Test Report

Intertek Testing Services
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REPORT OF

PRODUCT EVALUATION

CONDUCTED ON A

WOODEN AWNING WINDOW

FOR

LATKO ENTERPRISES LTD.

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PREFACE

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INTRODUCTION

Intertek Testing Services NA Ltd./Warnock Hersey has conducted performance tests on a Wooden Awning Window system. Testing was conducted between November 3 and November 17, 2000. All tests were performed in accordance with the CAN/CSA-A440-98 test standard "Windows".

DESCRIPTION

Designation:	R 2001 Series Awning Window System
Type (general):	Double Glazed Wooden Framed, Awning Window
Frame:	The frame was made of Kiln Dried Douglas Fir Lumber. The corners were rabbet jointed, sealed with caulking (Schnee-Morehead Acryl-R 8200 Acrylic Latex Sealant) and stapled. Each corner was secured using six 38 mm (1-1/2 x 0.048") staples through the jambs. A D-Fir brickmould was attached to the mainframe head and jambs and was fastened using a 50 mm (2" x 0.071") steel brad every 300 mm (12") with the head mitres fastened to the jamb mitres using a single #8 x 50 mm (2") plated flathead woodscrew. Thermoplastic sealant (Mulco Flex 9000) was applied as a fillet bead between the backside of the brickmould to the mainframe. Both the mainframe and the sash frame were pre-finished using DRYVAC 1010 wood preservative. A D-Fir sash stop was attached to the interior perimeter of the mainframe and was secured from the exterior perimeter of the mainframe using #8 x 31.8 mm (1-1/4") plated flathead woodscrews spaced 200 mm (8") apart. The window system was attached to the test chamber through the jambs using two #12 x 3-1/2" wood screws per jamb, each located 150 mm (6") above the sill and 150 mm (6") below the head.
Overall Size:	1000 mm wide x 1000 mm high.
Locks and Hardware:	A painted steel sash hinge (Truth 13 Series Awning Hinge) was secured to either jamb to allow the awning sash vent to open 15° outward (90° with the roto-operator disconnected). Each hinge was secured to each jamb using seven #7 x 25 mm (1") painted flathead screws and each hinge was secured to each stile using five #7 x 25 mm (1") painted flathead screws. Two sash locks (Truth 16 Series Low Profile Sash Locks); each secured to each jamb 250 above the sill, secure the sash in the closed position. A foam gasket (complete with an outer housing adhesively attached to each sash lock) formed an airseal with each sash stile when closed and locked. Each sash lock was secured to the jamb using two #8 x 25mm (1") painted flathead screws. Each lock engaged a plated steel Truth keeper which was secured to each sash stile using two #7 x 25mm (1") painted flathead screws. A roto-operator (Truth 11 Series Dual Pull Awning Operator) was secured to the sill using six #7 x 25mm (1") painted flathead screws. Two painted steel snubbers (Truth 99 Series Concealed Snubber #31496) were installed at third points to the head and to the top rail to provide additional support against excessive deflection under windload conditions. The snubbers were secured using two #8 x 19mm (3/4") stainless steel panhead screws.
Sash:	The sash was made of Kiln Dried Douglas Fir lumber. The stile and rail corners were joined together using mortise and tenon joints, sealed with Schnee-Morehead Acryl-R 8200 Acrylic Latex Sealant and secured using two brads and two staples.
Size:	952 mm wide x 952 mm high.

DESCRIPTION - *continued*

Weatherstrip:	The outer perimeter of the sash was weatherstripped using a vinyl fin weatherstrip (Schlegal Polyflex PF-111). The meeting perimeter of the mainframe was weatherstripped with a vinyl jacketed foam filled, folding type weatherstrip (Schlegal Q-Lon AQ21). The head and sill weatherstrip was installed first and the jamb weatherstrip was installed second with each end mitre cut and half lapping over the head and sill weatherstrip. The weatherstrip was cut snug against each of the two sash locks (the airseal was bridged with the sash lock foam gaskets) with the weatherstrip overlapping the foam gasket approximately 1 mm on either side. The Q-Lon weatherstrip was secured to the mainframe using 15.8 mm (5/8" x 0.048") steel staples every 300 mm (12").
Drainage:	No drainage was provided. See test history in Appendix I.
Glazing Thickness:	The glazing unit consisted of two 3 mm glass panels (one being AFG Low-e glass) separated by a 12.7 mm aluminum spacer bar set upon two 3 mm thick vinyl setting blocks placed at quarter points. The spacer bar had a polyisobutylene primary airseal and a polysulphide secondary airseal. The glazing unit was filled with argon gas.
Glazing Method:	The sash utilized laid-in glazing attached using Dow Corning 1199 Silicone Sealant caulking and Douglas Fir interior glazing stops secured with brads every 200 mm. The glazing stops were sealed to both the sash frame and the glass.
Drawings:	A full set of drawings stamped "WH" are included in Appendix II of this report.

TEST RESULTS

1a. Air Tightness (Infiltration) Test

An air infiltration test was performed in accordance with ASTM E283-91 "Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Wall, and Doors under Specified Pressure Differences across the Specimen" using a test pressure of 75 Pa (equivalent to a wind velocity of 40 km/h). A Meriam Instrument Co. Laminar Flow Element Model No. 50MW20-2F, Serial No. 748930-2F and an 8" WC calibrated inclined manometer was used to measure the volume of air infiltration through the window.

Based on a corrected infiltration rate of 0.18 m^3/h and a crack length of 3.82 m, the air tightness rate was calculated to be 0.05 m^3/h-m.

1b. Air Tightness (Exfiltration) Test

An air exfiltration test was performed in accordance with ASTM E283-91 "Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Wall, and Doors under Specified Pressure Differences across the Specimen" using a test pressure of 75 Pa (equivalent to a wind velocity of 40 km/h). A Meriam Instrument Co. Laminar Flow Element Model No. 50MW20-2F, Serial No. 748930-2F and an 8" WC calibrated inclined manometer was used to measure the volume of air exfiltration through the window.

TEST RESULTS - *continued*

Based on a corrected exfiltration rate of 0.18 m^3/h and a crack length of 3.82 m, the air tightness rate was calculated to be 0.05 m^3/h-m.

The average measured air tightness was 0.05m^3/h-m. The maximum specified average air tightness (infiltration + exfiltration)/2 rate is 0.55 m^3/h-m for an A-3 rating.

Table 1

AIR TIGHTNESS

Maximum Air Tightness	
Window rating	**Rate $(m^3/h)m^{-1}$**
Storm	8.35 (max)
	5.00 (min)
A1	2.79
A2	1.65
A3	0.55
Fixed	0.25

2. 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*". An Air Flow Developments Type SJ-12 O"-12" vertical manometer was used to measure the test 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 700 Pa (14.6 psf) and a water spray rate of at least 204 L/m^2 per hour. The period consisted of four cycles of five minutes with the pressure applied and one minute with the pressure released.

During the 23 minute test period, no water leakage was observed. The window unit therefore meets a level B-7 performance rating.

Table 2

WATER TIGHTNESS

Window Rating		
For Use in Small Buildings	**For Use in Other Building**	**Test Pressure Differential (Pa)**
Storm	--	0
B1	B1	150
B2	B2	200
B3	B3	250 (300Pa for M98)
--	B4	400
--	B5	500
--	B6	600
--	B7	700

TEST RESULTS - *continued*

3. Wind Load Resistance

A uniform load test was conducted at the C-5 level (2000 Pa or 41.6 psf).

a) There was no breakage or deformation, which would impair the operation of the window.

b) The maximum deflection recorded from positive and negative pressure tests on the sash was 1.1 mm; the maximum allowable is 7.1 mm.

This window unit was then subjected to a Blow-out test using positive and negative pressures of 5000 Pa (104.0 psf).

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

This window unit meets a level C-5 Wind Load Rating.

Table 3

WIND LOAD RESISTANCE

Window rating		Test pressure, Pa	
For Use in Small Buildings	**For Use in Other Building**	**Sash Deflection (L/125)**	**Blowout**
Storm	--	--	750
C1	C1	500	1500
C2	C2	750	2000
C3	C3	1200	3000
--	C4	1600	4000
--	C5	2000	5000

TEST RESULTS - *continued*

4. Sash Strength and Stiffness

The deflection of the outer corner of the sash was 6.0 mm with a load of 60 N applied at the mid point of the sash in the closing direction with the window blocked open 45 . The specified maximum is 18.0 mm.

5. Ease of Operation

The force was applied to the roto-operator handle. The maximum force required to initiate motion of the handle was measured and found to be 21 N, the maximum specified is 60 N. The force required to maintain motion of the handle was measured and found to be 14 N, the maximum specified is 30 N.

6. Forced Entry Resistance

The test sample was subjected to a Forced Entry Test in accordance with ASTM F588-97 *"Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact."*

Hydraulic rams with hoses, pressure gauges, and pumps were calibrated prior to testing. A Soiltest proving ring S/N: 4435 was used to calibrate the hydraulic systems.

Lock Manipulation Test:

Test was performed at Grade 40 for T1 (10 min.)

Static Load and Locking Device Resistance Test:

Type B Window Assembly

Moveable Sash Portion

Test B1 A concentrated load of L2 (150 lbf) at Grade 40 was applied independently to both ends of the sash stile in a direction perpendicular to the plane of glazing in an opening direction.

Test B2 Test B1 was performed in conjunction with a load L1 (300 lbf) at Grade 40 at the end of the sash rail in a direction parallel to the plane of glazing to the short dimension of the window.

Test B3 Test B1 was performed in conjunction with a load L1 (300 lbf) at Grade 40 at the end of the sash stile in a direction parallel to the plane of glazing to the long dimension of the window.

Stationary Sash Portion

No stationary sash.

There was no breakage or permanent deformation observed when the sample was tested to performance Grade 40.

TEST RESULTS - *continued*

Mandatory Information

A1 SUGGESTED MEASURED PERFORMANCE

Load Identification	Grade 10	Grade 20	Grade 30	Grade 40
T_1	5 min.	5 min.	10 min.	10 min.
T_2	5 min.	5 min.	10 min.	10 min.
L_1	150 lbf (667 N)	200 lbf (890 N)	250 lbf (1112 N)	300 lbf (1334 N)
L_2	75 lbf (334 N)	100 lbf (445 N)	125 lbf (556 N)	150 lbf (667 N)
L_3	25 lbf (111 N)	35 lbf (156 N)	50 lbf (222 N)	65 lbf (289 N)

TESTING HISTORY

See Appendix I

CONCLUSIONS

The window unit described herein met the A-3 Air Tightness (A-3 Air Infiltration, A-3 Air Exfiltration), B-7 Water Tightness, C-5 Wind Load Resistance, Sash, Strength and Stiffness, Ease of Operation and Resistance to Forced Entry requirements (Grade 40) of CSA A440-98.

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APPENDIX I

Testing History

Date	Test	Event	Modification
Nov. 6, 2000	Water Tightness @ 150 Pa	Water leakage was observed at the upper left corner and upper right corner of the sash at the end of the 3rd and 4th test cycles respectively.	The polyflex dust shield along the top rail of the sash was not making full contact with the underside of the mainframe window head, The dust shield was replaced.
Nov. 6, 2000	Water Tightness @ 300 Pa	Water leakage was observed at the upper left corner of the sash at the end of the 2nd test cycle.	The machined-out groove along the top surface of the top rail was chiselled out around the snubber locations as well as at either end around the hinges. Each of these components were causing a damming effect which was preventing water from exiting. Also, a small opening at the upper left mortise and tenon joint was observed and sealed over using acrylic latex sealant and allowed to cure.
Nov. 7, 2000	Water Tightness @ 700 Pa	No water leakage was observed for the duration of the test.	A 6 mm diameter weephole was added through the sash bottom rail into the glazing cavity 50 mm from either end. Also, the ends of the vinyl dust shield were trimmed at each corner of the bottom rail.
Nov. 7, 2000	Water Tightness @ 700 Pa	Water leakage was observed along the bottom rail glazing stops.	The glazing stops were removed and replaced with new stops. The stops were caulked to both the glass and the sash frame (as well as each stop mitre joint) using Dow Corning 1199 silicone sealant.
Nov. 7, 2000	Water Tightness @ 700 Pa	No water leakage was observed for the duration of the test.	