

TEST REPORT

SPECIFICATION AAMA/WDMA/CSA 101/I.S.2/A440-08 AAMA/WDMA/CSA 101/I.S.2/A440-11 A440S1-09 A440S1-17

PRODUCT SERIES & TYPE 6-Panel E3 Folding Door 1L5R System – 42" Richersons Panels

PRIMARY DESIGNATION SP – PG25 – Size Tested 6436 x 2526 mm (253 x 99 in)

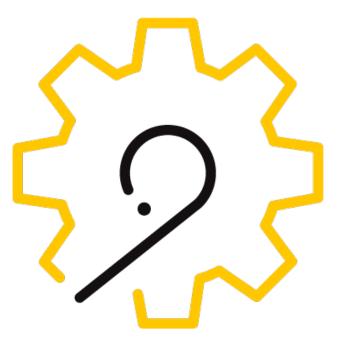
SECONDARY DESIGNATION Positive Design Pressure = 1200 Pa (25.1 psf) Negative Design Pressure = 1200 Pa (25.1 psf) Water Penetration Resistance = 180 Pa (3.8 psf) Canadian Air Leakage Resistance = A3

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CONCLUSION

1500 Brigantine Drive Coquitlam, BC, V3K 7C1

Telephone: 604-520-3321 Facsimile: 604-524-9186 www.intertek.com

The testing of a 6-Panel Folding Door 1L5R System – 42" Richersons Panels tested and described within this report, achieved the overall performance requirements of **PG25** when tested in accordance with NAFS-08, NAFS-11, A440S1-09 and A440S1-17.

L.C.

Jason Komorski TECHNICIAN BUILDING PRODUCTS

David Park REVIEWER BUILDING PRODUCTS

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SECTION 1 SUMMARY OF RESULTS

A summary of results for AAMA/WDMA/CSA 101/I.S.2/A440-08 "Standard/Specification for windows, doors, and unit skylights", AAMA/WDMA/CSA 101/I.S.2/A440-11 "Standard/Specification for windows, doors, and unit skylights", and A440S1-09 "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights", are as indicated in the table below:

Evaluation Property	Results
Air Leakage Resistance	US – Pass; Can – A3
Water Penetration Resistance	180 Pa (3.8 psf)
Uniform Load – Deflection	1200 Pa (25.1 psf)
Uniform Load – Structural	1800 Pa (37.6 psf)

Details of the tested results can be found in Section 7 of this report.

Primary and Secondary Designations are as indicated below:

6-Panel Folding Door 1L5R System – 42" Richersons Panels

SP – PG25 – Size Tested 6436 x 2526 mm (253 x 99 in)

Secondary Designator

Positive Design Pressure = 1200 Pa (25.1 psf) Negative Design Pressure = 1200 Pa (25.1 psf) Water Penetration Resistance = 180 Pa (3.8 psf) Canadian Air Leakage Resistance = A3

PAGE

SECTION 2 INDEX

SECTION NAMES

SUMMARY OF RESULTS	3
INDEX	4
OBJECTIVE	5
SAMPLE ASSEMBLY AND DESCRIPTION	5
TESTING AND EVALUATION METHODS AIR LEAKAGE RESISTANCE WATER PENETRATION RESISTANCE UNIFORM LOAD DEFLECTION UNIFORM LOAD STRUCTURAL. DEVIATION FROM STANDARD METHOD.	9 9 9 9 9
TEST EQUIPMENT	10
RESULTS AND OBSERVATIONS AIR LEAKAGE RESISTANCE WATER PENETRATION RESISTANCE UNIFORM LOAD – DEFLECTION UNIFORM LOAD – STRUCTURAL	11 11 11
CONCLUSION	13
APPENDIX A: DRAWINGS	14
APPENDIX B: PHOTOGRAPHS	
	19

SECTION 3

OBJECTIVE

Intertek Testing Services NA Ltd. (Intertek) has conducted testing on a 6436 mm (253.4") x 2526 mm (99.4") 6-Panel Folding Door 1L5R System – 42" Richersons Panels . Testing was conducted in accordance with following standard / specification:

- AAMA/WDMA/CSA 101/I.S.2/ A440-08 "Standard/Specification for windows, doors, and unit skylights" (NAFS-08)
- A440S1-09 "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS North American Fenestration Standard/Specification for windows, doors, and skylights" (A440S1-09)
- AAMA/WDMA/CSA 101/I.S.2/ A440-11 "Standard/Specification for windows, doors, and unit skylights" (NAFS-11)
- A440S1-17 "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS North American Fenestration Standard/Specification for windows, doors, and skylights" (A440S1-17)

This evaluation was started on October 12, 2018 and completed on October 16, 2018.

SECTION 4

SAMPLE ASSEMBLY AND DESCRIPTION

Model Name	 6-Panel Folding Door 1L5R System – 42" Richersons Panels
Installation	 Test Buck: Glue-lam beams were constructed out of lengths of 2x6 lumber, used to construct the test buck. The top beam is approximately 457 mm (18") tall, the bottom and the sides are approximately 152 mm (6") tall. The glue-lam beams were secured with the use of steel angle plates and 5x lag bolts. The glue-lam beams were clad with a 2x12, #2 & better spf, butt joints secured with 4x #8 x 3" deck screws. The 2x12 clad was secured to the glue-lam beams along the length with #8 x 3" deck screws, used in groups of 2x, with each set spaced approximately 305 mm (12") o.c. Specimen to Buck: The jambs of the frame are secured to the buck with 5x #10 x 3-1/2" flat-head wood screws per jamb. The head of the frame was secured to the buck with 23x #12 x 3" pan-head screws, 5x within the first 457 mm (18") on either side, and the rest spaced 406 mm (16") o.c. The sill was adhered to the blue skin on the test buck with 2x continuous bead of silicone. The buck was lined with a blue skin membrane, continuous along the bottom and up the sides approximately 152 mm (6") Silicone was used in the rough opening to seal the product to the test buck around the exterior, full perimeter.

Size Frame	 Overall Size: Width: 6436 mm (253.4") Height: 2526 mm (99.4") Material: Wood – 165 mm (6-1/2") wide Corners: Jamb to head corners are butt joined and secured with 5x #10 x 2" flathead screws. A black foam gasket is used between the ends of the head profile and the jambs.
Sill	 Material: Aluminum, PVC and wood Corners: Jamb to sill corners are butt joined and secured with 5x #10 x 2" flat-head screws. A black foam gasket is used between the ends of the sill ssembly and the jambs.
Door Panels (6x)	 Smooth fiberglass skin door panels from Richersons Enterprise with Integrated full lite Spec: BSL9G00; Style: 1N 002 S003732 Panel Size: Width: 1061 mm (41.8") Height: 2412 mm (95.0") Top Rail: 1" composite with square edge; 3" solid wood; 1" composite Hinge Stile: 5/8" composite cap with a recessed, proud edge; 2" wood LVL; 1" composite. Lock Stile: 5/8" composite cap with a recessed, proud edge; 2" wood LVL; 1" composite. Bottom Rail: 7/8" PVC composite; foam; 1-1/4" composite A wood astragal is used along the latch stile of the panel next to the Side-hinged door panel. Secured to the panel with brad nails spaced approximately 229 mm (9") o.c.
Locks and Hardware	 Frame The sill has flush bolt strike plates inserted into the aluminum pockets of the sill. A machine screw is used to adjust a shim block on the strike plates to secure the strike plate in place with compression. Panel 1 Jamb stile: Pivot sets inserted into the Top Track and the Sill track. Top Pivot set secured to the track with a steel cover plate by 4x #8 x 1" flat head screws. Sill Pivot set secured by 2x #8 x 1-1/2" screws. Each secured to the slab with 4x #10 x 1-1/2" flat head screws. Jamb stile: A Wall Pivot was used at the centre point of the stile, secured to panel with 4x #10 x 1-1/2" flat head screws, secured to frame with 2x #8 x 1-1/2" flat head screws. Multi-point locking assembly with deadbolt, latch and two rhino hooks secured to panel with 14x #8 x 1-1/2" Flat head screws, Lock points including latch and deadbolt centered approximately 254 mm (10") from the top of the panel, and 216 mm (8-1/2"), 1003 mm (39-1/2") and 1041 mm (41") from the bottom of the panel.

	Panel 2 & 4	 Roller stile: Carrier set at the top and bottom of the panel shared with panel 3. Bottom roller carrier secured by 3x #10 x 1-1/2" flat head screws, top roller carrier secured by 4x flat head screws. Roller stile: One hinge shared with panel 3 & 5, secured by 4x #10 x 1-1/2" Flat head screws. Lock stile for Panel 2: 3 corresponding keepers for the multi point lock and deadbolt system, each secured to panel with 2x #8 x 1-1/2" flat head screws. One 16" Flushbolt at the top portion of the panel slots directly into the top track, secured to the interior face of the panel by 7x #8 x 1-1/4" flat head screws. One 8" Flushbolt at the sill of the panel slots directly into the bottom track secured to the interior face of the panel with 5x #8 x 1-1/4" flat head screws.
	Panel 3 & 5	 Bi-fold stile: Three hinges at the top, middle and bottom, shared with panel 4 & 6. Each hinge secured by 4x #10 x 1-1/2" flat head screws. Middle hinge has handle set attached. Roller stile: Carrier set at the top and bottom of the panel, shared with panel 2 & 5. Top roller carrier secured by 3x #10 x 1-1/2" Flat head screws. Bottom roller carrier secured by 4X #10 x 1-1/2" Flat head screws. Roller stile: One hinge shared with panel 2 & 5, secured by 3x #10 x 1-1/2" Flat head screws.
	Panel 6	 Jamb stile: Pivot sets inserted into the top track and the sill track. Top pivot set secured to the track with a steel cover plate by 4x #8 x 1" flat head screws. Sill Pivot set secured by 2x #8 x 1-1/2" screws. Each secured to the slab with 4x #10 x 1-1/2" flat head screws. Jamb stile: A Wall Pivot was used at the centre point of the stile, secured to panel with 4x #10 x 1-1/2" flat head screws, secured to frame with 2x #8 x 1-1/2" flat head screws. One 16" Flushbolt at the top portion of the panel slots directly into the top track, secured to the interior face of the panel by 7x #8 x 1-1/4" Flat head screws. One 8" Flushbolt at the sill of the panel slots directly into the bottom track secured to the interior face of the panel with 5x #8 x 1-1/4" flat head screws.
Drainage	470 mmthroughaluminur3x length	sill face: 14x 16 mm x 6 mm slots evenly spaced along the sill approximately (18-1/2") o.c., fit with blue drain covers (ECWHC1BL). The drain continues the walls of the sill as 2x 6mm diameter holes to the interior most n cavity. In cavity. In so f black PVC inserts are inserted into the aluminum pockets of the sill drainage notches aligned with the drains in the aluminum sill.

Weather-strip	 Main frame: Inner most portion has 4x lengths of kerf inserted closed cell foam weather-stripping (KT421) around the perimeter of the frame. The bottom corners have a small amount of silicone used. Top Track: Pile weather-stripping with centre fin (DSP108-35BL) along the middle of the track, above the top exterior edge of the door panels. Each panel has a 6 mm (1/4") thick C-shaped foam gasket used around the hinge locations, adhered to the stile of the panel. Panels 2, 3, 4 and 5 have 2 lengths of a vinyl wrapped weather-stripping (DS415), adhered to the right edge (when viewed from the exterior) of the panel stile. One length along the exterior edge and one along the interior edge, broken at the hinge locations. Panel 6 and the side-hinged door panel have one length of this same weather-stripping used along the stile of the panel against the jamb side. Each panel has a pile dust pad (DS672) adhered to the bottom rail of the panel, at the right corner (when viewed from the exterior). Side-hinged door Panel 1: The locking stile of the panel has a pile weather-stripping with centre fin used along the entire length, on the exterior side from the locking tie bar. Panel 2: The astragal has a length of kerf inserted closed cell foam weather-stripping used along the astragal, as well as a pile dust pad (DS672) adhered to the top and bottom.
Glazing(6x)	 IGU specification: 3 mm / 3 mm clear tempered with a 19 mm (~3/4") stainless steel spacer with desiccant, sealed using polyisobutylene. Overall thickness, 25 mm (~1") Lite kit and glazing is exterior glazed into the door panel. Two layers of silicone are used around the exterior side full perimeter, including the seam between the glass and glazing stop, as well as the glazing stop and panel.

SECTION 5 TESTING AND EVALUATION METHODS

AIR LEAKAGE RESISTANCE

The Air Leakage Resistance test was performed in accordance with ASTM E283-04(2012), "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen". Air infiltration and exfiltration tests were performed using test pressures of 75 Pa (1.57 psf). The maximum air leakage rate was calculated and compared to the allowable air leakage.

WATER PENETRATION RESISTANCE

A four-cycle Water Penetration Resistance test was performed in accordance with ASTM E547-00(2016) *"Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference"* (ASTM E547). The test was performed using the specified pressure differential and a water spray rate of at least 204 L/m² per hour (5.0 U.S. gal/ft² per hour). Each cycle consisted of five minutes with the pressure applied and one minute with the pressure released, during which the water spray was continuously applied.

UNIFORM LOAD DEFLECTION

The Uniform Load Deflection tests were conducted in accordance with ASTM E330/E330M-14 "Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference" (ASTM E330), Procedure A. The tests were performed in both the positive and negative directions. After a 10 second preload (50% of the test load), followed by 1 minute with the pressure released, the tests were conducted at the specified test pressure for a period of 10 seconds. Deflections were measured at the mid-span and at the ends. The end deflections were averaged and subtracted from the mid-span deflection (to eliminate deflections caused by movement at the ends of the structural supporting members). Polyethylene film was used during the positive wind pressure sequences.

UNIFORM LOAD STRUCTURAL

The Uniform Load Structural tests were conducted in accordance with ASTM E330/E330M-14 "Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference" (ASTM E330), Procedure A. After a 10 second preload (50% of test load), followed by 1 minute with the pressure released, the sample was subjected to a Uniform Load Structural test using a specified test pressure for a time of 10 seconds. The test was performed in both the positive and negative directions. After the test loads were released, the permanent deflections were recorded and the specimen was inspected for failure or permanent deformation of any part of the system that would cause any operational malfunction. Polyethylene film was used during the positive wind pressure sequences.

DEVIATION FROM STANDARD METHOD

None

SECTION 6

TEST EQUIPMENT

Equipment used during testing is listed as follows:

Test	Equipment	Intertek ID#
	Fenestration Testing Control Unit	60650
		60651
	Water spray assembly	60652
Air Leakage Resistance,		60653
Water Penetration Resistance, and		60673
Uniform Load Deflection /		64928
Structural	20" Line Course	64926
	20" Line Gauge	64923
		64920
		64922
Forced-entry Resistance	1000 lbs Load Cell	P60688
Operation Cycling Performance	Stop Watch	60624
Vertical Loading Peristance	1000 lbs Load Cell	P60689
Vertical Loading Resistance	Mitutoyo Digital Deflection Gauge	P60175

SECTION 7

RESULTS AND OBSERVATIONS

AIR LEAKAGE RESISTANCE

Air test data is indicated in the following table:

Property	Pressure Pa (psf)	Area m ² (ft ²)	Infiltratio L/s*m ² (cf		Exfiltration Rate L/s*m ² (cfm/ft ²)	Compliance US (CAN)
Overall Assembly	75 (1.57)	16.26 (175.0)	0.21 (0	.04)	0.33 (0.07)	Pass (A3)
	Allowable Leakage Rates					
Maximum allowable air leakage rate (US):				1.5 L/s	*m², 0.3 cfm/ft²	
Maximum allowable air leakage rate (CAN – A3):			0.5 L/s	*m ² , 0.1 cfm/ft ²		

The overall system **met** the US and Canadian performance requirements as reported above when evaluated under NAFS-08, NAFS-11 and A440S1-09.

WATER PENETRATION RESISTANCE

During the 24-minute test period, using a pressure differential of 180 Pa (3.8 psf), there was no water leakage observed. The system met the **(CAN) PG25** Water Penetration Resistance performance requirements under NAFS-08, NAFS-11 and A440S1-09.

UNIFORM LOAD – DEFLECTION

Side-hinged door Uniform Load Deflection data:

	0	Deflection Measu	rements, mm (ii	n.)		
Test Pressure, Pa (psf)	Po	sitive	Negative Deflection Residual		Compliance	
Pa (psi)	Deflection	Residual				
1200 (25.1)	32.15 (1.27)	0.33 (0.01)	27.18 (1.07) 0.70 (0.03)		Pass PG25	
SHD Locking	Locking Stile, L = 2390 mm (94.09") Deflection lir			eflection limit, L/	′175 = N/A	

Mid-panel Door Latch Stile Uniform Load Deflection data:

	Deflection Measurements, mm (in.)					
Test Pressure, Pa (psf)	Positive		Negative		Compliance	
	Deflection	Residual	Deflection Residual			
1200 (25.1)	46.99 (1.85)	0.53 (0.02)	49.13 (1.93)	0.85 (0.03)	Pass PG25	
Left stile of Pa	anel 4, L = 2390	mm (94.09")	De	flection limit, L/	175 = N/A	

UNIFORM LOAD – STRUCTURAL

Side-hinged door Uniform Load Structural data:

Test Pressure,	Residual Deflection Me	Residual Deflection Measurements, mm (in.)		
Pa (psf)	Positive	Negative	Compliance	
1800 (37.6)	0.48 (0.02)	0.48 (0.02)	Pass PG25	
SHD Locking Stile, L = 2390 mm (94.09")		Residual deflection limit, L*	0.4% = 9.56 mm (0.38")	

Mid-panel Door Uniform Load Structural data:

Test Pressure,	Residual Deflection M	Compliance	
Pa (psf)	Positive	Negative	
1800 (37.6)	0.88 (0.03)	0.33 (0.01)	Pass PG25
Left stile of Panel 4, L = 2390 mm (94.09")		Residual deflection limit, L'	*0.4% = 9.56 mm (0.38")

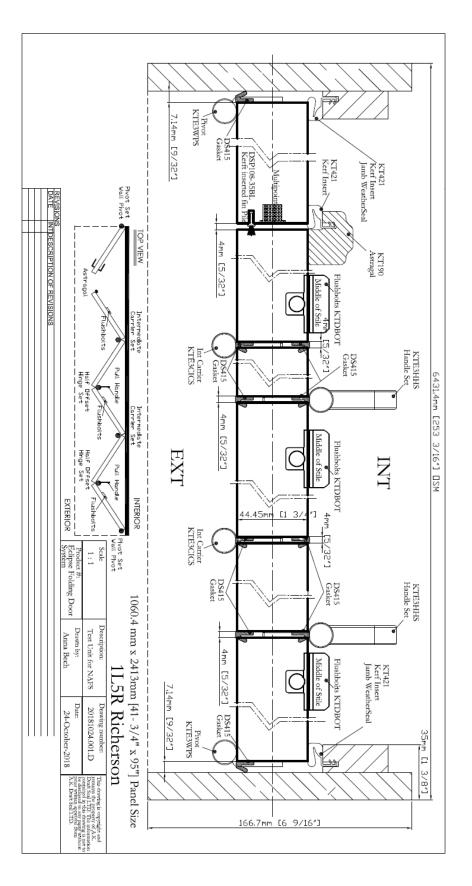
After the test loads were released, the specimen was inspected and there was found to be no failure or permanent deformation of any part of the window system that would cause any operational malfunction. The system met the overall **PG25** Uniform Load performance requirements under NAFS-08 and NAFS-11.

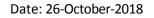
SECTION 8 CONCLUSION

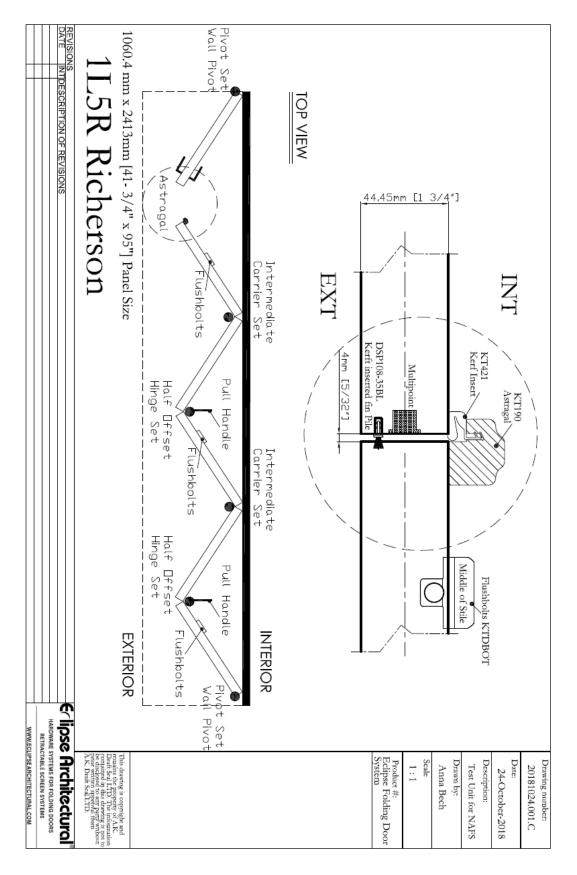
The testing of a 6-Panel Folding Door 1L5R System – 42" Richersons Panels tested and described within this report, achieved the overall performance requirements **of** PG25 when tested in accordance with NAFS-08, NAFS-11, A440S1-09 and A440S1-17.

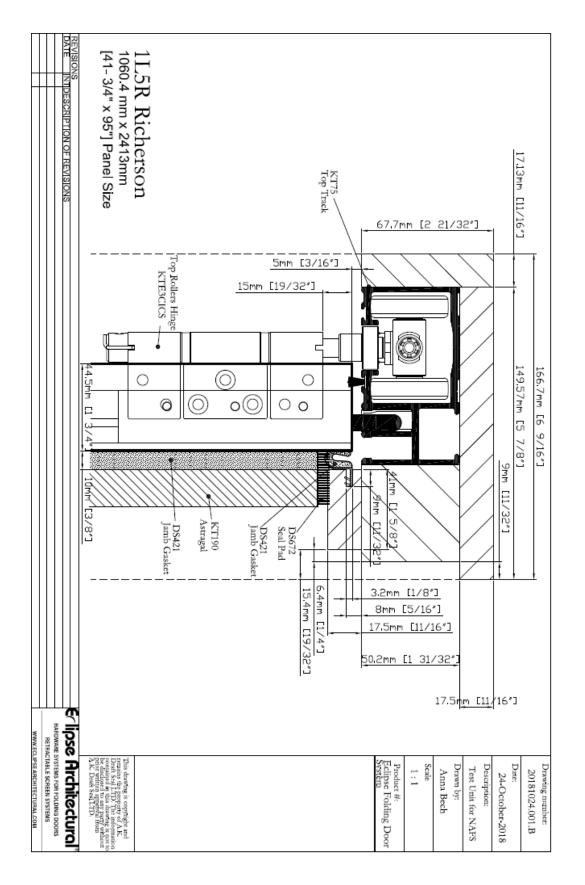
SECTION 9

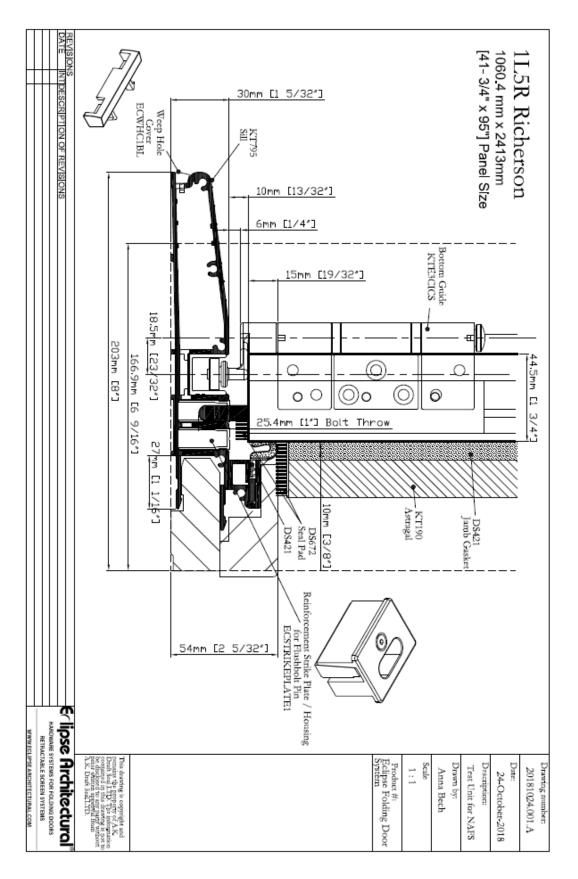
APPENDIX A: DRAWINGS (4 Pages)











SECTION 10

APPENDIX B: PHOTOGRAPHS (10 Pages)



6-Panel Folding Door 1L5R System – 42" Richersons Panels; Exterior



Sill assembly



Head assembly



Jamb assembly



Corner joint screws at the head



Side-hinged panel jamb side stile



Side-hinged panel top rail



Side-hinged panel bottom rail



Side-hinged panel locking stile



Panel 2 right side stile (from exterior)



Panel 2 left side stile with astragal



Panel top rail



Panel 2 bottom rail



Installation screws at the head



Strike plate in the sill



Strike plate assembly



Bottom flush bolt



Top flush bolt



Deadbolt and latch



Multi-point rhino hook



Deadbolt and latch strike plate



Multi-point strike plate



Mid-point hinge at the jamb



Frame weather-stripping corner



Weather-stripping profile

•



Astragal with pile dust pads



Pile dust pad used under each panel



Door panel stile weather-stripping configuration



C-shaped gasket around the hinge locations



Pile weather-stripping and dust pad under eadge of SHD panel



Drain slot out from the sill with drain cove

SECTION 11

APPENDIX C: REVISION TABLE (1 Page)

Revision Table				
Date	Section	Description	Technician	Reviewer
26-October- 2018		Original Issue Date		