



Folding Door Systems

A Division of Eclipse Architectural Products Ltd.

Hardware / Integrated Folding Doors / Screens / Shades

Condensed Report of Product Evaluation Conducted on Eclipse E2 1L3R Door System

Report prepared by Intertek Testing Services NA LTD. Warnock Hersey, Coquitlam, BC, Canada
Date: September 27, 2002

INTRODUCTION

Testing was conducted in general accordance with CAN/CGSB 82.1-M89 "Sliding Doors", CSA A440-98 "Windows", and in general accordance with AAMA/NWWDA 101/I.S.2-97, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors". Neither of the aforementioned standards makes reference to folding door systems. However, the system was evaluated, where applicable, as a Sliding Door for CAN/CGSB 82.1-M89, CSA A440-98 as a Hinged Glass Door for AAMA/NWWDA 101/I.S.2-97.

DESCRIPTION

Designation: Eclipse E2™ "1L3R"

Type (general): Double-glazed 4mm tempered four panel folding door. Each door 36" x 96"

Frame: The frame was made of solid, clear, tight-grained Douglas fir lumber. The exterior portion of the sill was made of extruded aluminum.

Doors: The door slabs were made of solid, clear, tight-grained Douglas fir lumber. The stiles and rails were joined using mortise and tennon joint and glued.

TEST RESULTS

1. Air Tightness Test

Test	Pressure differential Pa/psf	Crack length m / ft	Area m ² / ft ²	Result m ³ / hr*m / cfm / ft ²	Maximum allowable CSA A440-98 / CGSB 82.1-M89/ AAMA 101 m ³ /hr*m / cfm / ft	Pass / Fail
Infiltration	75 / 1.57	19.506 / 64.00	9.442 / 101.64	0.04 / 0.005	0.55 / 1.00 / 0.3	A3 / A3 / Pass
Exfiltration	5 / 1.57	19.506 / 64.00	9.442 / 101.64	0.05 / 0.006	0.55 / 1.00 / 0.3	A3 / A3 / Pass

2. Water Tightness Test

A calibrated water spray assembly was used to deliver the water on the test sample. The test was performed using a pressure differential of 300 Pa (6.24 psf) and a water spray rate of at least 204 L/m² per hour (5.0 US gal/ft² · h). The period consisted of four cycles of five minutes with the pressure applied and one minute with the pressure released. During the 24-minute test period, no water leakage was observed. The test sample met a level B-3 rating as per CSA A440-98 and

3. Wind Load Resistance

A test was conducted using a test pressure of 750 Pa (15.6 psf). The maximum deflection recorded from positive and negative pressure tests on the stile of a door was 11.518 mm (0.453"); the maximum allowable was 13.43 mm (0.529") (based L/175). As per section 2.1.4.1 and 2.1.4.2 of AAMA/NWWDA 101/I.S. 2 -97 allowable deflection of any framing member is L/175 and HC class products shall have no permanent deformation in excess of 0.4% of the span. The maximum residual deflection of the door stile was 0.00 mm (0.000"); the maximum allowable was 9.398 mm (0.370"). The test sample was subjected to a Structural Test Pressure using positive and negative pressures of 2000 Pa (41.6 psf). There was no breakage or permanent deformation, which would impair the operation of the doors. The sample met a C-2 Wind Load Resistance rating as per CSA A440-98 and CAN/CGSB 82.1-M89.

4. Water Tightness Test

An additional water test was performed. The height of the sill was increased 1-1/8" (28.6 mm). During the 24-minute test period, no water leakage was observed. The test sample met a level B-4 rating as per CSA A440-98 and CAN/CGSB 82.1-M89.

CONCLUSION

The Eclipse E2™ 1L3R Folding Door system described herein met the performance criteria as per CAN/CGSB 82.1-M89 and CSA A440-98 for Air Tightness (A-3), Water Tightness by Static Pressure (B-3) with standard sill, Water Tightness by Static Pressure (B-4) with modified sill riser, and Structural Performance (C-2). The system received an equivalent AAMA/NWWDA 101/I.S.2-97 performance criteria 146" x 100" HGD-LC25 rating. For configurations with additional panels of the same height, Air Tightness and Water Tightness ratings are applicable.

These results evaluate a product based on area. Construction details must be the same as the tested sample. Site water testing of the product may be desired in cases where detailing has been altered.

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REPORT OF

PRODUCT EVALUATION

CONDUCTED ON A

**ECLIPSE E2™ 1L3R FOLDING DOOR SYSTEM WITH
DOOR PANELS BY B.C. DOOR CO. LTD.
146 x 100 HGD-LC25**

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TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	1
PREFACE	2
INTRODUCTION	3
PRODUCT DESCRIPTION.....	3 - 4
TEST RESULTS.....	5 - 6
CONCLUSION	7
APPENDIX A - TESTING HISTORY	
APPENDIX B - DRAWINGS	

PREFACE

All services undertaken are subject to the following general policy:

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INTRODUCTION

As requested, Intertek Testing Services N.A. Ltd. Warnock Hersey has conducted a series of performance tests on a KrisTrack Manufacturing Ltd. KT eclipse e2™ "1L3R" Folding Wood Door System, assembled at our Coquitlam Laboratory by A. K. Draft Seal Ltd. and B.C. Boor Co. Ltd. Testing was conducted between July 18 and 22, 2002.

Testing was conducted in general accordance with CAN/CGSB 82.1-M89 "*Sliding Doors*", CSA A440-98 "*Windows*", and in general accordance with AAMA/NWWDA 101/I.S.2-97, "*Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors*". Neither of the aforementioned standards makes reference to folding door systems. However, the system was evaluated, where applicable, as a Sliding Door for CAN/CGSB 82.1-M89, CSA A440-98 as a Hinged Glass Door for AAMA/NWWDA 101/I.S.2-97.

DESCRIPTION

Designation: KT Eclipse e2™ "1L3R"

Type (general): Double-glazed four panel folding door.

Frame: The frame was made of solid, clear, tight-grained Douglas fir lumber. Each corner was butt jointed, secured using two #10 x 2" (51mm) wood screws along with three 0.056" (1.43 mm) x 2" (51mm) staples, gasketed with a profile cut double sided foam pad (KT748) and sealed using silicone. The exterior portion of the sill was made of extruded aluminum. It was secured to the wood sill of the mainframe using ½" (13 mm) staples at an 8" (203 mm) spacing and sealed at its edges to the wood using silicone. All stops were heel beaded about their perimeter to the framing using caulking (Silicone).

All wood framing components were treated a urethane lacquer after assembly.

The sample was secured to the test chamber rough opening through the framing using #12 x 3-1/2" (89 mm) screws at a 24" (610 mm) spacing.

Overall Size: 146-1/8" (3710 mm) wide x 100-1/8" (2540 mm) high.

Doors: The door slabs were made of solid, clear, tight-grained Douglas fir lumber. The stiles and rails were joined using mortise and tennon joint and glued.

Locks and Hardware: The door system comprised of a single swing door that mated with three folding doors (astragal door, intermediate door, and pivot door).

The swing door and pivot door were hung from aluminum pivot sets (KTE2PS14) and secured to the top and bottom of the stiles using four #8 x 1-1/4" (32 mm) screws. The pivot sets were mounted into the head track and sill channel. The swing door utilized a heavy-duty passage set and dead bolt (Weiser) located 46" (1168 mm) and 40" (1016 mm) from the bottom of the slab. They were both sealed to the door slab at the exterior with caulking (Silicone).

The doors were secured in the closed position using a system of flush mount flush bolts (KT eclipse e2™ Harmony Style) milled into the interior face of the swing door, astragal door and pivot door. The upper flush bolts were 16" (400 mm) flush bolts and were secured to the door slabs using seven #8 x 1-1/4" (32 mm) screws. The lower flush bolts consisted of 8" (200 mm) long units that were secured using five # 8 x 1-1/4" (32 mm) screws. Brass flush bolt strike plates were milled into the head and flush bolt cups were installed into the sill of the mainframe. The flush bolt cups were installed with under rim sealing gaskets and secured using two #8 x 1-1/4" (32 mm) screws each.

The folding doors were hinged together using three sets of hinges each. They comprised of an Intermediate Carrier and Guide Set (KTE21CS12) and standard Hinge Set with pull handle (KTE2HS). They were face mounted to the stiles using seven #8 x 1-1/4" (32 mm)

screws each.

- Door Panel Size: Active: 35-15/16" (913 mm) wide x 96" (2438 mm) high.
Astragal: 35-15/16" (913 mm) wide x 96" (2438 mm) high.
Intermediate: 35-3/8" (900 mm) wide x 96" (2438 mm) high.
Pivot: 35-15/16" (913 mm) wide x 96" (2438 mm) high.
- Weatherstrip: The mainframe perimeter was weatherstripped using a heavy santoprene jacketed closed cell foam filled V-type weatherstrip (KT421). They were lap mitred and sealed (Silicone) to form a continuous perimeter seal. On the mainframe head a 3/8" wide x 3/16" thick (9.5 mm x 4.7 mm) closed neoprene tape (DS 62-50) was located 1-1/4" (32 mm) outboard the head stop and was adhered from jamb to jamb.
- All doors had a pile and fin type weatherstrip set into a kerf on the underside of the bottom sash rail and all hinges had neoprene tape adhered around the flush mount hinges to act a water diverter. As well, all folding doors had EPDM gasket pads (DS2626) adhered to the top and bottom of the meeting stiles. Both gasket pads and neoprene tape were tightly adhered to the stile weatherstrips.
- The interior face of the astragal had a heavy santoprene jacketed closed cell foam filled V-type weatherstrip (KT421) along its length. A pile and fin weatherstrip (KTP108-35) was located in a kerf inboard of the astragal weatherstrip. A vinyl-jacketed V-type weatherstrip (KT426) was set into a kerf at the interior side of the stile. The top and bottom of the astragal had neoprene pads (DS2626) adhered to its ends.
- Full-length weatherstrips (KT426) were set into kerfs located on the interior and exterior sides of the stile edges on the astragal door and the pivot door. The same weatherstrip was also located on the interior side of the active and pivot doors on their jamb sides.
- Drainage: Water drainage was provided in the extruded aluminum sill channel. Weep holes, 0.670" wide x 0.149" high (17 mm x 3.5 mm) were located at a 12" (300 mm) spacing along the length of the sill on the exterior.
- Glazing Thickness: Both glazing units consisted of two 4 mm tempered glass panels separated by a 11.11 mm aluminum spacer bar with a polyurethane backer.
- Glazing Method: Both glazing units utilize laid-in glazing laid into a bed of caulking and secured using wood glazing stops.
- Drawings: A full set of drawings stamped "WH " are included in the appendix of this report.

TEST RESULTS

1. Pre-test Cycling

The doors were opened and closed, with the dead bolt and flush bolts engaged and disengaged, five times.

2. Air Tightness Test

A Meriam Instrument Co. Laminar Flow Element Model No. 50MW20-2F, Serial No. 748930-H1, ITS ID# P-52610 and a Meriam Instrument Co. 8" W.C. Calibrated Inclined Manometer Model No. 40HEX35WM, Serial No. 748930-H2 were using to measure the volume of air passing through the test sample.

Air Infiltration/Exfiltration

Air infiltration and Exfiltration tests was performed in accordance with ASTM E283-91 "Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen" using various test pressures.

Test	Pressure Differential Pa / psf	Crack Length m / ft	Area m ² / ft ²	Result m ³ /hr*m / cfm/ft ²	Maximum Allowable CSA A440-98 / CGSB 82.1-M89/ AAMA 101 m ³ /hr*m / cfm/ft ²	Pass / Fail
Infiltration	75 / 1.57	19.506 / 64.00	9.442 / 101.64	0.04 / 0.005	0.55 / 1.00 / 0.3	A3 / A3 / Pass
Exfiltration	75 / 1.57	19.506 / 64.00	9.442 / 101.64	0.05 / 0.006	0.55 / 1.00 / 0.3	A3 / A3 / Pass

3. Water Tightness Test

A water resistance test was performed on the sample in accordance with ASTM E547-96 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential." A Dwyer SG-16 manometer (s.n. 1010) was used to measure the pressures. A calibrated water spray assembly was used to deliver the water on the test sample.

The test was performed using a pressure differential of 300 Pa (6.24 psf) and a water spray rate of at least 204 L/m² per hour (5.0 US gal/ft² · h). The period consisted of four cycles of five minutes with the pressure applied and one minute with the pressure released.

During the 24-minute test period, no water leakage was observed. The test sample met a level **B-3** rating as per CSA A440-98 and CAN/CGSB 82.1-M89.

TEST RESULTS (continued)**4. Wind Load Resistance**

A uniform load test was conducted in accordance with ASTM E-330-97^{e1} "*Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference*". A Dwyer 36" manometer (s/n 52613) was used to measure pressures and a Starrett F2740 Deflection Indicator (s/n 04744) was used to measure the deflection of the door.

A test was conducted using a test pressure of 750 Pa (15.6 psf). The maximum deflection recorded from positive and negative pressure tests on the stile of a door was 11.518 mm (0.453"); the maximum allowable was 13.43 mm (0.529") (based L/175).

As per section 2.1.4.1 and 2.1.4.2 of AAMA/NWDA 101/I.S. 2-97 allowable deflection of any framing member is L/175 and HC class products shall have no permanent deformation in excess of 0.4% of the span. The maximum residual deflection of the door stile was 0.00 mm (0.000"); the maximum allowable was 9.398 mm (0.370").

The test sample was subjected to a Structural Test Pressure using positive and negative pressures of 2000 Pa (41.6 psf).

There was no breakage or permanent deformation, which would impair the operation of the doors.

The sample met a C-2 Wind Load Resistance rating as per CSA A440-98 and CAN/CGSB 82.1-M89.

5. Water Tightness Test

An additional water test was performed after the structural evaluation of the sample. The test was performed on the sample in accordance with ASTM E-331-96 "*Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference*".

The height of the sill was increased 1-1/8" (28.6 mm) by installing and sealing a sill riser block along the length of the sill. The riser block consisted of a full-length fir lumber block complete with a weatherstrip slot. The riser block was sealed to the top of the existing wood sill.

The test was performed using a pressure differential of 400 Pa (8.32 psf) and a water spray rate of at least 204 L/m² per hour (5.0 US gal/ft² · h). The period consisted of four cycles of five minutes with the pressure applied and one minute with the pressure released.

During the 24-minute test period, no water leakage was observed. The test sample met a level B-4 rating as per CSA A440-98 and CAN/CGSB 82.1-M89.

TEST HISTORY

See Appendix I for test history and modifications.

CONCLUSION

The Kristrack eclipse e2™ 1L3R Folding Door system described herein met the performance criteria as per **CAN/CGSB 82.1-M89** and **CSA A440-98** for Air Tightness (**A-3**), Water Tightness by Static Pressure (**B-3**) with standard sill, Water Tightness by Static Pressure (**B-4**) with modified sill riser, and Structural Performance (**C-2**). The system received an equivalent **AAMA/NWWDA 101/LS.2-97** performance criteria **146" x 100" HGD-LC25** rating.

INTERTEK TESTING SERVICES NA LTD.

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APPENDIX I

Testing History

Date	Test	Event	Modification
02/07/19	Water Tightness @ 200 Pa (4.2 psf)	Water was observed at: 1. Hinges. 2. Interior glazing stops 3. Perimeter frame stops 4. Corners mainframe weatherstrip	<ol style="list-style-type: none"> 1. Closed cell foam adhered around hinge to make isolated seal. 2. The glazing stops were heal beaded to the glass and the door slab using silicone. The test sample utilized exterior glazing, but future doors will be interior glazed and IG's will be set into a bead of sealant. 3. All framing stops sealed to mainframe. 4. Mainframe weatherstrip joints were sealed using silicone.
02/07/19	Water Tightness @ 200 Pa (4.2 psf)	Water was observed at: 1. Above top hinges on two doors. 2. Pivot door mainframe weatherstrip at corner.	<ol style="list-style-type: none"> 1. Closed cell foam tape was adhered to the underside of the head, full length, to act as water deflection at the head. 2. Caulked end of mainframe weatherstrip. <p>Through subsequent testing the system achieve a B-3 300 Pa (6.24 psf) rating with a standard sill.</p>

APPENDIX II

