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EVALUATION CENTER

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RENDERED TO

**Shanghai Yirong Door & Window
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**No.750 Waiqinsong Road, Jiading District,
Shanghai, China**

PRODUCT EVALUATED

Aluminum Casement Window
Model: SHYR50-1

EVALUATION PROPERTY

Deflection Test, Operating Force Test, Air Infiltration Test,
Water Penetration Resistance Test, and Ultimate Strength Test

Report of Testing an Aluminum Casement Window, model of SHYR50-1 for compliance with the applicable requirements of the following criteria: AS 2047-1999 "Windows in buildings selection and installation", AS 4420.2-1996 "Windows—Methods of test, Method 2: Deflection test", AS 4420.3-1996 "Windows—Methods of test, Method 3: Operating force test", AS 4420.4-1996 "Windows—Methods of test, Method 4: Air infiltration test", AS 4420.5-1996 "Windows—Methods of test, Method 5: Water penetration resistance test", AS 4420.6-1996 "Windows—Methods of test, Method 6: Ultimate strength test".

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2 Introduction

Intertek has conducted testing for Shanghai Yirong Door&Window Installation&Design Co., Ltd. on an aluminum casement window, model of SHYR50-1 to evaluate deflection test, operating force test, air infiltration test, water penetration resistance test and ultimate strength test. Testing was conducted in accordance with AS 2047-1999 specifications and use standard method of:

- AS 4420.2-1996 *"Windows — Methods of test, Method 2: Deflection test"*
- AS 4420.3-1996 *"Windows — Methods of test, Method 3: Operating force test"*
- AS 4420.4-1996 *"Windows — Methods of test, Method 4: Air infiltration test"*
- AS 4420.5-1996 *"Windows — Methods of test, Method 5: Water penetration resistance test"*
- AS 4420.6-1996 *"Windows — Methods of test, Method 6: Ultimate strength test"*

This evaluation began on August 10, 2011 and was completed on August 18, 2011.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing. Samples were received at the Evaluation Center on August 8, 2011.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

A full scale sample of Aluminum Casement Window was provided by the manufacturer that was not weathered nor conditioned.

Table1. Product Information

| | |
|---------------------------|--|
| Dimension of Window Frame | 500 mm (wide) × 600 mm (high) x 55 mm (thick) |
| Dimension of Window Sash | 466 mm (wide) × 566 mm (high) x 50 mm (thick) |
| Aluminum Profile | Type: 50 Series Manufacturer: Guangdong Fenglv Aluminum Co., Ltd. |
| Glazing | Double insulated glass with nominal structure: 5 mm Tempered Glass + 9 mm Air + 5 mm Tempered Glass Size: 350 mm (wide) x 450 mm (high) x 19 mm (thick) Supplier: Shanghai Yaohua |
| Handle | Type: TG54221 Supplier: German ROTO Company |
| Friction Stay Hinge | Material: 304 Stainless Steel Type: DG876Y-1 Supplier: German ROTO Company |
| Drainage | 2 drain holes (8 mm width) without covers, 70 mm from left and right frame. |
| Weather Strip | Material: EPDM Type: YT20011-N Supplier: Shanghai Yajun Building Product Co., Ltd. |
| Sealant of Glass: | Material: Neutral silica gel Type: SU0056 Supplier: Dow Corning (Zhangjiagang) Silicone Co., Ltd. |

The sample ID number was S1108081.001. The drawing of the representative sample was included in Appendix A.

4 Testing and Evaluation Methods

4.1. DEFLECTION TEST

The Deflection Test was conducted in accordance with AS 4420.2-1996. The pressure was applied to test specimen in not less than four approximately equal increments until the test pressure was reached; first to the exterior surface (positive) and then to the interior surface (negative). The load duration was held for at least 1 minute at each pressure increment. The test specimen was evaluated for deflection during load, and was evaluated for permanent deflection after differential pressure removed for 2 minutes. No structure members in a completely assembled and glazed window should deflect by an amount greater than span/150 when the specimen was tested at the serviceability design wind pressure specified in Table 2.2 in AS 2047-1999.

4.2. OPERATING FORCE TEST

The Operating Force Test was conducted in accordance with AS 4420.3-1996. For the casement window, the forces were applied the fixed at handle position; and forces to initiate the handle and sash in motion and to maintain the motion should be recorded. The test force should be not great than the value of windows specified in Table 2.2 in AS 2047-1999.

4.3. AIR INFILTRATION TEST

The Air Infiltration Test was conducted in accordance with AS 4420.4-1996. The test was performed using positive and negative differential pressures of 75 Pa and 150 Pa. The air infiltration rates through the specimen should be determined. The air infiltration should not exceed the value specified in Table 2.3 in AS 2047-1999.

4.4. WATER PENETRATION RESISTANCE TEST

The Water Penetration Resistance Test was conducted in accordance with AS 4420.5-1996. The test specimen was subjected to water sprayed uniformly and continuously over the exterior face of the test specimen at a rate not less than 0.05 L/m².s. At the start of test, the water sprays should operate for 5 minutes with zero air pressure; and then the test pressures specified in Table 24 in AS 2047-1999 was applied and maintained for 15 minutes with the water sprays still operating. During the test sequence, there should be no uncontrolled water penetration observed.

4.5. ULTIMATE STRENGTH TEST

The Ultimate Strength Test was conducted in accordance with AS 4420.6-1996. The ultimate strength test pressure specified in Table 2.5 in AS 2047-1999 was increased smoothly and was applied to the test specimen for 10 seconds in both positive and negative direction. The test specimen should not collapse when subjected to the ultimate strength pressure, and was evaluated for permanent damage after loading.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The test results are summarized in Table 2 below. A more comprehensive set of test data is included in Appendix B.

Table 2. Test Results

| Test Description | Test Result | Verdict |
|------------------------|---|---------|
| Deflection Test | Serviceability design wind pressure: 3000 Pa Window rating: N6 | Pass |
| Operating Force Test | Initial movement: 35 N (Rotation of Handle); 39 N (Pull of Sash); Sustain movement: 18 N (Rotation of Handle); 22 N (Pull of Sash). | Pass |
| Air Infiltration Test | +75 Pa: 0.162 L/s·m ² ; -75 Pa: 0.195 L/s·m ² ; +150 Pa: 0.390 L/s·m ² ; -150 Pa: 0.260 L/s·m ² Window type: Airconditioned | Pass |
| Water Resistance Test | Test Pressure: 450 Pa Window rating: N6 | Pass |
| Ultimate Strength Test | Test Pressure: 4500 Pa Window rating: N6 | Pass |

5.1.1. Statement of Measurement Uncertainty

When determining the test result, measurement uncertainty has been considered.

6 Conclusion

The Aluminum Casement Window, model of SHYR50-1 identified in this report has been tested in accordance with deflection test, operating force test, air infiltration test, water resistance test, and ultimate strength test requirements as per AS 2047-1999.

The test specimen met the requirements for window rating of N6 for deflection test, operating force test, window type of airconditioned for air infiltration, window rating of N6 for water resistance test, and window rating of N6 for ultimate strength test as per AS 2047-1999.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

Reported by:



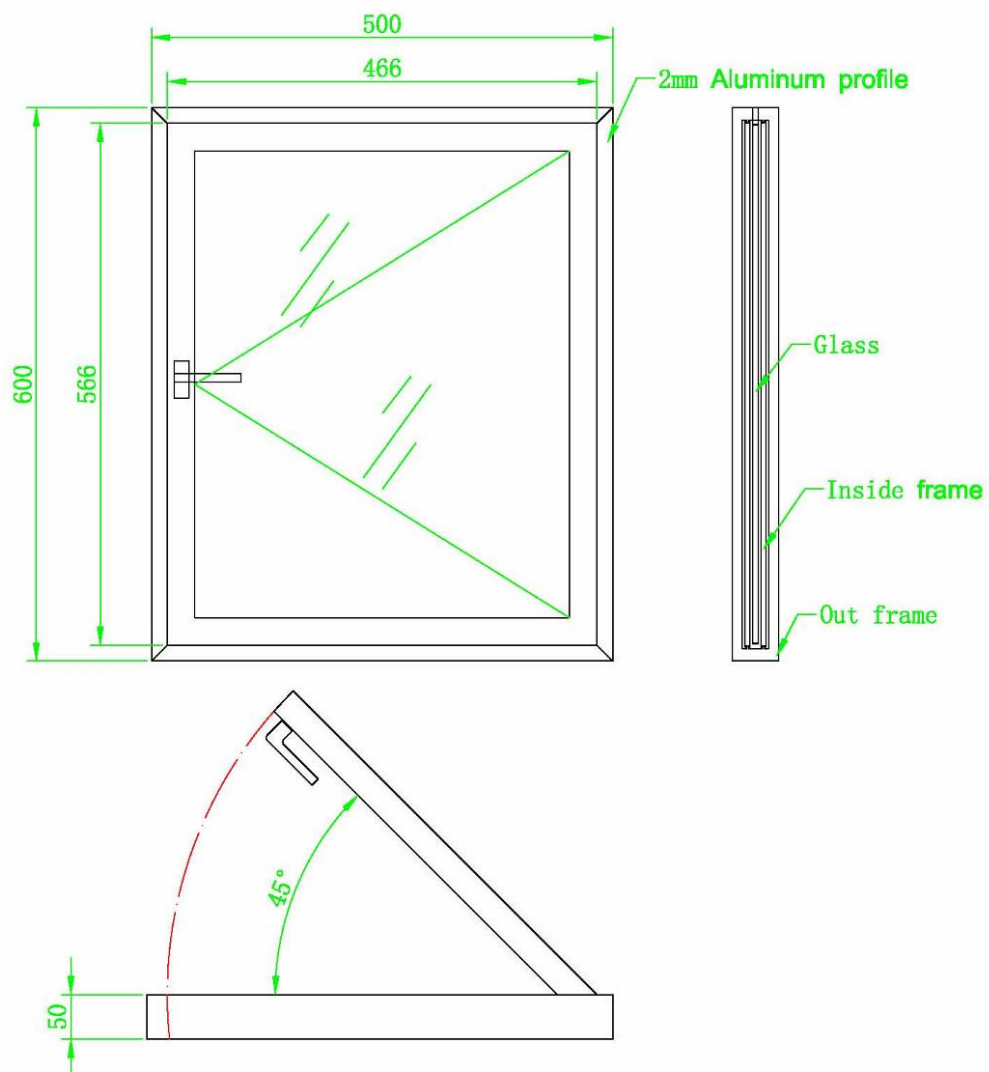
Alex Gu
Engineer, Building Products

Reviewed by:



Fred Bao
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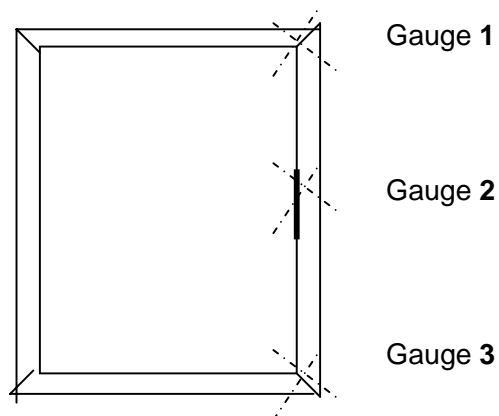
7 Appendix A: Sample Drawing



8 Appendix B: Test Data

1. Deflection Test – Test method AS4420.2-1996

- Span length, $L = 540$ mm
- Maximum allowable deflection = $\text{Span} / 150 = 3.6$ mm
- Test Pressure (Serviceability design wind pressure), $P = 3000$ Pa



(1, 2, and 3 are locations of gauges)

Table 3. Test Data of Deflection Test

| Member (mm) | | Pressure (Pa) | Deflection (mm) | | | Frontal Deflection (mm) | Maximum allowable deflection (mm) | Verdict |
|-------------|-------------|---------------|-----------------|-----|-----|-------------------------|-----------------------------------|---------|
| Item | Span Length | | 1 | 2 | 3 | | | |
| Mullion | 540 | +P/4 = 750 | 0.1 | 0.1 | 0.2 | 0.1 | 3.6 | Pass |
| | | +2P/4 = 1500 | 0.1 | 0.3 | 0.4 | 0.1 | | |
| | | +3P/4 = 2250 | 0.3 | 0.5 | 0.6 | 0.1 | | |
| | | +P = 3000 | 0.5 | 0.8 | 1.0 | 0.1 | | |
| | | 0 | 0.1 | 0.1 | 0.1 | 0.0 | | |
| Mullion | 540 | -P/4 = -750 | 0.1 | 0.1 | 0.2 | 0.1 | 3.6 | Pass |
| | | -2P/4 = -1500 | 0.1 | 0.2 | 0.2 | 0.1 | | |
| | | -3P/4 = -2250 | 0.2 | 0.3 | 0.5 | 0.1 | | |
| | | -P = -3000 | 0.3 | 0.5 | 0.6 | 0.1 | | |
| | | 0 | 0.1 | 0.1 | 0.1 | 0.0 | | |

2. Operating force test – Test method AS4420.3-1996

Table 4. Test Data of Operating Force Test

| Force | Rotation of Handle | Pull of Sash | Maximum allowable | Verdict |
|-------------------------|--------------------|--------------|-------------------|---------|
| To initial movement (N) | 35 | 39 | 110 | Pass |
| To sustain movement (N) | 18 | 22 | 90 | Pass |

3. Air infiltration test – Test method AS4420.4-1996

- Overall area: 0.300 m²

Table 5. Test Data of Air Infiltration Test

| | | |
|-------------------------|--|--------------------------|
| Test pressure of 75 Pa | Infiltration rate (positive direction) | 0.162 L/s·m ² |
| | Exfiltration rate (negative direction) | 0.195 L/s·m ² |
| | Average air leakage rate | 0.179 L/s·m ² |
| | Maximum allowable air infiltration (Window type: Non-airconditioned) | 1.0 L/s·m ² |
| Test pressure of 150 Pa | Infiltration rate (positive direction) | 0.390 L/s·m ² |
| | Exfiltration rate (negative direction) | 0.260 L/s·m ² |
| | Average air leakage rate | 0.325 L/s·m ² |
| | Maximum allowable air leakage (Window type: Non-airconditioned) | 1.6 L/s·m ² |

4. Water resistance test – Test method AS4420.5-1996

Water penetration: When water sprayed for 15 minutes at 450 Pa, no uncontrolled water penetration was observed.

Test result:

P_{max} = 450 Pa

Window Rating: N6

5. Ultimate strength test – Test method AS4420.6-1996

Window rating: N6

Required ultimate strength test pressure: 4500 Pa

Test Pressure: $P = 4500 \text{ Pa}$

Test result:

The window was not collapsed when subjected to both positive and negative ultimate strength of 4500 Pa.

No significant breakage, permanent deformation, or operational malfunction after ultimate strength was released.

9 Revision Page

| Revision No. | Date | Changes | Author | Reviewer |
|--------------|-----------------|-------------|---------|----------|
| 0 | August 22, 2011 | First issue | Alex Gu | Fred Bao |
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