ENGINEERING EVALUATION

REPORT NUMBER: 3174887COQ-004A
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EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, BC V3K 7C1

RENDERED TO

EXCELL RAILING SYSTEM
#306 – 12886 ANVIL WAY
SURREY, BC V3W 8E7

PRODUCT EVALUATED:
Excell Welded Picket & Glass Railing System and Durarail Welded Picket & Glass Railing System
EVALUATION PROPERTY:
2006 International Building Code, Section 1607.7.1

Engineering Evaluation of Excell Welded Picket & Glass Railing System and Durarail Welded Picket & Glass Railing System for compliance with the applicable requirements of the following criteria: 2006 International Building Code, Section 1607.7.1

THIS REPORT HAS BEEN EDITED BY EXCELL RAILING SYSTEMS. FOR A COPY OF THE ORIGINAL REPORT CONTACT EXCELL RAILING SYSTEMS.

1 Introduction

Intertek Testing Services NA Ltd. has conducted an engineering evaluation for Excell Railing System Ltd., on the Excell Welded Picket & Glass Railing System and Durarail Welded Picket & Glass Railing System, to evaluate the interchangeability of 2 respective types of top rails. The evaluation was conducted to determine if the testing performed on the 1-piece and the 2-piece round top rail will show equivalency for the use of the other respective top rails in accordance with the 2006 International Building Code, Section 1607.7.1.

2 Sample and Assembly Description

Intertek has tested the following 4 railing systems in full accordance with the load requirements of the 2006 IBC, Section 1607.7.1:

System 1 – 6 ft. Durarail 2-Piece Round Welded Picket Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post
Base Plate:	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high, 6063-T5 aluminum rail (2-piece round profile)
Picket Insert:	5/8 in. x 5/8 in. 6063-T5 aluminum spaced 4-1/2 in. o/c
Top Rail Connections:	2 piece with receiver channel, other connection details are provided in the Appendix

System 2 – 5 ft. Durarail 2-Piece Round Glass In-fill Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post
Base Plate:	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high, 6063-T5 aluminum rail (2-piece round profile)
Panel Insert:	6 mm, tempered glass panel measuring 54 in. wide x 38 in. high
Top Rail Connections:	2 piece with receiver channel, other connection details are provided in the Appendix

System 3 – 6 ft. Excell 1-Piece Round Welded Picket Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post
Base Plate:	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high, 6063-T5 aluminum rail (1-piece round profile)
Picket Insert:	5/8 in. x 5/8 in. 6063-T5 aluminum spaced 4-1/2 in. o/c
Top Rail Connections:	1 piece post mount bracket, other connection details are provided in the Appendix

System 4 – 5 ft. Excell 1-Piece Round Glass In-fill Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post
Base Plate:	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high, 6063-T5 aluminum rail (1-piece round profile)
Panel Insert:	6 mm, tempered glass panel measuring 54 in. wide x 38 in. high
Top Rail Connections:	1 piece post mount bracket, other connection details are provided in the Appendix

The following systems have been evaluated to determine if they are equivalent to the systems above and would meet the requirements of the 2006 IBC, Section 1607.7.1:

System 5 – 6 ft. Durarail 2-Piece Square Welded Picket Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post with a 6 in. 6061-T6 post insert
Base Plate (deck):	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high 6063-T5 aluminum rail (2-piece square profile)
Picket Insert:	5/8 in. x 5/8 in. 6063-T5 aluminum spaced 4-1/2 in. o/c
Top Rail Connections:	2 piece with receiver channel, other connection details are provided in the Appendix

System 6 – 5 ft. Durarail 2-Piece Square Glass In-fill Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 aluminum rail
Base Plate (deck):	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high 6063-T5 aluminum rail (2-piece square profile)
Panel Insert:	6 mm, tempered glass panel measuring 54 in. wide x 38 in. high
Top Rail Connections:	2 piece with receiver channel, other connection details are provided in the Appendix

System 7 – 6 ft. Excell 1-Piece Square Welded Picket Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 extruded aluminum post with a 6 in. 6061-T6 post insert
Base Plate (deck):	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high 6063-T5 aluminum rail (1-piece square profile)
Picket Insert:	5/8 in. x 5/8 in. 6063-T5 aluminum spaced 4-1/2 in. o/c
Top Rail Connections:	1 piece post mount bracket, other connection details are provided in the Appendix

System 8 – 5 ft. Excell 1-Piece Square Glass In-fill Railing System

Post:	1.72 in. x 1.72 in. 6061-T6 aluminum rail
Base Plate (deck):	2 in. x 2 in. x 5 in. x 1/4 in. 6061-T6 fascia mounted angle bars (2) each with 2 mounting holes
Top Rails:	42 in. high 6063-T5 aluminum rail (1-piece square profile)
Panel Insert:	6 mm, tempered glass panel measuring 54 in. wide x 38 in. high
Top Rail Connections:	1 piece post mount bracket, other connection details are provided in the Appendix

Installation details of all 8 railing systems have been provided in the Appendix, along with specifications on each part.

3 Reference Documents

- 2006 International Building Code (2006 IBC)
- Intertek Test Report 3174887COQ-002A
- Intertek Test Report 3174887COQ-002B
- System Drawings
  - Durarail Welded Picket System w/ 1.72" Posts
  - Durarail Glass System w/ 1.72" Posts
  - Excell Welded Picket System w/ 1.72" Posts
  - Excell Glass System w/ 1.72" Posts

4 Evaluation Method

Durail 2 piece systems:

Intertek Test Report 3174887COQ-002A for Systems 1 and 2 show that these systems meet the load requirements stated in Section 1607.7.1 of the 2006 IBC using a factor of safety of 2.5. A safety factor of 4 was applied on the in-fill test on the tempered glass panel in accordance with Section 2407.1.1 of the 2006 IBC. Based on the noted test results, the alternate systems mentioned in Section 2 of this report (System 5 and 6) were evaluated for compliance in accordance with Section 1607.7.1 of the 2006 IBC.

Systems 5 and 6 are identical to Systems 1 and 2 in terms of the components being utilized in the railing system and the installation of the product, however, there is one key difference. The top rail used in Systems 1 and 2 consists of a 2-piece round 6063-T5 aluminum rail as detailed in diagram VS-35977A, whereas Systems 5 and 6 use a 2-piece square 6063-T5 aluminum rail as detailed in VS-11725A (see Appendix). Comparing the moment of inertias (I_x, I_y) for both top rails as detailed in the noted drawings, the square top rail has greater I_x and I_y values than that of the round top rail. The maximum bending stress in the top rail is determined following the relationship noted in Equation 1 below.

$$\sigma = \frac{My}{I_n} \qquad \text{(Equation 1)}$$

Where σ = bending stress
M = bending moment
y = thickness / 2
I_n = I_x or I_y

Between the round top rail and square top rail systems, for equivalent loads the bending stress experienced in the square top rail would be lower than that experienced by the round top rail. As the bending stress is the failure cause for the top rail, the lower stress experienced by the square rail for equivalent loads means Systems 1 and 2 tested in Intertek Test Report 3174887COQ-002B would meet the requirements of Section 1607.7.1 of the 2006 IBC using the 2-piece square top rail detailed in Appendix Drawing VS-11725A.

Excell 1 piece systems:

Intertek Test Report 3174887COQ-002B for Systems 5 and 6 show that these systems meet the load requirements stated in Section 1607.7.1 of the 2006 IBC using a factor of safety of 2.5. A safety factor of 4 was applied on the in-fill test on the tempered glass panel in accordance with Section 2407.1.1 of the 2006 IBC. Based on the noted test results, the alternate systems mentioned in Section 2 of this report (System 7 and 8) were evaluated for compliance in accordance with Section 1607.7.1 of the 2006 IBC.

Systems 7 and 8 are identical to Systems 3 and 4 in terms of the components being utilized in the railing system and the installation of the product, however, there is one key difference. The top rail used in Systems 3 and 4 consists of a 1-piece round 6063-T5 aluminum rail as detailed in diagrams VS-40396B (glass infill) and VS-40827 (picket infill), whereas Systems 7 and 8 use a 1-piece square 6063-T5 aluminum rail as detailed in diagrams VS-39217B (glass infill) and VS-38399 (picket infill) (see Appendix). Comparing the moment of inertias (I_x, I_y) for both top rails (glass infill and picket infill compared respectively) as detailed in the noted drawings, the square top rail has greater I_x and I_y values than that of the round top rail. The maximum bending stress in the top rail is determined following the relationship noted in Equation 1 below.

$$\sigma = \frac{My}{I_n} \qquad \text{(Equation 1)}$$

Where σ = bending stress
M = bending moment
y = thickness / 2
I_n = I_x or I_y

Between the round top rail and square top rail systems, for equivalent loads the bending stress experienced in the square top rail would be lower than that experienced by the round top rail. As the bending stress is the failure cause for the top rail, the lower stress experienced by the square rail for equivalent loads means Systems 3 and 4 tested in Intertek Test Report 3174887COQ-002B would meet the requirements of Section 1607.7.1 of the 2006 IBC using the 1-piece square top rail detailed in Appendix Drawings VS-39217B (glass infill) and VS-38399 (picket infill).

5 Conclusion

Intertek Testing Services NA Ltd. has conducted an engineering evaluation for Excell Railing System Ltd., on the Excell Welded Picket & Glass Railing System and Durarail Welded Picket & Glass Railing System, to evaluate the interchangeability of 2 respective types of top rails. The evaluation was conducted to determine if the testing performed on the 1-piece and the 2-piece round top rail will show equivalency for the use of the other respective top rails in accordance with the 2006 International Building Code, Section 1607.7.1. The evaluation, as described in Section 4 of this report, shows that the following systems meet the load requirements of Section 1607.7.1 of the 2006 IBC:

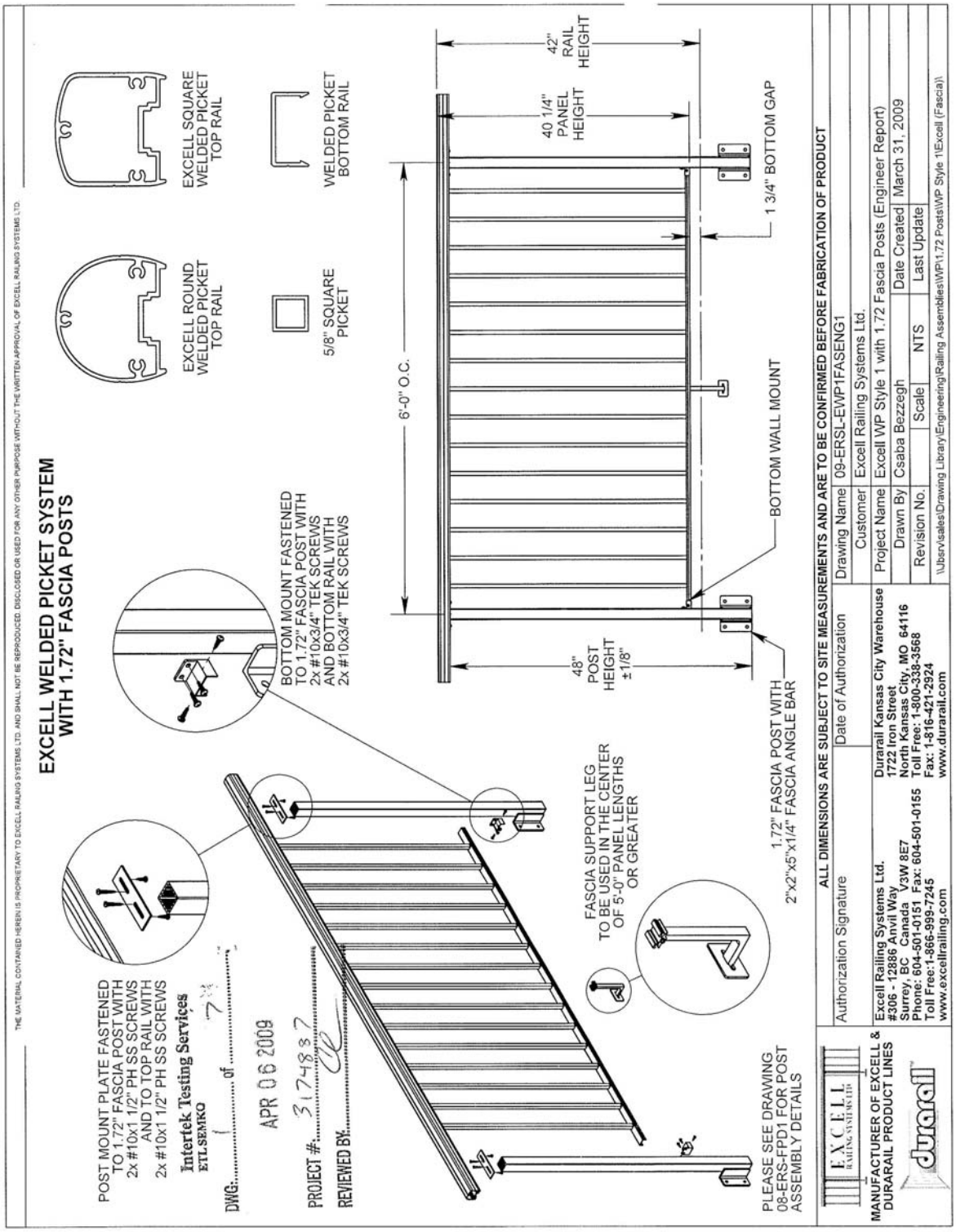
- System 1 – 6 ft. Durarail 2-Piece Round Welded Picket Railing System
- System 2 – 5 ft. Durarail 2-Piece Round Glass In-fill Railing System
- System 3 – 6 ft. Excell 1-Piece Round Welded Picket Railing System
- System 4 – 5 ft. Excell 1-Piece Round Glass In-fill Railing System
- System 5 – 6 ft. Durarail 2-Piece Square Welded Picket Railing System
- System 6 – 5 ft. Durarail 2-Piece Square Glass In-fill Railing System
- System 7 – 6 ft. Excell 1-Piece Square Welded Picket Railing System
- System 8 – 5 ft. Excell 1-Piece Square Glass In-fill Railing System

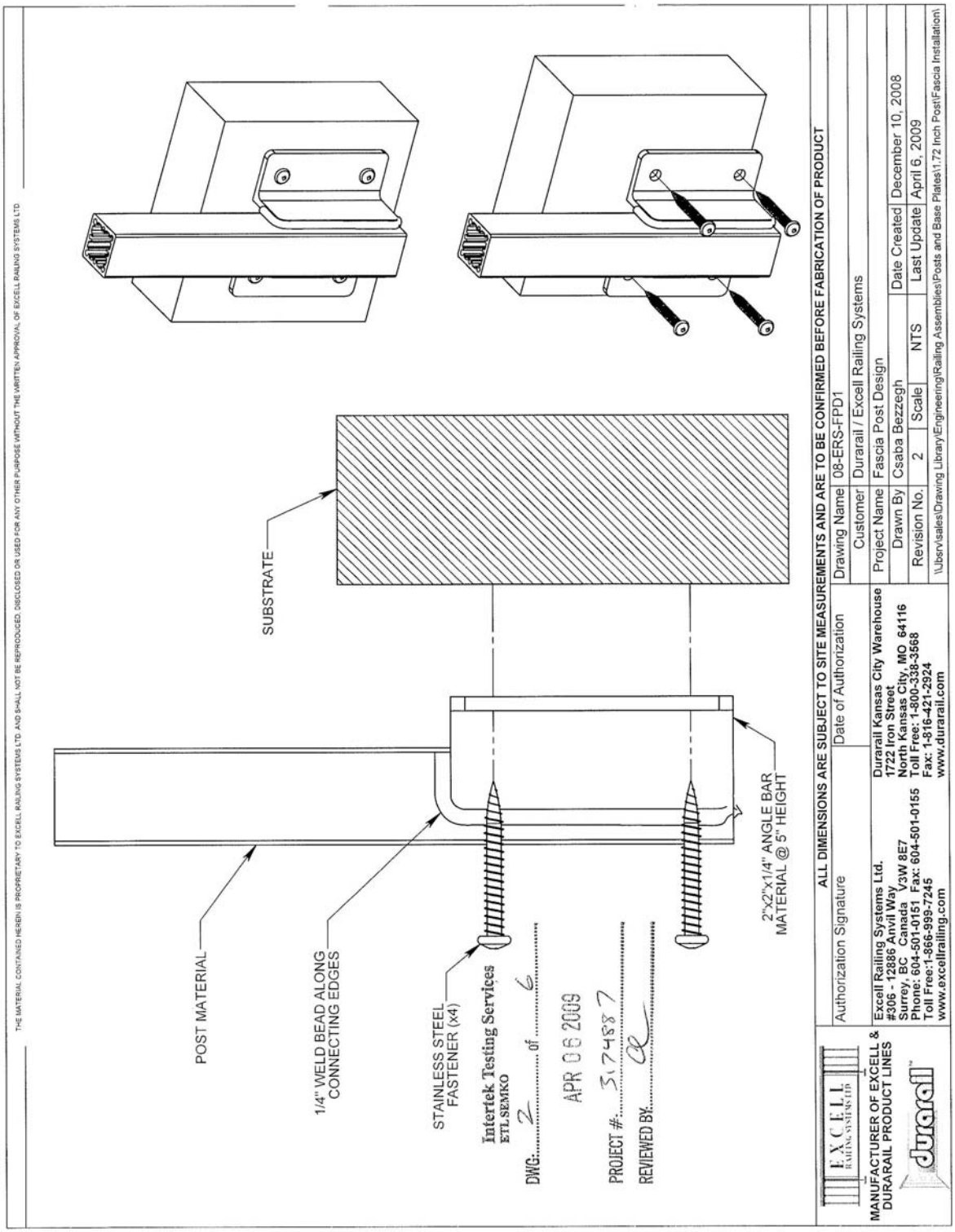
INTERTEK TESTING SERVICES NA LTD.

Reported by: _____
Adriaan van der Lely, EIT
Engineer, Building Products

Reviewed by: _____
Kal Kooner, P.Eng
Manager, Engineering Services CDN

ATTACHMENTS: Drawings of Durarail & Excell Railing Systems


EXCELL WELDED PICKET SYSTEM
WITH 1.72" FASCIA POSTS
THE MATERIAL CONTAINED HEREIN IS PROPRIETARY TO EXCELL RAILING SYSTEMS LTD. AND SHALL NOT BE REPRODUCED, DISCLOSED OR USED FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN APPROVAL OF EXCELL RAILING SYSTEMS LTD.
EXCELL ROUND WELDED PICKET TOP RAIL
EXCELL SQUARE WELDED PICKET TOP RAIL
5/8" SQUARE PICKET
WELDED PICKET BOTTOM RAIL
6'-0" O.C.
42" RAIL HEIGHT
40 1/4" PANEL HEIGHT
1 3/4" BOTTOM GAP
BOTTOM WALL MOUNT
48" POST HEIGHT ±1/8"
BOTTOM MOUNT FASTENED TO 1.72" FASCIA POST WITH 2x #10x3/4" TEK SCREWS AND BOTTOM RAIL WITH 2x #10x3/4" TEK SCREWS
POST MOUNT PLATE FASTENED TO 1.72" FASCIA POST WITH 2x #10x1 1/2" PH SS SCREWS AND TO TOP RAIL WITH 2x #10x1 1/2" PH SS SCREWS
Intertek Testing Services
ETL SEMKO
DWG:..... of .....
APR 06 2009
PROJECT #..... 3174887
REVIEWED BY.....
FASCIA SUPPORT LEG TO BE USED IN THE CENTER OF 5'-0" PANEL LENGTHS OR GREATER
1.72" FASCIA POST WITH 2"x2"x5"x1/4" FASCIA ANGLE BAR
PLEASE SEE DRAWING 08-ERS-FPD1 FOR POST ASSEMBLY DETAILS
ALL DIMENSIONS ARE SUBJECT TO SITE MEASUREMENTS AND ARE TO BE CONFIRMED BEFORE FABRICATION OF PRODUCT
Authorization Signature
Date of Authorization
Drawing Name 09-ERSL-EWP1FASENG1
Customer Excell Railing Systems Ltd.
Project Name Excell WP Style 1 with 1.72 Fascia Posts (Engineer Report)
Drawn By Csaba Bezzegh
Date Created March 31, 2009
Revision No.
Scale NTS
Last Update
\\Jbsrv\sales\Drawing Library\Engineering\Railing Assemblies\WP\1.72 Posts\WP Style 1\Excell (Fascia)\
EXCELL RAILING SYSTEMS
MANUFACTURER OF EXCELL & DURARAIL PRODUCT LINES
durarail
Excell Railing Systems Ltd.
#306 - 12886 Anvil Way
Surrey, BC Canada V3W 8E7
Phone: 604-501-0151 Fax: 604-501-0155
Toll Free: 1-866-999-7245
www.excellrailing.com
Durarail Kansas City Warehouse
1722 Iron Street
North Kansas City, MO 64116
Toll Free: 1-800-338-3568
Fax: 1-816-421-2924
www.durarail.com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SUBSTRATE
POST MATERIAL
1/4" WELD BEAD ALONG CONNECTING EDGES
STAINLESS STEEL FASTENER (x4)
2"x2"x1/4" ANGLE BAR MATERIAL @ 5" HEIGHT
Intertek Testing Services
ETL SEMKO
DWG: 2 of 6
APR 06 2009
PROJECT #: 3174887
REVIEWED BY:
ALL DIMENSIONS ARE SUBJECT TO SITE MEASUREMENTS AND ARE TO BE CONFIRMED BEFORE FABRICATION OF PRODUCT
Authorization Signature
Date of Authorization
Drawing Name 08-ERS-FPD1
Customer Durarail / Excell Railing Systems
Project Name Fascia Post Design
Drawn By Csaba Bezzegh
Date Created December 10, 2008
Revision No. 2
Scale NTS
Last Update April 6, 2009
\\Ubsrv\sales\Drawing Library\Engineering\Railing Assemblies\Posts and Base Plates\1.72 Inch Post\Fascia Installation\
EXCELL RAILING SYSTEMS LTD.
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MANUFACTURER OF EXCELL & DURARAIL PRODUCT LINES
Excell Railing Systems Ltd.
#306 - 12886 Anvil Way
Surrey, BC Canada V3W 8E7
Phone: 604-501-0151 Fax: 604-501-0155
Toll Free:1-866-999-7245
www.excellrailing.com
Durarail Kansas City Warehouse
1722 Iron Street
North Kansas City, MO 64116
Toll Free: 1-800-338-3568
Fax: 1-816-421-2924
www.durarail.com