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Assignment Report

Testing of a Viking tophung reversible window

Air tightness
Rain tightness
Resistance to wind load

Summary

Norwegian Building Research Institute's (Byggforsk's) laboratory in Trondheim has on commission from Viking Window AS tested the air tightness, rain tightness and resistance to wind load for a tophung reversible window.

The air leakage was 1.4 m³/m²h and 0.54 m³/mh at 600 Pa static positive pressure when testing according to EN 1026. At 300 Pa negative pressure the air leakage was 1.4 m³/m²h and 0.6 m³/mh. The window fulfils class 4 according to EN 12207 for positive pressure and class 2 for negative pressure. The window shall be classified as the average.
The window fulfils class 3 according to EN 12207.

No leakage was observed during rain tightness testing.
The window fulfils class E1500 according to EN 12208.

The tested window's resistance to wind load is classified in class 3C according to EN 12210.
The wind load classification is valid for windows with area 2.2 m² and smaller sizes.

Address of the building			Built (year)
	Method	Keywords Vindu Styrke Tetthet Luftlekkasje Tre	Filename O21364 Viking tophung reversible windowc

1. INTRODUCTION

Norwegian Building Research Institute's (Byggforsk's) laboratory in Trondheim has on commission from Viking Window AS tested the air tightness, rain tightness and resistance to wind load for a tophung reversible window.

2. PRODUCT DESCRIPTION

The products arrived at Byggforsk, Trondheim, 20.10.06 with arrival no. 207/06. Drawing and product information is found in the appendixes.

Manufacturer:	Viking Window AS
Product:	Tophung reversible window
Material:	Pine
Window type:	Outward opening, horizontally sliding, two hinges
No. of hinges:	2
No. of fasteners:	2
Type of fastener:	Espagnolette
Drainage system:	Glazing rebate drained using raised glazing bead
Surface treatment:	Painted
Dimensions (mm):	1360 x 1630
Functioning prior to test:	Good

3. TESTING

3.1 General

The testing was performed in Byggforsk's laboratory in Trondheim 23.10 and 24.10.2006.
Indrek Rüütel and Villo Jüris from the manufacturer witnessed the testing.

3.2 Air permeability

Air permeability testing was performed by use of Byggforsk's air permeability chamber according to EN 1026, applying external static positive and negative pressure differences across the test section. By calculation of the air leakage of the specimen, the results are adjusted for the air leakage of the test chamber. The air leakage is reported in m^3/m^2h for the overall area of the window and in m^3/mh for the length of the opening joints. The window area is calculated from the outer dimensions of the frame. The joint length is calculated from the outer dimensions of the sash.

3.3 Resistance to wind load

Resistance to wind load was measured with the window mounted in Byggforsk's air permeability chamber according to EN 12211. Testing was done with pressure levels defined in class 3. Deflection was measured at 1200 Pa positive and negative pressure. The window was exposed to 50 cycles at 600 Pa positive and negative pressures. Finally a safety test at 1800 Pa positive and negative pressure was performed. Picture 3.3.1 shows the test apparatus. Deflections were measured for the top frame and the threshold.

3.4 Rain tightness

The rain tightness testing was carried out in Byggforsk's driving rain chamber in accordance with EN 1027. During the testing, water is sprayed against the specimen by a row of nozzles horizontally spaced at 400 mm. Each nozzle gives 2.0 l/min. The nozzle angle is 24° so that the top joint is exposed to water spraying. After an initial period of 15 min with water spraying and no air pressure, the air pressure difference is increased in 14 steps up to a maximum static pressure of 1500 Pa. Each pressure step lasts for 5 minutes. Any leakages are detected by observation of the internal window face during testing.

Picture 3.3.1 Testing of resistance to wind load

4. RESULTS

4.1 Air tightness

Measured air leakage for external positive pressure on the window is shown in the table and the figure below.

Table 4.1.1 Measured air leakage per area and per joint length compared to allowed leakage for class 4 according to EN 12207

Pressure	Pa	50	100	150	200	250	300	450	600
Allowed pr area	m^3/m^2h	1,9	3,0	3,9	4,8	5,5	6,2	8,2	9,9
Measured negative pressure	m^3/m^2h	0,5	0,5	0,8	1,0	1,2	1,4	41,4	95,3
Measured positive pressure	m^3/m^2h	0,3	0,5	0,6	0,8	0,9	1,0	1,2	1,4
Average pr area	m^3/m^2h	*0,4*	*0,5*	*0,7*	*0,9*	*1,1*	*1,2*	*21,3*	*48,3*
Allowed pr length of joints	m^3/mh	0,47	0,75	1,0	1,2	1,4	1,6	2,0	2,5
Measured negative pressure	m^3/mh	0,12	0,21	0,30	0,4	0,5	0,6	16,3	37,6
Measured positive pressure	m^3/mh	0,11	0,19	0,24	0,30	0,35	0,39	0,47	0,54
Average pr length of joints	m^3/mh	*0,11*	*0,20*	*0,27*	*0,35*	*0,42*	*0,48*	*8,39*	*19,06*

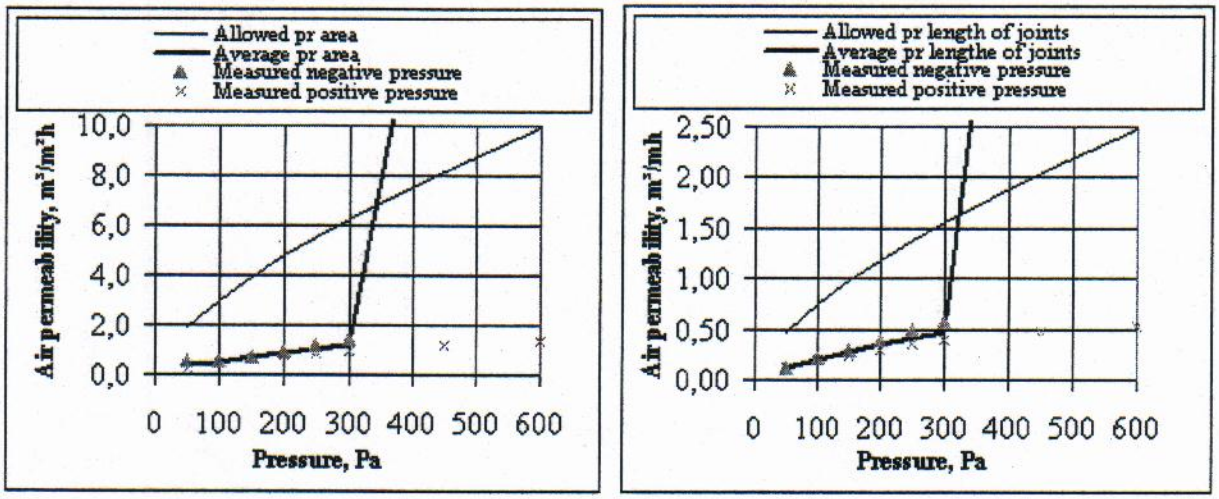


Figure 4.1.1 Measured air leakage per area and per joint length compared to allowed leakage for class 4 according to EN 12207

4.2 Resistance to wind load

The table below shows results from resistance to wind load testing according to EN 12211.

Table 4.2.1 Measured deflection during resistance to wind load testing according to EN 12211

Pressure level	Top frame Measured deflection (mm)	Top frame Relative deflection (deflection/ frame width)	Threshold Measured deflection (mm)	Threshold Relative deflection (deflection/ frame width)
1200 Pa Positive pressure	1.3	0.001	1.2	0.001
1200 Pa Negative pressure	0,1	0.000	0,1	0.000

Cycling of the pressure and the safety test did not result in any damages to the window.

4.3 Rain tightness

Table 4.2.1. Rain tightness, testing according to EN 1027 method A

Overpressure (Pa)	Time (min)	Observations
0	15	No leakages observed
50	5	No leakages observed
100	5	No leakages observed
150	5	No leakages observed
200	5	No leakages observed
250	5	No leakages observed
300	5	No leakages observed
450	5	No leakages observed, but one drop of water visible in the lower left corner at the weather seal.
600	5	No leakages observed
750	5	No leakages observed, bur one drop of water visible in the lower right corner at the weather seal.
900	5	No leakages observed
1050	5	No leakages observed, but one more drop of water observed in the lower left corner
1200	5	No leakages observed
1350	5	No leakages observed
1500	5	No leakages observed

By reference to the product's right or left side in the table, the definition is into the product's interior side

5. Comments

5.1 Air tightness testing

The window fulfils class 4 according to EN 12207 for positive pressure and class 2 for negative pressure. The window shall be classified as the average. The window fulfils class 3 according to EN 12207.

Byggforsk's recommendation for air tightness is class 4 according to EN 12207.

5.2 Resistance to wind load

The tested window's resistance to wind load is classified in class 3C according to EN 12210. The test results are only valid for windows with area 2.2 m² and smaller sizes.

5.3 Rain tightness

The tested window fulfils class E1500 according to EN 12208. This is six classes better then Byggforsk's recommendation for rain tightness. Byggforsk's recommendation is class 9A, no leakages at 600 Pa pressure.

6. Conclusion

The tested window fulfils air tightness class 3 according to EN 12207.

The tested window's resistance to wind load is classified in class 4C according to EN 12210.

The tested window fulfils rain tightness class E1500 according to EN 12208.

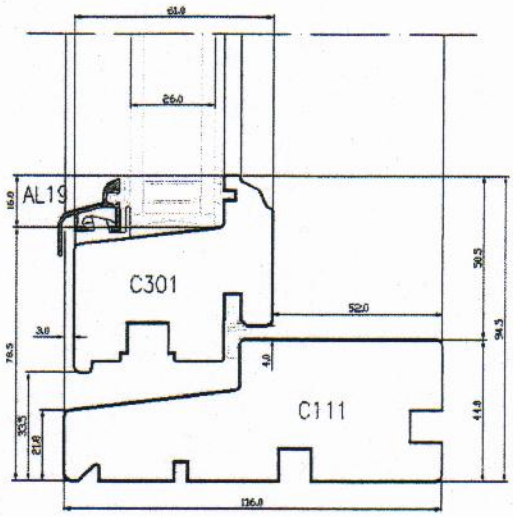
Trondheim, 13.11.2006
Norwegian Building Research Institute

Birgit Risholt

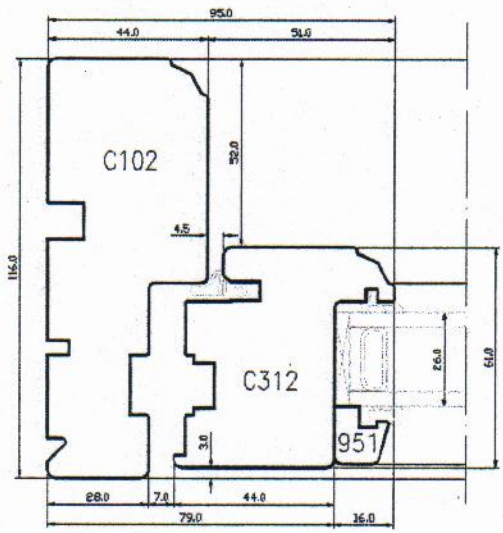
Birgit Risholt

Appendix 1

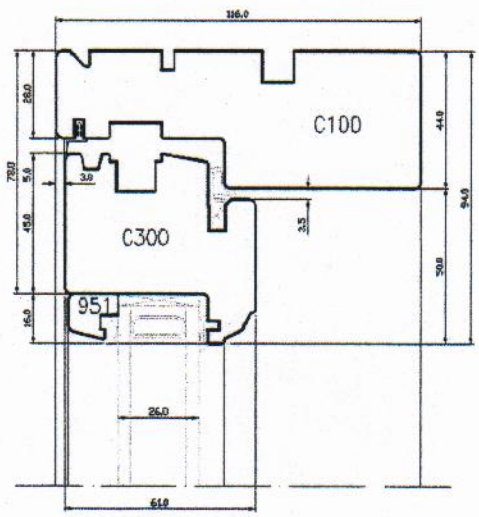
SIDEHUNG AND TOPHUNG REVERSIBLE WINDOW



TOPHUNG REVERSIBLE WINDOW



TOPHUNG REVERSIBLE WINDOW



Appendix 2

Viking Window AS

PRODUCT DESCRIPTION

2) COMBI 500 TOPHUNG REVERSIBLE WINDOW

Opening: tophung, reversible sash; opens outside

Width: 1 360 mm
Height: 1 630 mm

Glazing: double glass sealed unit; 26mm (2K4 + 4PltFut; 18mm space between)
width of glass 1 360 – 164 mm
height of glass 1 630 – 164 mm

Wooden parts: vacuum impregnated laminated pine; PVAC glue used for lamination and for mounting of details

Hinges: PN Peslag COMBI 500
Fix S1801 espagnolette

Handle: Fix 83 (inside)

Additional equipment: sealing stripe in upper cap between frame and sash

Weathersealing: Trelleborg EPDM 19mm sash sealing

Additional sealing: Deventer TPE glazing sealings

Mounting of glass: from outside; additional silicone used as glue