

IANBENNIE AND ASSOCIATES

TEST REPORT NO. 6044-S3-NZ-2014
ZENDOW UPVC INWARD TILT-TURN
WINDOW
PROTOTYPE TEST to NZS 4211-2008

for

DECEUNINCK

March 2019



Accreditation No. 2371
Accredited for compliance with ISO/IEC 17025 - Testing

TEST RESULTS

Serviceability Deflection Test

Deflections recorded:

	Requirement span/200	
Pressure (Pa)	+3010	-3000
MULLION		
Deflection	Span/210	Span/213
SASH STILE		
Deflection	Span/537	Span/456

All test readings and calculated deflections are given in Table 1 and measurement locations are indicated on Figure 1.

Air Leakage Test

Air Leakage Recorded (L / s.m ²)	Pressure Applied (Pa)	
	+150	-150
Condition		
Chamber & Sample (A):	0.40	-0.40
Chamber (sample taped) (B):	NR	NR
Sample (A-B):	0.40	-0.40

Sash joint length: 3.96 m		
Air Leakage Recorded (L / s.m of joint)	0.18	-0.18

NR: measurement not required

Water Leakage Test 450 Pa

No water was observed during the test.

Water Leakage Test 600 Pa

Water penetrated from behind the hinge at the bottom RH corner of the sash during the test, which constitutes a failure.

Overall Strength Test: ±4500 Pa

No sign of collapse was observed at either test pressure.

CONCLUSION

The Zendow UPVC Inward Tilt-Turn Window sample achieved the following ratings per NZS4211:2008 Amd 1 for Serviceability Deflection, Air Infiltration, Water Penetration and Ultimate Strength.*

For buildings not requiring specific design

Window Rating (SLS) VERY HIGH Wind Zone‡
Window Rating (ULS) ... EXTRA HIGH Wind Zone
Air Leakage Air conditioned

For buildings requiring specific design

Window rating for SLS+1500‡ and -3000 Pa
Window rating for ULS+4500 and -4500 Pa
Air Leakage Air conditioned

‡ limited by water leakage test result

* Torsional tests and Operating Resistance force tests were not requested by the Client.

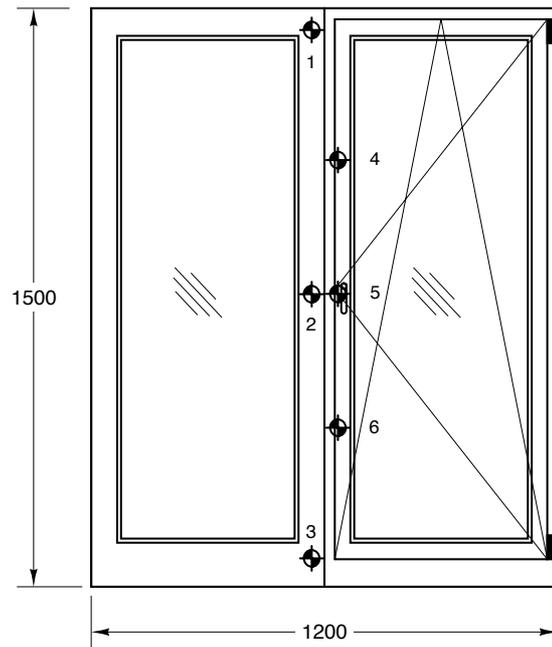


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INDOOR VIEW



Displacement measurement locations:

1. Mullion - top
2. Mullion - centre
3. Mullion - bottom
4. Door Stile - top at lock
5. Door Stile - centre
6. Door Stile - bottom at lock

Figure 1. Indoor view of the test sample showing the displacement measurement locations.

Table 1

STRUCTURAL PERFORMANCE

DATAFILE 537		TEST NUMBER 1			DATE : 07/06/2006		
MEMBER	PRESSURE (kPa)	DISPLACEMENTS (rounded to 0.1 mm)			BENDING DEFLECTION (rounded to 0.01 mm) DC - $\frac{D1+D2}{2}$ DEF (mm)	SPAN L (mm)	SDR L/DEF
		LEFT OR TOP D1 (mm)	CENTRE DC (mm)	RIGHT OR BOTTOM D2 (mm)			
1,2,3	MULLION						
	0.60	0.3	1.3	0.2	1.06	1400	1322
	1.51	0.8	3.9	0.8	3.08		455
	1.80	1.1	4.9	1.1	3.81		368
	2.22	1.6	6.3	1.4	4.77		293
	2.51	1.9	7.4	1.8	5.53		253
	3.01	2.5	9.1	2.3	6.66		210
	0.00	0.4	0.3	0.6	-0.15		-9308
	-0.60	-0.2	-1.2	-0.2	-1.01		-1382
	-1.50	-0.4	-3.5	-0.7	-2.98		-470
	-2.20	-0.8	-5.6	-1.2	-4.67		-300
	-2.56	-1.0	-6.8	-1.5	-5.57		-252
	-3.00	-1.2	-8.1	-1.8	-6.57		-213
	-0.00	-0.3	-0.5	-0.5	-0.11		-13321
4,5,6	SASH STILE						
	0.60	1.1	1.1	0.4	0.34	694	2019
	1.51	3.5	3.3	1.6	0.70		993
	1.80	4.7	4.2	2.2	0.76		918
	2.22	5.9	5.4	3.0	0.97		713
	2.51	6.9	6.4	3.7	1.05		658
	3.01	8.6	7.9	4.6	1.29		537
	0.00	0.5	0.6	0.6	0.05		15210
	-0.60	-1.0	-1.0	-0.4	-0.32		-2147
	-1.50	-3.1	-3.0	-1.3	-0.79		-880
	-2.20	-5.0	-4.9	-2.3	-1.16		-597
	-2.56	-6.1	-5.8	-2.9	-1.31		-529
	-3.00	-7.3	-6.9	-3.5	-1.52		-456
	-0.00	-0.5	-0.5	-0.5	0.01		96389

APPENDIX A - Test Procedures for NZS 4211:2008 - Amd 1

1Preparation for Tests - AS4420.1-1996

Test Description

Prior to commencement of the main tests listed below, any operable windows or doors are to be opened and close five (5) times. The sample is to be subject to positive or negative wind pressures being 50% of the nominated deflection test pressures. This is a pre-requirement for each of the main tests. However, when more than one of the tests is to be conducted the preparations need only be conducted once.

2Serviceability Deflection Test - AS4420.2-1996

Test Description

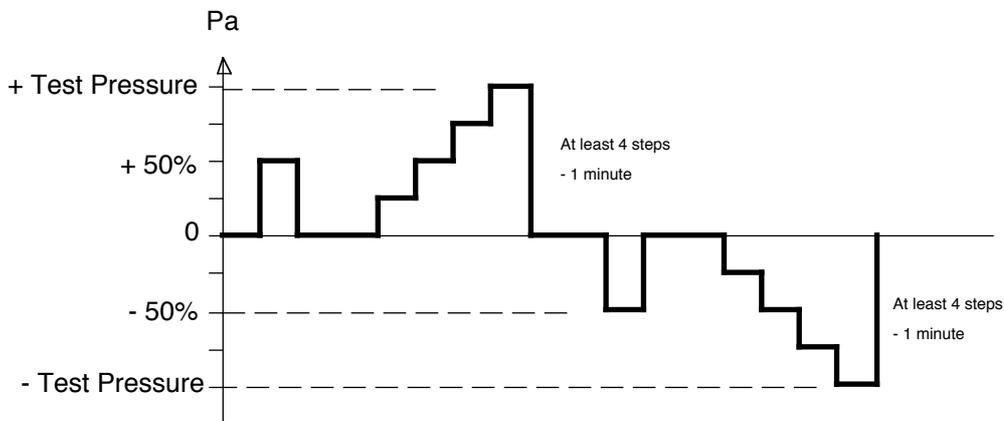
Measurements of movement of critical structural members are taken at a range of test pressures in order to determine if the bending of the members exceed the nominated requirements.

NZ Test Parameters

Test Pressure: is dependent on the Window Rating –

Window Rating	Test Pressure (Pa)
Low	±510
Medium	±680
High	±970
Very High	±1250
Extra High	±1515

Test pressure steps: as given below



Pass / Fail criteria:

Maximum deflection for structural members: 1/200 of span.

3Operating Force Test : AS4420.3-1996

Test Description

The forces required to operate sliding doors and windows are measured to test compliance with the requirements.

NZ Test Parameters

Test measurements: The forces required to initiate and sustain movement of the door/sash in both directions of movement are recorded.

Pass / Fail criteria : Forces shall not exceed the following

Force (Newtons)	Projecting sashes	Sliding window type		Sliding doors
		Horizontal	Vertical	
To initiate movement	90	110	200	180
To sustain movement	90	90	160	110

4Operation Resistance Test - per Section 7.1 and 7.2 of NZS 4211

Test Description

Small forces are applied to operable sashes to determine if they move too freely.

Test Parameters

Test loads: Vertical Sliding Sashes: 10 N upward and downward.
Projecting Sashes: Force = (35 x Area of Sash in m²) N, inward and outward at all angles of opening.

Pass / Fail criteria : The position of the sash shall not change when subjected to the force.

5Air Infiltration Test - AS4420.4-1996

Test Description

Air leakage through the entire test sample is measured at the nominated pressures in order to determine if it exceeds the allowable rate.

NZ Test Parameters

Pass / Fail criteria : Maximum air infiltration shall not exceed the following:
Fixed Windows: Value shown on the table for “Per m² of Sample”.
Windows Containing Sashes: Value is the geometric mean of the respective calculated infiltration rates for both the “Per m² of Sample” and “Per m of opening joint length” in the table.

Rate of air infiltration	Litres per second (L/s)	
	Air conditioned	Non air conditioned
Per m ² of Sample	1.6	8.0
Per m of opening joint length	0.6	2.0

6Water Penetration Resistance Test - AS4420.5-1996

Test Description

Water is sprayed onto the outdoor face of the test sample with air pressure simultaneously being applied across it to determine if unacceptable water leakage occurs.

NZ Test Parameters

Test pressure : The test pressure is dependent on the rating:

Window Rating	Test Pressure (Pa)
Low	153
Medium	204
High	291
Very High	375
Extra High	455
Specific Design	30% of SLS

Test duration: The test pressure shall be maintained for 15 minutes.

Water application rate : 0.05 litre per second per square metre of sample area.

Pass / Fail criteria :

The window shall be designed to permit no uncontrolled water penetration through the window at a static positive air pressure.

Uncontrolled water penetration is defined as-

- (a) water that is not contained in a purpose-built drainage area;
- (b) water that may wet window fixtures and finishes, reveal linings or window furnishings beyond the window frame; or
- (c) water that flows in a constant stream on the inside, or dripping.

Acceptable water penetration is defined as-

- (a) minor splashing which occurs due to air infiltration, within 1 mm after change of pressure;
- (b) minor, intermittent leakage on the indoor side of operable sashes, which is contained on gaskets, sill tracks and thresholds.

A purpose built collection or drainage area is defined as a system that allows water to collect or be drained to the outside (at the cessation of testing) from sills, other framing members or cavities.

7Ultimate Strength Test - AS4420.6-1996

Test Description

Air pressure greater than the design pressure is applied across the test sample in order to demonstrate that it has a suitable structural safety margin.

NZ Test Parameters

Test Pressure: is dependent on the Window Rating -

Window Rating	Test Pressure (Pa)
Low	±720
Medium	±960
High	±1360
Very High	±1760
Extra High	±2130
Extreme	±2500

Pass / Fail criteria:

Windows shall not collapse when subjected to the test pressures for a period of ten (10) seconds. Collapse is defined as any one, or any combination, of the following:

- (a) Dislodgement or breaking of any glazing.
- (b) Dislodgment of a frame or any part of a frame.
- (c) Dislodgement of a sash from its frame.
- (d) Loss of support of a frame, such as when it is unstable in its opening in the building structure.
- (e) Failure of any sash, locking device, fastener or supporting stay allowing an opening light to open.

8Torsional Strength of Sashes - per Appendix A of NZS 4211

Test Description

Projecting sashes are tested with a torsional load to provide an indication of the likely smoothness of operation.

Test Parameters

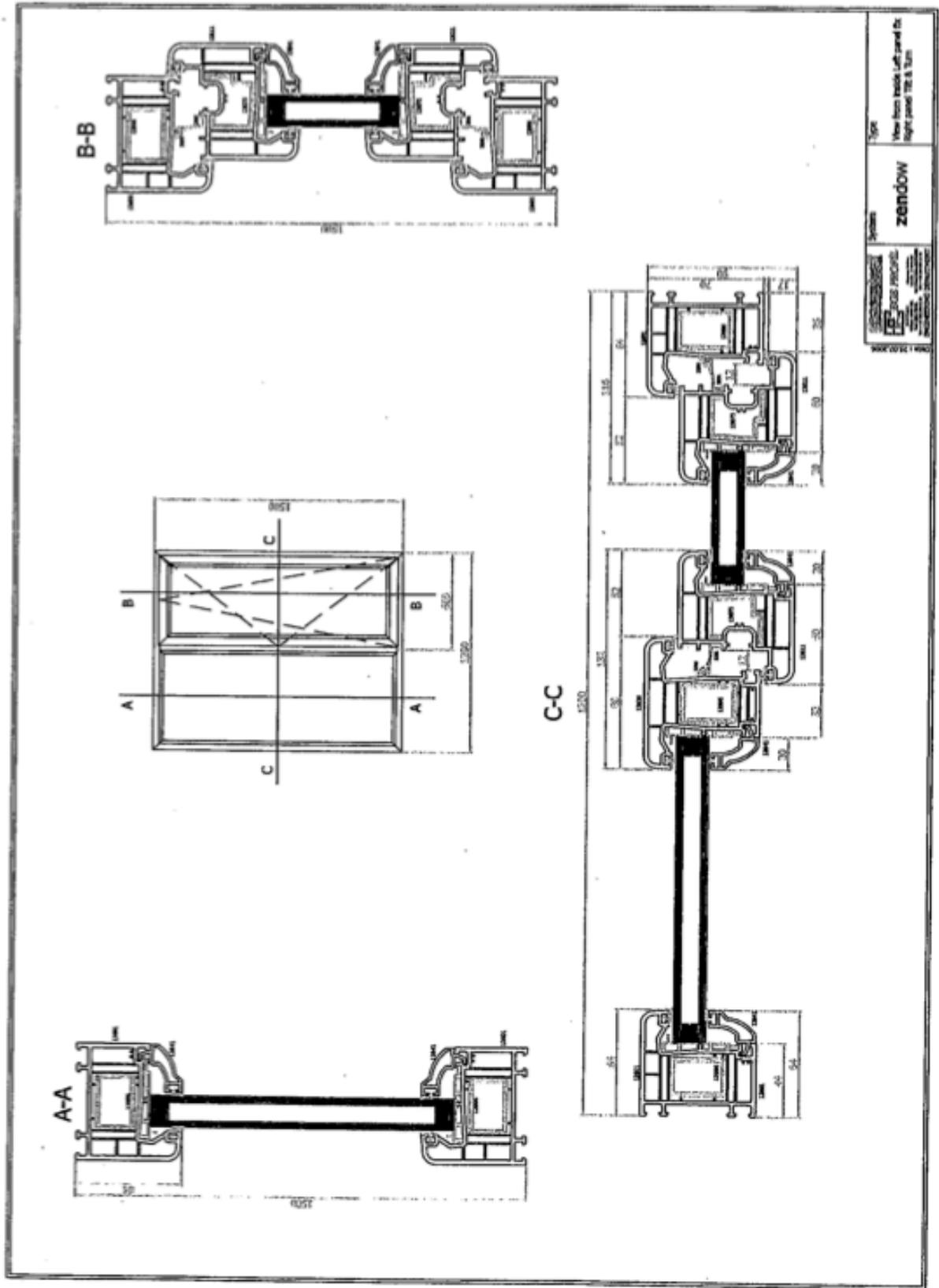
Test Load: a load of 45 N is applied at one corner of the sash in both directions, perpendicular to the plane of the sash, while the other three corners of the sash are held in plane.

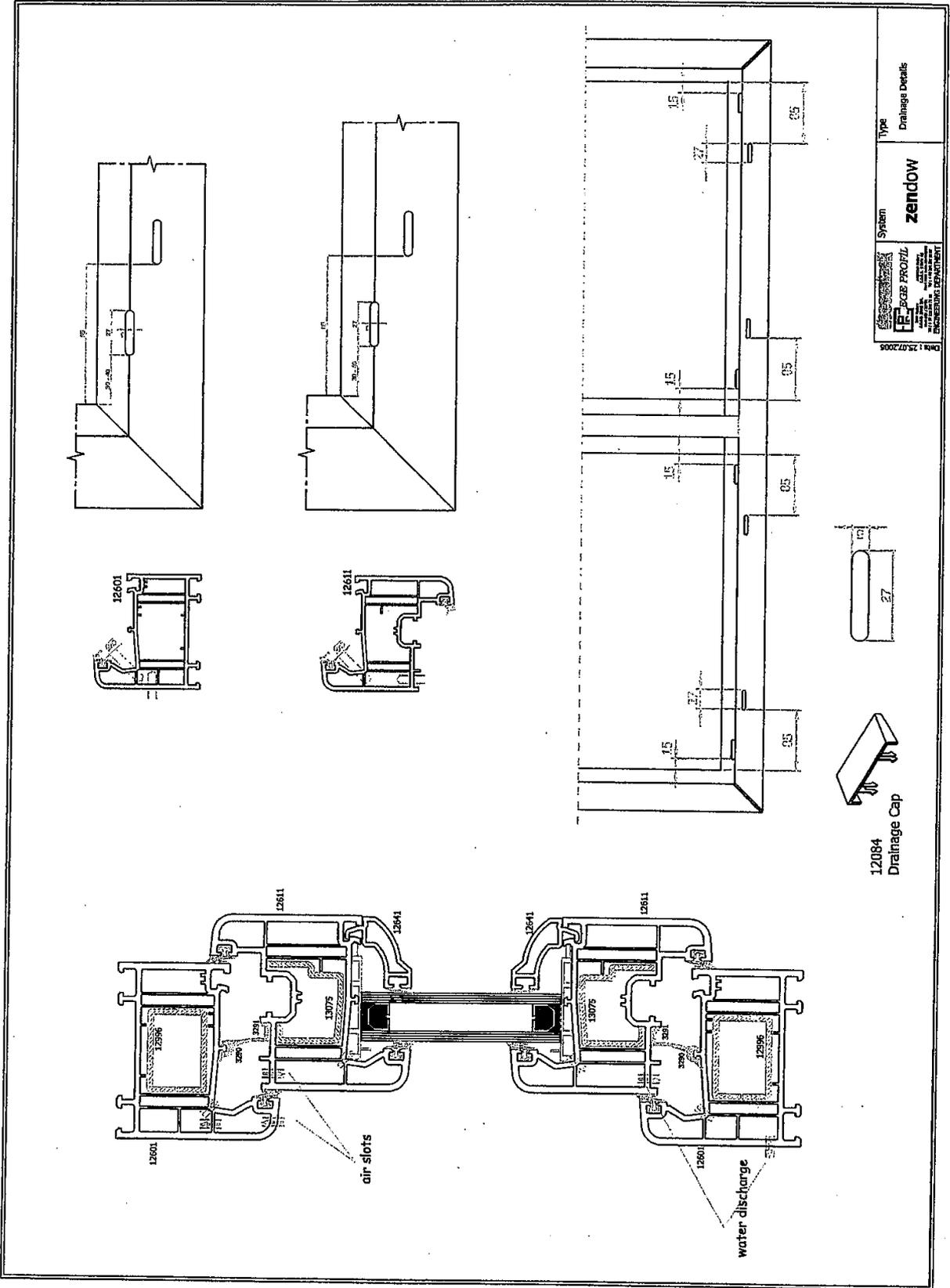
Pass / Fail criteria:

The deflection at the corner of the sash shall not exceed 0.04 times the length of the shortest of the two members joined at the point of the load, or 50 mm whichever is the lesser.

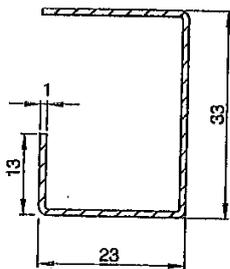
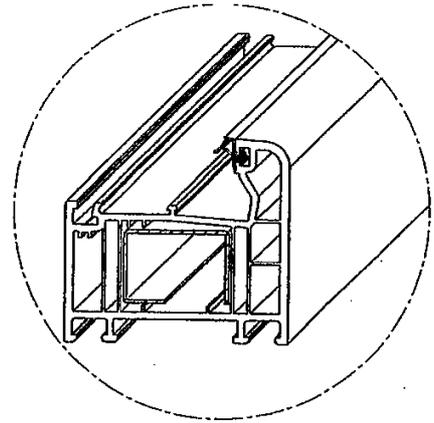
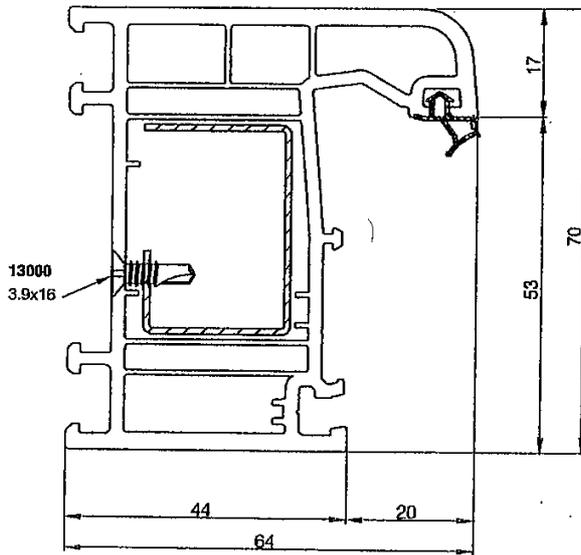
Appendix B – Client drawings

Sample elevation
Drainage details
Hardware accessory drawing
Main profiles
Glazing beads

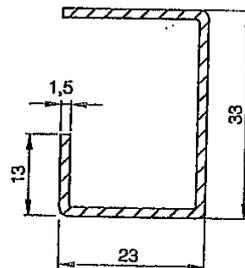




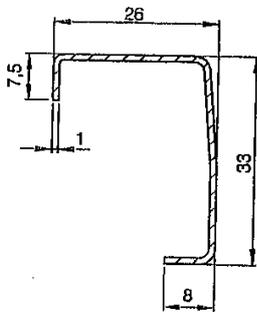
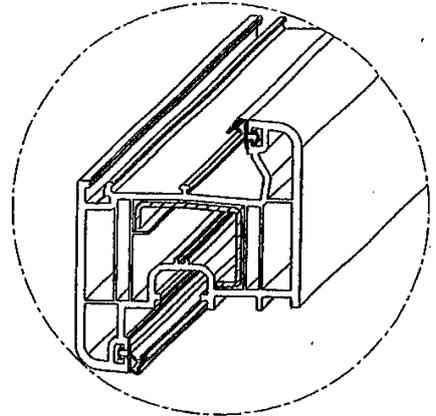
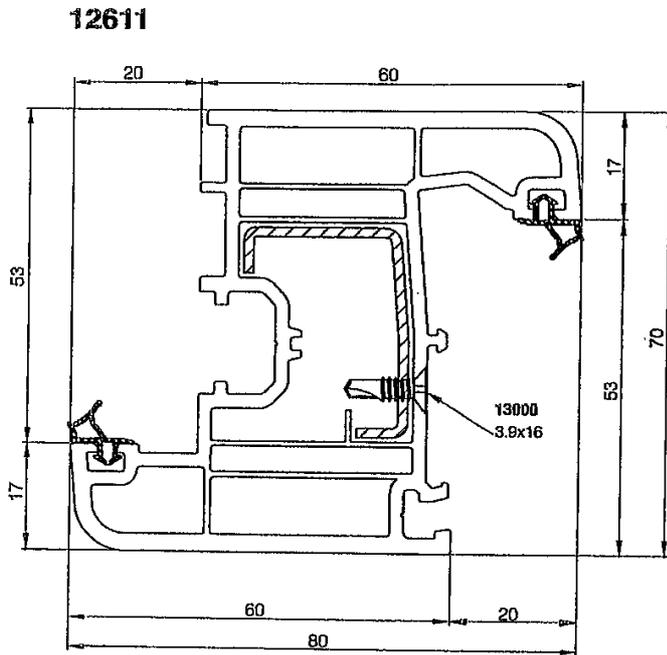
12601



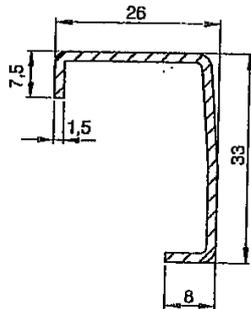
Y ↑ **12992**
 Ix : 1.5018 cm⁴
 Iy : 0.6595 cm⁴
 X →



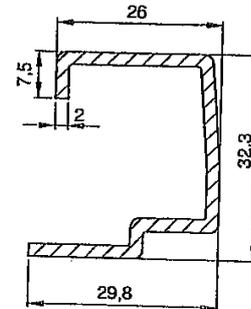
Y ↑ **12993**
 Ix : 2.1648 cm⁴
 Iy : 0.9419 cm⁴
 X →



13073
 $I_x : 0.9571 \text{ cm}^4$
 $I_y : 0.5516 \text{ cm}^4$

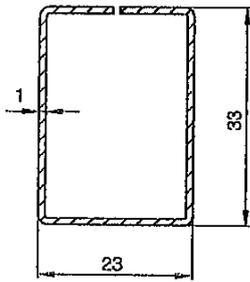
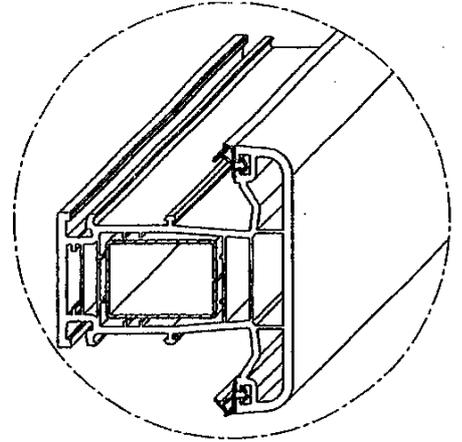
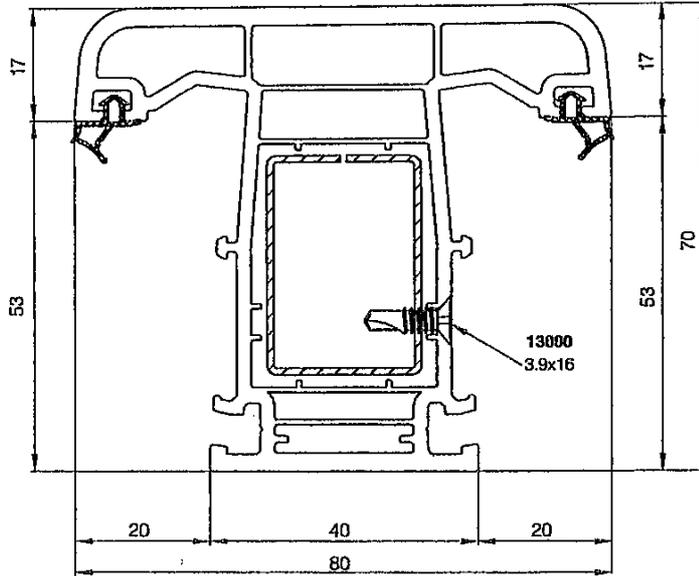


13074
 $I_x : 1.3713 \text{ cm}^4$
 $I_y : 0.7847 \text{ cm}^4$

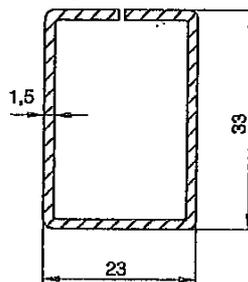


13075
 $I_x : 2.7149 \text{ cm}^4$
 $I_y : 1.4577 \text{ cm}^4$

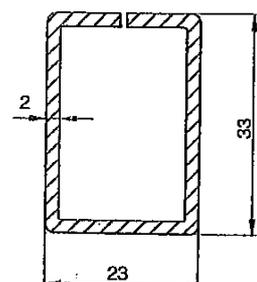
12620



Y ↑ **12994**
 Ix : 1.6032 cm⁴
 Iy : 0.9317 cm⁴
 X →



Y ↑ **12995**
 Ix : 2.3046 cm⁴
 Iy : 1.3239 cm⁴
 X →



Y ↑ **12996**
 Ix : 2.9317 cm⁴
 Iy : 1.6661 cm⁴
 X →

