intertek
Total Quality. Assured.

POLYTECH PRODUCTS LTD

TEST REPORT

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

PRODUCT SERIES & TYPE
Vinyl Dual Action Window

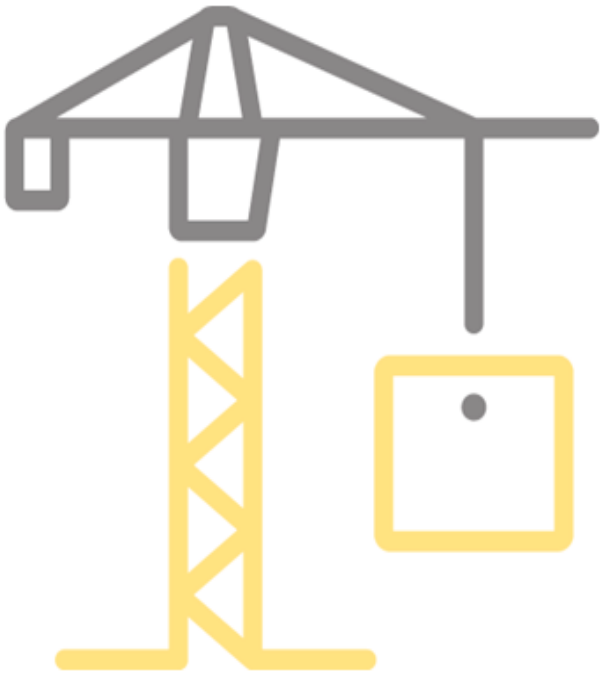
REPORT NUMBER
104153404TOR-001

ISSUE DATE
04/28/2020

RECORD RETENTION END DATE
04/28/2024

PAGES
20

DOCUMENT CONTROL NUMBER
GFT-OP-10b (13-March-2017)



REPORT ISSUED TO

Polytech Products Ltd.
8819 Highway 105 RR3
Baddeck, NS B0E 1B0
Canada

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by Polytech Products Ltd to perform testing in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-17 "North American Standard/Specification for windows, doors, and skylights", and A440S1-17 "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights", on their Dual Action Vinyl Window. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek test facility in Mississauga, Ontario.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained for the entire test record retention period.

SECTION 2
SUMMARY OF RESULTS

AAMA/WDMA/CSA 101/I.S.2/A440-17 *"North American Standard/Specification for windows, doors, and skylights",* and A440S1-17 *"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 @ +75 Pa (1.6 psf)	US – Pass; Can: 0.01 L/s/m² (A3)
Air Leakage Resistance @ -75 Pa (1.6 psf)	US – Pass; Can: 0.02 L/s/m² (A3)
Water Penetration Resistance	720 Pa (15.04 psf)
Uniform Load – Deflection	3600 Pa (75.19 psf
Uniform Load – Structural	5400 Pa (112.78 psf)
Forced Entry Resistance	Pass
Sash/Leaf Concentrated Load on latch rail	Pass
Stabilizing Arm Load	Pass
Insect Screen Serviceability Test	Pass
Thermoplastic Corner weld Test	Pass

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

Primary and Secondary Designations are as indicated below:

Dual Action Vinyl Window
Class LC – PG75 – Size Tested 1200x 1500 mm (47.24 x 59.05 in) – DAW

Secondary Designator
Positive Design Pressure = 3600 Pa (75.19 psf
Negative Design Pressure = 3600 Pa (75.19 psf
Water Penetration Resistance = 720 Pa (15.04 psf)
Canadian Air Leakage Resistance = A3

For INTERTEK B&C:

COMPLETED BY:	Edsel Lopez	**REVIEWED BY:**	David Park
TITLE:	Technical Analyst - Building & Construction	**TITLE:**	Reviewer Building & Construction
SIGNATURE:		**SIGNATURE:**	
DATE:	04/28/20	**DATE:**	04/28/20

SECTION 3
OBJECTIVE

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Polytech Products Ltd. on a 1200 x 1500 mm (47.24 x 59.05 in) Dual-Action Window. Testing was conducted in accordance with following standard / specification:

- AAMA/WDMA/CSA 101/I.S.2/ A440-17 *"North American Standard/Specification for windows, doors, and unit skylights"* (NAFS-17)
- 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 April 09, 2020 and completed on April 13, 2020.

SECTION 4
TEST SPECIMEN DESCRIPTION

Manufacturer Information	Polytech Products Ltd. 8819 Highway 105 RR3 Baddeck, NS B0E 1B0 Canada
Model Name	• Dual Action Vinyl Window
Installation	• The full frame assembly was attached to a 2 x 10 in. wood buck and fastened with #8 x 3" wood screws spaced at approximately 460 mm along the interior perimeter of the frame. The perimeter joint between the window frame and wood buck on the interior was sealed with silicone at the exterior. The test mock-up was built by Polytech Products Ltd.
Frame	• Overall Size: Width – 1200 mm Height - 1500 mm • Extruded rigid vinyl frame members with mitered and welded corners • Reinforcement :16 GA rectangular box section installed in each frame member cavity and fastened with 4 mm diameter by 16 mm length metal screws spaced at approx. 230 mm. • Screen track kit installed to exterior of the frame jamb and fastened with five #6 - 20mm stainless steel screws spaced at 250 mm.

Operable Sash	• Extruded rigid vinyl with mitred and welded corners. • Sash Size: Width: 1105 mm Height: 1415 mm • The sash top and bottom rails were reinforced with a galvanized 16 GA J-section along the entire length of the rails and fastened with two 4 mm diameter by 16 mm self-drilling screws spaced at 540 mm. • The stiles were reinforced with galvanized 16 GA J-section along the entire length of the stiles and fastened with nine 4 mm diameter by 16 mm self-drilling screws spaced at approx. 750 mm. • Deflector kit was installed at the exterior bottom rail interface and fastened with five #6-20 mm stainless steel screws
Locks and Hardware	• Lock: A locking handle was fastened to a cavity along the lock stile through an aluminium backing plate and was fastened with two # 10 X 2" flat head stainless steel machine screws. The lock engaged a multipoint latch system that engages to nine metal keepers that are located at the jambs, header and sill. The handle was installed at the interior face of the sash at 650 mm from the underside of the sash. • Keepers: Eight metal keepers are fastened to the interior sash with three #7 x 1 ¼" flat head stainless steel screw. One at the header located at 510 mm from the interior weld of header and lock jamb, three along the lock jamb spaced at 430 mm and 560 mm respectively, two at hinge jamb spaced at 686 mm and two at the sill approximately 700 mm apart. • Tilt and turn hardware was installed at 70 mm from the lock jamb at the interior header interface. • Hinge: Hinge was installed at the top corner of the hinge jamb. A hinge arm 430 mm in length is attached to the multipoint system at the top rail of the sash rail.
Weather-stripping	• A bulb seal was installed at the kerf of the glazing leg of the frame • Glazing stops were weather-sealed with a flexible double vinyl fin. • A bulb seal was installed at the perimeter of the frame and fitted to the kerf facing the interior. • The interior perimeter was single weather-stripped with an inserted bulb seal fin at the innermost kerf of the sash and at the glazing cavity.
Drainage	• The top rail was vented by three 5mm x 30 mm slots spaced at 300 mm from the centre of the rail at the glazing cavity. • The bottom rail was drained by three 5mm x 25mm slots spaced at approximately 300 mm apart measured at the centre of bottom rail glazing cavity. • The top rail is vented by two 5mm x 25 mm slot at the exterior interface of the operable sash and spaced at 710 mm from the centre of the top rail. • The bottom rail is drained by two 5mm x 25 mm slot at the exterior interface of the operable sash spaced at 710 mm from the centre of the bottom rail. • The interior header cavity was vented by two 5mm x 25 mm slots spaced at 830 mm from the centre of the header. • The interior sill track was drained to a forward cavity by two 5 mm x 25 mm slots that are spaced at 830 mm O.C. • The sill cavity was drained to the exterior by two slots, measuring 5 mm x 25 mm,

	spaced at 660mm on centre. The exterior drain slots were fitted with eyelid weep covers.
Glazing & Glazing Methods	• The IG (insulating glass) unit was dry glazed from the interior on the bulb seal of the glazing leg at the top rail and stiles. The bottom rail was sealed with silicone all throughout its length and upwards of 100 mm to both stiles. Glazing leg corners were welded prior to installation of the glass. • Three setting blocks measuring 100 x 30 x 5 mm supported the IG unit at the bottom rail located at 450 mm O.C. • Two setting blocks measuring 100 x 30 x 5 mm supported the IG unit at the top rail located at 690 mm O.C. • Two setting blocks measuring 100 x 30 x 5 mm supported the IG unit at the stiles spaced approximately 400 mm apart and located 100 mm of the adjacent weld at the top rail and lock stile. • Two setting blocks measuring 100 x 30 x 5 mm supported the IG unit at the stiles spaced approximately 1870 mm apart and located 100 mm of the adjacent weld at the bottom rail and hinge stile. • Factory sealed glazing unit having two sheets of nominally thick 4 mm glass with a 16 mm wide gap and a spacer. • Overall IG thickness was 24 mm.
Insect Screen	• Frame : Roll formed aluminium members supported by four plastic corners • Mesh: Fiberglass mesh retained by plastic spline • Installation: Screen stile engaged a track along the frame jambs Screen Size: Width:1120 mm Length:1455 mm
Drawings	• To be Submitted by the client.

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/m^2 per hour (5.0 U.S. gal/ft^2 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.

FORCED ENTRY RESISTANCE

The Forced Entry Resistance Test was conducted and evaluated in accordance with Clause 9.3.5, in conjunction with ASTM F588-17 "Standard Test Methods for Measuring the Force Entry Resistance of Window Assemblies, Excluding Glass Impact".

Disassembly Test

Using the disassembly tools listed below, all members and/or fasteners that could readily be removed from the exterior within a time limit of five minutes were removed carefully so as not to cause collateral damage to the specimen.

Tools for Disassembly

Putty knife – 0.6 mm thick by 20 mm wide by 90 mm long (0.024" × 0.78" × 3.5")

Straight or Philips head non-powered screwdriver – 150 mm (6") long

Standard slot-type pliers – 150 mm (6") long

Type B Window Assembly Test

The Operable Window was tested to a Grade 10 measured performance (T1 = 5 minutes). All test loads were applied at a rate of 45 N/s (10 lbf/s) and held for a period of 60 seconds. The test loads used were as shown in the following table:

Grade 10 Measured Performance Loads		
Load ID	Load (N)	Load (lbf)
L1	667	150
L2	333	75

Test B1 With the swinging sash in the test position, simultaneously apply a concentrated load of L2 within 75 mm (3") from each end of the stile which is opposite the hinge side and in a direction perpendicular to the plane of the glazing that would tend to open the window.

Test B2 With the swinging sash in the test position, simultaneously apply a concentrated load of L2 within 75 mm (3") from each end of the stile which is opposite the hinge side and in a direction perpendicular to the plane of the glazing that would tend to open the window, while simultaneously applying a concentrated load L1 from the exterior side within 25 mm (1") from the end of the stile, between the lock stile and the frame in a direction parallel to the short dimension of the window and parallel to the plane of the glazing in a manner which would tend to disengage the lock.

Test B3 With the swinging sash in the test position, simultaneously apply a concentrated load of L2 within 75 mm (3") from each end of the stile which is opposite the hinge side and in a direction perpendicular to the plane of the glazing that would tend to open the window, while simultaneously applying a concentrated load L1 from the exterior side within 25 mm (1") from the end of the stile, between the lock stile and the frame in a direction parallel to the long dimension of the window and parallel to the plane of the glazing in a manner which would tend to disengage the lock.

Lock Hardware Manipulation Test

Using the putty knife listed above plus a straight stiff steel wire (i.e. coat hanger) – 2.5 mm (3/32") max. diameter (long enough to reach from the point of insertion to the locking device(s)), an attempt was made to gain entry by inserting each tool and tool combination so as to contact the locking device from the exterior. The lock manipulation test was conducted for a time of T1 by one technician in a manner so as not to cause collateral damage to the specimen

SASH /LEAF CONCENTRATED LOAD TEST ON LATCH RAIL

In accordance to Section 9.3.6.4.3 of the AAMA/WDMA/CSA 101/I.S.2/A440-17, a concentrated load was applied to the center span of the latch rail, perpendicular to the plane of the glazed sash or leaf. The load was applied in one perpendicular direction and then the opposite direction. While applying the load there shall not be any glass breakage, deglazing or deflection that is greater than specified in Tables 6.4 of the standard.

A concentrated load was applied to center of the latch rail. The load applied was parallel or in the plane of the sash or leaf first in one direction then was performed in the other direction. While applying the load there shall not be any glass breakage, deglazing or deflection that is greater than specified in Tables 6.4 of the standard.

STABILIZING ARM LOAD TEST

Stabilizing arm load test was conducted in accordance with Clause 9.3.6.5.3 of the AAMA/WDMA/CSA 01/I.S.2/A440-17. The testing unit was mounted vertically with a concentrated load acting vertically downward applied on both corners and in the middle of the leaf, while being in full ventilating position supported solely by the stabilizing arm at one jamb, for 10 seconds. After the test loads were released, the casement was inspected for any damage to the frame, leaves, glass, stabilizing arm, and hardware components that would cause any operational malfunction.

INSECT SCREEN SERVICEABILITY TEST

The Insect Screen test was conducted in accordance with Clause 5.1 of CSA A440S1-17 Canadian Supplement and evaluated in accordance with ASTM E1748 in the outward direction only. The load for the test shall be 60 N and the results shall be reported as pass or fail. It was applied to the insect screen (perpendicular to the plane of the screen and in an outward direction) through a 300 mm (12") diameter, rigid, circular platen centered on the centroid of the insect screen and held for a period of 60 seconds. After the test load was released, the screen was inspected for deformation or damage.

THERMOPLASTIC CORNER WELD TEST

Corner weld tests were conducted in accordance with Clause 9.3.6.2 of the AAMA/WDMA/CSA 101/I.S.2/A440-17. Each corner sample was mounted in a test fixture as per Figure 9.3 of the standard. The frame corners and the sash corners were loaded as per Figure 9.3 with a gradually increasing load until breakage of the corner occurred.

DEVIATION FROM STANDARD METHOD

There were no noted deviations from the test standards used in the evaluation reported herein.

SECTION 6
TEST EQUIPMENT

Equipment used during testing is listed as follows:

Test	Equipment	Intertek Asset#	Cal. Due
Air Leakage Resistance	Laminar Flow Element	280-01-0171	Apr. 28, 2020
	Pressure Transducer	280-01-0961	Dec. 19, 2020
Water Penetration	Spray Rack	273-01-0974	May 4 2020
Uniform Load Deflection / Structural	String Pots	280-01-0956A	February 5,2021
		280-01-0956B	February 5,2021
		280-01-0956C	February 5,2021
		280-01-0956D	February 5,2021
		280-01-0956E	February 5,2021

SECTION 7
RESULTS AND OBSERVATIONS

AIR LEAKAGE RESISTANCE

Air Infiltration + 75 Pa	
Net infiltration:	0.01 L/s
Door System Area:	1.80 m²
Infiltration rate:	0.01 L/s·m²
Air Exfiltration – 75 Pa	
Net exfiltration:	0.04 L/s
Door System Area:	1.80 m²
Exfiltration rate:	0.02 L/s·m²

Maximum allowable air leakage rate (US infiltration only):	1.5 L/s·m²
Maximum allowable air leakage rate (Canadian A3):	0.5 L/s·m²

WATER PENETRATION RESISTANCE

During the 24-minute test period, using a pressure differential of 720 Pa, there was no water leakage observed, nor was there trapped water in the window assembly following completion of the test.

The window system **MET** the Water Penetration Resistance requirements at 720 Pa (15.04 psf) as specified in AAMA/WDMA/CSA 101/I.S.2/A440-17 and CSA A440S1-17

UNIFORM LOAD TEST

Uniform Load Deflection Tests at Design Pressure (Clause 9.3.4.2)				
Member	Top Rail		Lock Stile	
Span Length (L)	1080 mm		1420 mm	
Allowable Deflection	Report Only			
Test Pressure	Positive	Negative	Positive	Negative
	3600 Pa	3600 Pa	3600 Pa	3600 Pa
Maximum Net Deflection	6.03 mm	5.67 mm	6.70 mm	5.45 mm
Post-test Details	After the test loads were released, the door system was inspected and there was found to be no failure or permanent deformation of any part of the window system.			

The window system MET the minimum Uniform Load Deflection Gateway performance requirements for Class LC at 1200 Pa by virtue of meeting the Optional Performance requirements at ±3600 Pa for Uniform Load Structural as specified in AAMA/WDMA/CSA 101/I.S.2/A440-17.

Uniform Load Structural Test (Clause 9.3.4.3)				
Member	Top Rail		Lock Stile	
Span Length (L)	1080 mm		1420 mm	
Allowable Deflection (L x 0.3%) Length	2.40 mm		6.90 mm	
Test Pressure	Positive	Negative	Positive	Negative
	5400 Pa	5400 Pa	5400 Pa	5400 Pa
Net Residual Deflection	0.10 mm	0.01 mm	0.09 mm	0.01 mm
Post-test Details	After the test loads were released, the door was inspected and there was found to be no failure or permanent deformation of any part of the window system.			

The window system MET the minimum Uniform Load Structural Gateway performance requirements for Class LC at 1800 Pa by virtue of meeting the Optional Performance requirements at ±5400 Pa for Uniform Load Structural as specified in AAMA/WDMA/CSA 101/I.S.2/A440-17.

FORCED ENTRY RESISTANCE TEST

The window was installed into a wood test buck as supplied by the manufacturer. The test unit was subjected to a Grade 10 measured performance for a Type B window system in accordance with the procedure outlined in ASTM F588-17.

Grade 10 Load	Within 5 minutes, nothing was removed from the window and entry was not gained.
Disassembly Test	Within 5 minutes, nothing was removed from the window and entry was not gained.
Sash Manipulation Test	Within 5 minutes, entry was not gained.

The Dual Action Window system **met** the Grade 10 measured performance requirements of ASTM F588-17 for Forced Entry Resistance for Type B window and Clause 9.3.5 of NAFS-17.

SASH /LEAF CONCENTRATED LOAD ON LATCH RAIL

Tilt and Turn Panel				
	Perpendicular to Latch Rail		Parallel to Latch Rail	
Load Direction	1	2	1	2
Load Required	135N (30.35 lbf)	135N (30.35 lbf)	230N (51.71 lbf)	230N (51.71 lbf)
Deflection limit	1.5 mm	1.5 mm	3.3 mm	3.3 mm
Results	0.08 mm	0.07mm	1.01 mm	1.2 mm

The Dual Action Window **met** the performance requirements specified in Clause 9.3.6.4.3 of NAFS-17.

STABILIZING ARM LOAD TEST

Tilt and Turn Panel	
Target Position	Load
Top Right Corner	890 N (200 lbf)
Top Left Corner	890 N (200 lbf)
Center	1780 N (400 lbf)
Comments	No damage occurred to the hardware and the sash operated properly.

The Dual Action Window **met** the performance requirements specified in Clause 9.3.6.5.3 of NAFS-17.

INSECT SCREEN SERVICEABILITY TEST

After the test load was released, the screen was inspected and showed no signs of failure or permanent deformation.

The window system PASSED the performance requirements for Insect Screen Serviceability Test as outlined in CSA A440S1-17, Canadian Supplement

THERMOPLASTIC CORNER WELD TEST

The sample was loaded until the point of failure. The break line did not extend along the entire weld line. The system **met** the Thermoplastic Corner Weld Test performance requirements of NAFS-17.

SECTION 8

CONCLUSION

The Dual Action Window submitted by Polytech Products Ltd tested and described within this report, achieved the overall performance requirements of Class LC – PG75 when tested in accordance with NAFS-17, and A440S1-17.

Vinyl Dual Action Window
Class LC – PG75 – Size Tested 1200 x 1500 mm (47.24 x 59.05 in) – DAW

Secondary Designator
Positive Design Pressure = 3600 Pa (75.19 psf)
Negative Design Pressure = 3600 Pa (75.19 psf)
Water Penetration Resistance = 720 Pa (15.04 psf)
Canadian Air Leakage Resistance = A3