
|---|---|---|---|---|
| | ALUMARAIL | MH-48118 | AH-50578 | |
| DESCRIPTION: | 3/4"x 3/4" PICKET | TARRIF# 7604.21.00.00 | PROPOSAL# 21006-1A | |
| INDALEX LIMITED 325 Avro, Pointe-Claire, Quebec H9R 5W3 (514) 697-5120 | | DATE / SYM / REVISION / BY | | |
| | | 05/07/27 / A / DESCRIPTION CHANGED / GFG | | |




CONTRE MATRICE POUR AZOTE
MATRICE A PORTES NULLES

SURFACE EXPOSEE

ACTUAL SIZE



INDALEX ALUMINUM SOLUTIONS

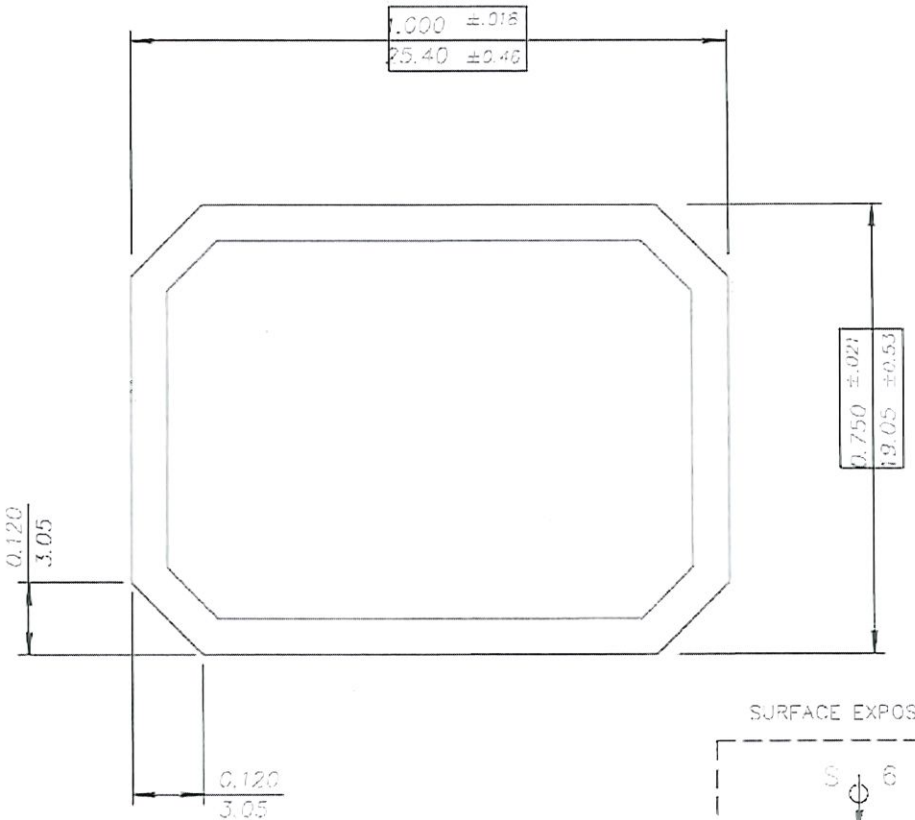
| | | | | | |
|---|---|---|---|---|---|
| SURF. ETABLIE EST. AREA | 0.151 PO² IN² 98 MM² | PER EXT. OUT PER. | 2.719 PO IN 69 MM | EPAISSEUR DE PAROIS NON INDIQUE UNSPECIFIED WALL THICKNESS | 0.060(1.52) ±.010 ±0.25 |
| POIDS ETABLI EST. WEIGHT | 0.181 LBS/PI-FT 0.270 KG/M | FACTEUR FACTOR | 28 | | |
| PER ETABLI EST. PER. | 5.040 PO IN 128 MM | e.c.d. | 0.902 PO IN 23 MM | | |
| DESSINE PAR DRAWN BY | SM | ALLIAGE ALLOY 6063-T5 | ECHELLE SCALE 4:1 | DATE 04/02/11 | |

ARRONDIR TOUS LES COINS AVEC UN RAYON DE 0.25mm (0.010") SAUF AUTREMENT INDIQUE
BREAK ALL CORNERS .010" (0.25R) UNLESS OTHERWISE NOTED.

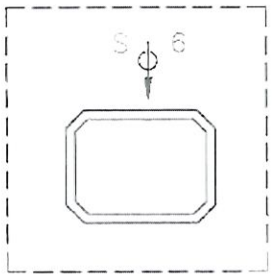
TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED

| CLIENT | ALUMARAIL | CLIENT No. MH-48120 | No. De PROFILE/DIE No. AH-50580 | DASH |
|---|---|---|---|---|
| DESCRIPTION: | 3/4"x1" PICKET | TARRIF# 7604.21.00.00 | PROPOSAL# 21006-4A | |
| INDALEX LIMITED 325 Ave. Pointe-Claire, Quebec H9R 5W3 (514) 697-5120 | | DATE | SYM | REVISION | BY |
| | | 05/12/07 | A | DESCRIPTION CHANGE | G.S. |

AGAINST MATRICE FOR NITROGEN
MATRICE LAID NULLES




SURFACE EXPOSEE



ACTUAL SIZE

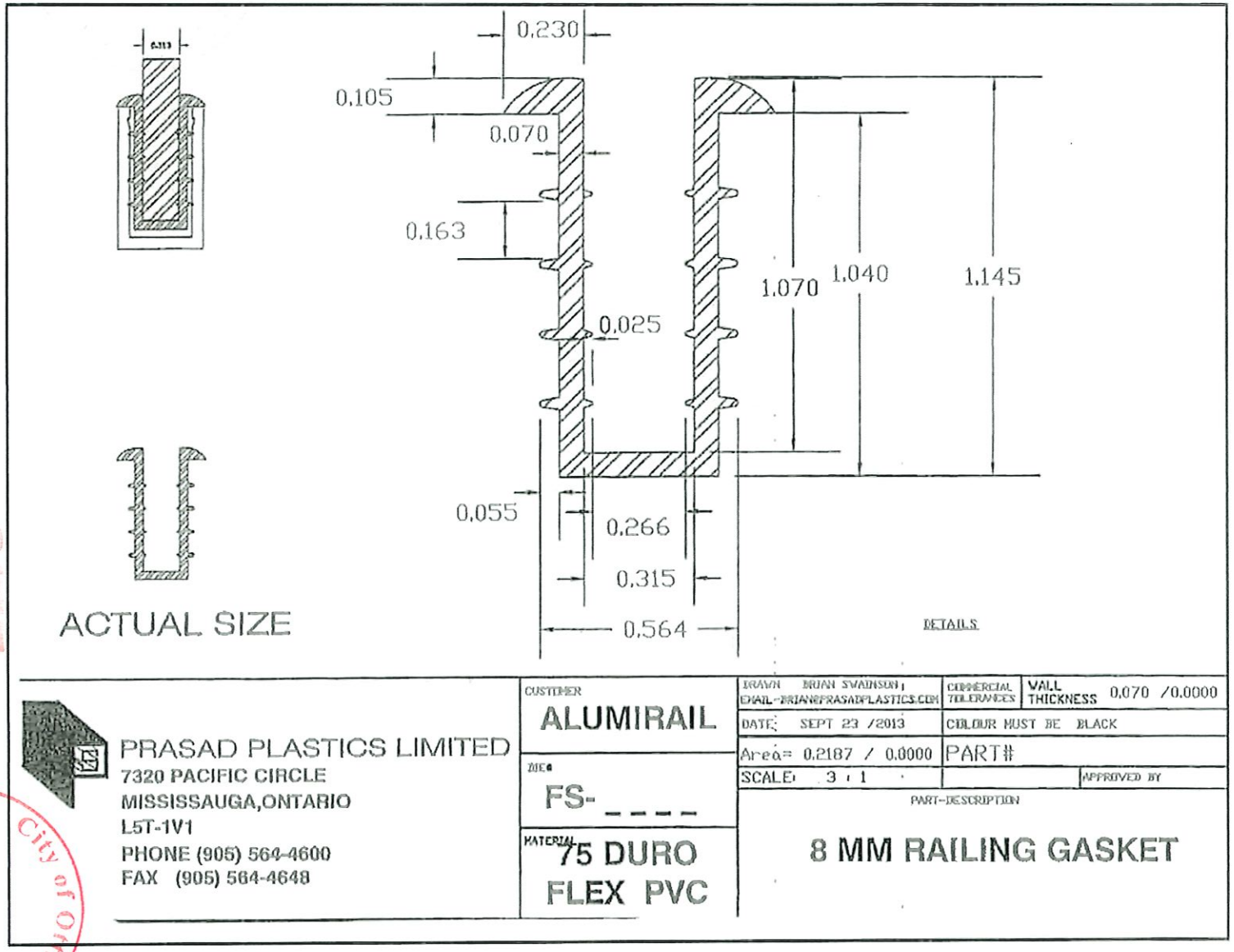
INDALEX ALUMINUM SOLUTIONS

EPAISSEUR DE PAROIS NON INDIQUE
UNSPECIFIED WALL THICKNESS
0.060(1.52) ±.010 ±0.25

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SURF. ETABLIE EST. AREA | 0.181 | PO² IN² 117 | MM² | PER. EXT. OUT PER. | 3.219 | PO IN 82 | MM |
| POIDS ETABLI EST. WEIGHT | 0.217 | LBS/PI-FT. 0.324 | KG/M | FACTEUR FACTOR | 28 | | |
| PER ETABLI EST. PER | 6.040 | PO IN 153 | MM | 6.63 | 1122 | PO IN 28 | MM |
| DESSINE PAR DRAWN BY | SM | ALLIAGE ALLOY | 6063-T5 | ECHELLE SCALE | 4:1 | DATE | 04/02/11 |

ARRONDIR TOUS LES COINS AVEC UN RAYON DE 0.25mm (0.01") SAUF AUTREMENT INDIQUE
BREAK ALL CORNERS .010"R (0.25R) UNLESS OTHERWISE NOTED.

TOLERANCE STANDARD SAUF SI INDIQUE
STANDARD ALUMINUM ASSOCIATION TOLERANCES TO APPLY UNLESS OTHERWISE SPECIFIED




PRASAD PLASTICS LIMITED
7320 PACIFIC CIRCLE
MISSISSAUGA,ONTARIO
L5T-1V1
PHONE (905) 564-4600
FAX (905) 564-4648

CUSTOMER: ALUMIRAIL
DIE#: FS- _ _ _ _
MATERIAL: 75 DURO FLEX PVC

DRAWN: BRIAN SWAINSON; EMAIL-BRIAN@PRASADPLASTICS.COM
COMMERCIAL TOLERANCES
WALL THICKNESS 0.070 /0.0000
DATE: SEPT 23 /2013
COLOUR MUST BE BLACK
Area= 0.2187 / 0.0000
PART#
SCALE: 3 : 1
APPROVED BY

PART-DESCRIPTION

**8 MM RAILING GASKET**

## 9 Revision Page

| No. | Date | Changes | Author | Reviewer |
|---|---|---|---|---|
| 0 | March 30, 2015 | First Issue | Claudio Sacilotto | Robert Giona |
| | | | | |
| | | | | |
| | | | | |

**END OF DOCUMENT**