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Interuniversity Institute for Silicates, soils and Materials
Test and Research laboratory
Non-profit-making association

BELAC
Accreditation N° : 32-Test
according to ISO 17025

TEST REPORT : N° 2007B VEC 2819-1

Mons, March 1st, 2007

REQUESTED BY : GLAVERBEL C.R.D.
Rue de l'Aurore, 2
6040 Jumet
BELGIQUE

REFERENCE OF THE REQUEST : Order N° 45689034 from October 22nd, 2006

CONCERNED MANUFACTURER : GLAVERBEL S.A.
Chaussée de la Hulpe, 166
1170 BRUXELLES
BELGIUM

NUMBER OF SAMPLES AND IDENTIFICATION : **SUNERGY** - See page 2

PURPOSE OF THE REQUESTED : **TESTS ACCORDING TO EOTA – ETAG 002**

SAMPLES RECEIVED ON : December 1st, 2006

TESTING DATE : December 20th, 2006

COMMENTS : * Test under accreditation

CE **Notified body (Id.N°1174)**
according to ART.18 of the « Construction Products Directive » CPD 89/106/EEC

THIS REPORT CONCERNS ONLY THE SAMPLES SUBMITTED TO TESTING.
OUR REPORTS ARE VALID ONLY IN FULL TEXT. THE FINAL USE OF THE RESULTS IS UNKNOWN TO US

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TECHNICAL REPORT
ADHESION PERFORMANCES ACCORDING TO ETAG GUIDELINE

SAMPLES

Samples were made in conformity with the description given in the ETAG guideline :

SUNERGY + DC 3362 + STOPSOL SUPER SILVER

See annex 1 : Preparation of sample

RESULTS on Sunergy

The tests were conducted in compliance with the methods described in the "Guideline for European Technical Approval for Structural Sealant Glazing System (SSGS)" ETAG n° 002.

Définitions :

Kx = Stiffness of the sample at x% elongation in the initial state
Kx,c = Stiffness of the sample at x% elongation after conditioning
= 100 . σx / x
Ru,5 = the characteristic breaking stress giving 75% confidence that 95% of the test result will be higher than this value
= Xmean – $\tau_{\alpha\beta}$. S
S = standard deviation of the serie under consideration
Xmean,n = the average breaking stress, either under tension or shear in the initial state
Xmean,c = the average breaking stress, either under tension or shear after conditioning
ΔXmean = Xmean ,c/ Xmean,n

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Mechanical performances

5.1.4.1. INITIAL TESTS – INITIAL MECHANICAL STRENGHT

5.1.4.1.1. TENSION – RUPTURE

a) Results for 10 samples conditioned at +23°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of breakage (*)
1	588	0.09	0.26	0.38	0.48	0.54	1.15	83	100C
2	595	0.15	0.30	0.41	0.51	0.57	1.28	94	100C
3	578	0.09	0.24	0.35	0.45	0.52	0.96	67	100C
4	590	0.09	0.26	0.37	0.46	0.53	1.34	115	100C
5	581	0.14	0.31	0.42	0.52	0.59	1.37	103	100C
6	588	0.10	0.26	0.37	0.46	0.52	1.11	86	100C
7	604	0.09	0.26	0.38	0.48	0.54	1.21	89	100C
8	599	0.10	0.27	0.39	0.48	0.55	1.04	69	100C
9	594	0.10	0.26	0.37	0.46	0.53	0.88	59	100C
10									100C
Average	**591**	**0.11**	**0.27**	**0.38**	**0.48**	**0.54**	**1.15**	**85**	
Standard deviation	**8**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.17**	**18**	
Minimum	578	0.09	0.24	0.35	0.45	0.52	0.88	59	
Maximum	604	0.15	0.31	0.42	0.52	0.59	1.37	115	

(*) xC: x% cohesive

$$K_{12.5} = 0.35$$

$$Ru,5 = 0.79$$

Results for 5 samples conditioned at -20°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of breakage (*)
1	587	0.05	0.25	0.38	0.47	0.54	0.94	64	587
2	575	0.08	0.29	0.41	0.51	0.57	1.53	137	575
3	593	0.07	0.28	0.40	0.50	0.57	1.24	91	593
4	570	0.08	0.28	0.40	0.49	0.56	1.16	93	570
5	588	0.06	0.28	0.40	0.49	0.56	1.07	74	588
Average	**583**	**0.07**	**0.28**	**0.40**	**0.49**	**0.56**	**1.19**	**92**	
Standard deviation	**10**	**0.01**	**0.02**	**0.01**	**0.01**	**0.01**	**0.22**	**28**	
Minimum	570	0.05	0.25	0.38	0.47	0.54	0.94	64	
Maximum	593	0.08	0.29	0.41	0.51	0.57	1.53	137	

(*) xC: x% cohesive

Ru,5 = 0.65

ΔX_{mean} = 1.19

b) Results for 5 samples conditioned at +80°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	580	0.04	0.24	0.38	0.50	0.58	1.03	59	100C
2	589	0.20	0.35	0.46	0.55	0.63	0.84	41	100C
3	588	0.15	0.30	0.42	0.52	0.60	1.07	61	100C
4	588	0.21	0.35	0.46	0.56	0.64	1.17	67	100C
5	588	0.20	0.34	0.45	0.55	0.62	0.78	38	100C
Average	**587**	**0.16**	**0.32**	**0.43**	**0.54**	**0.61**	**0.98**	**53**	
Standard deviation	**4**	**0.07**	**0.05**	**0.03**	**0.03**	**0.02**	**0.16**	**13**	
Minimum	580	0.04	0.24	0.38	0.50	0.58	0.78	38	
Maximum	589	0.21	0.35	0.46	0.56	0.64	1.17	67	

(*) xC: x% cohesive

Ru,5 = 0.59

ΔX_{mean} = 0.85

5.1.4.1.2. SHEAR – RUPTURE

a) Results for 10 samples conditioned at +23°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	593	0.05	0.08	0.12	0.15	0.17	0.88	155	100C
2	577	0.06	0.10	0.13	0.16	0.19	0.88	152	100C
3	592	0.05	0.05	0.11	0.15	0.17	0.89	153	100C
4	597	0.06	0.09	0.13	0.16	0.18	0.80	143	100C
5	568	0.02	0.06	0.09	0.12	0.15	0.76	145	100C
6	597	0.06	0.10	0.14	0.18	0.20	0.81	157	100C
7	587	0.05	0.07	0.11	0.15	0.18	0.71	140	100C
8	588	0.04	0.08	0.12	0.15	0.18	0.74	132	100C
9	584	0.06	0.08	0.13	0.17	0.19	0.81	133	100C
10	577	0.03	0.05	0.08	0.12	0.15	0.92	158	100C
Average	**586**	**0.05**	**0.08**	**0.12**	**0.15**	**0.18**	**0.82**	**147**	
Standard deviation	**10**	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**	**0.07**	**10**	
Minimum	568	0.02	0.05	0.08	0.12	0.15	0.71	132	
Maximum	597	0.06	0.10	0.14	0.18	0.20	0.92	158	

(*) xC: x% cohesive

Ru,5 = 0.67

Results for 5 samples conditioned at -20°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	553	0.04	0.06	0.09	0.10	0.12	0.73	150	100C
2	578	0.03	0.06	0.09	0.13	0.14	0.86	189	100C
3	582	0.05	0.07	0.09	0.11	0.13	0.76	163	100C
4	553	0.02	0.05	0.10	0.14	0.17	0.83	157	100C
5	576	0.04	0.06	0.09	0.12	0.15	0.98	173	100C
Average	**568**	**0.04**	**0.06**	**0.09**	**0.12**	**0.14**	**0.83**	**166**	
Standard deviation	**14**	**0.01**	**0.01**	**0.00**	**0.02**	**0.02**	**0.10**	**15**	
Minimum	553	0.02	0.05	0.09	0.10	0.12	0.73	150	
Maximum	582	0.05	0.07	0.10	0.14	0.17	0.98	189	

(*) xC: x% cohesive

Ru,5 = 0.58

ΔX_{mean} = 1.01

b) Results for 5 samples conditioned at +80°C

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	592	0.06	0.09	0.13	0.17	0.20	0.65	102	100C
2	573	0.02	0.03	0.06	0.11	0.14	0.76	140	100C
3	511	0.06	0.11	0.17	0.21	0.25	0.86	121	100C
4	486	0.04	0.06	0.08	0.12	0.16	0.89	130	100C
5	587	0.04	0.08	0.12	0.16	0.19	0.71	108	100C
Average	**550**	**0.04**	**0.07**	**0.11**	**0.15**	**0.19**	**0.77**	**120**	
Standard deviation	**48**	**0.02**	**0.03**	**0.04**	**0.04**	**0.04**	**0.10**	**16**	
Minimum	486	0.02	0.03	0.06	0.11	0.14	0.65	102	
Maximum	592	0.06	0.11	0.17	0.21	0.25	0.89	140	

(*) xC: x% cohesive

Ru,5 = 0.52

ΔX_{mean} = 0.94

5.1.4.2. RESIDUAL MECHANICAL STRENGH AFTER ARTIFICIAL AGEING

5.1.4.2.1 IMMERSION IN WATER AT HIGH TEMPERATURE WITH SOLAR RADIATION

a) Conditioning :

- Duration : 2 x 21 days
- Water temperature : 45°C ± 1°C
- Conductivity of the water : 1.5 µs
- Irradiation UV (300 – 400 ηm) : 50 ± 1 w/m²

b) Results of the traction test after the artificial ageing :

After 21 days :

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	602	0.09	0.22	0.31	0.38	0.43	1.14	138	100 C
2	575	0.09	0.22	0.30	0.37	0.42	1.09	130	100 C
3	591	0.06	0.19	0.28	0.35	0.40	1.13	146	100 C
4	603	0.08	0.21	0.29	0.36	0.41	1.02	117	100 C
5	582	0.09	0.22	0.31	0.38	0.43	0.99	106	100 C
Average	**591**	**0.08**	**0.21**	**0.30**	**0.37**	**0.42**	**1.07**	**127**	
Standard deviation	**12**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.07**	**16**	
Minimum	575	0.06	0.19	0.28	0.35	0.40	0.99	106	
Maximum	603	0.09	0.22	0.31	0.38	0.43	1.14	146	

(*) xC: x% cohesive

$$\Delta X_{mean} = 0.93$$

After 42 days :

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	601	0.07	0.21	0.30	0.38	0.44	1.25	148	100 C
2	591	0.06	0.20	0.29	0.36	0.41	1.07	118	100 C
3	590	0.06	0.22	0.32	0.39	0.45	1.01	96	100 C
4	586	0.08	0.21	0.30	0.37	0.42	0.95	106	100 C
5	587	0.08	0.23	0.32	0.39	0.45	1.18	126	100 C
Average	**591**	**0.07**	**0.21**	**0.31**	**0.38**	**0.43**	**1.09**	**119**	
Standard deviation	**6**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**0.12**	**20**	
Minimum	586	0.06	0.20	0.29	0.36	0.41	0.95	96	
Maximum	601	0.08	0.23	0.32	0.39	0.45	1.25	148	

(*) xC: x% cohesive

$$\Delta X_{mean} = 0.95$$

For x = 12.5 we have Kx,c/Kx = 0.79

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5.1.4.2.2 HUMIDITY AND NACL ATMOSPHERE

a) Conditioning :

- Duration : 480 hours
- NaCl concentration : 50 g/l
- pH : 6.7

b) Results of the traction test after the artificial ageing :

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	593	0.09	0.22	0.33	0.42	0.48	0.90	73	100C
2	581	0.09	0.24	0.35	0.44	0.50	1.20	115	100C
3	587	0.11	0.25	0.34	0.43	0.49	1.06	94	100C
4	587	0.09	0.24	0.34	0.43	0.48	1.10	102	100C
5	606	0.05	0.20	0.31	0.41	0.47	0.77	59	100C
6	575	0.05	0.20	0.32	0.42	0.48	1.34	152	100C
7	584	0.09	0.23	0.33	0.42	0.48	1.10	109	100C
8	582	0.08	0.24	0.35	0.44	0.50	0.85	64	100C
9	593	0.06	0.21	0.32	0.41	0.47	1.13	108	100C
10	585	0.09	0.24	0.34	0.43	0.49	1.20	123	100C
Average	**587**	**0.08**	**0.23**	**0.33**	**0.43**	**0.48**	**1.07**	**100**	
Standard deviation	**8**	**0.02**	**0.02**	**0.01**	**0.01**	**0.01**	**0.18**	**29**	
Minimum	575	0.05	0.20	0.31	0.41	0.47	0.77	59	
Maximum	606	0.11	0.25	0.35	0.44	0.50	1.34	152	

(*) xC: x% cohesive

$$\Delta X_{mean} = 0.93$$

5.1.4.2.3 HUMIDITY AND SO_2 ATMOSPHERE

a) Conditioning :

- Duration : 20 cycles
- 0.2l SO_2

b) Results of the traction test after the artificial ageing :

Sample number	Section (mm²)	Limited to 5% stretch. (N/mm²)	Limited to 10 % stretch. (N/mm²)	Limited to 15% stretch. (N/mm²)	Limited to 20% stretch. (N/mm²)	Limited to 25% stretch. (N/mm²)	Limit of breakage (N/mm²)	Stretch on breaking (%)	Type of Breakage (*)
1	604	0.04	0.23	0.35	0.44	0.51	0.94	66	100C
2	592	0.05	0.25	0.37	0.47	0.54	1.32	110	100C
3	590	0.05	0.25	0.37	0.46	0.54	1.02	85	100C
4	585	0.07	0.25	0.37	0.47	0.53	1.24	98	100C
5	592	0.07	0.26	0.38	0.47	0.54	1.18	89	100C
6	597	0.07	0.24	0.36	0.46	0.53	1.19	91	100C
7	594	0.09	0.26	0.37	0.47	0.54	1.03	73	100C
8	588	0.08	0.20	0.30	0.37	0.43	0.53	37	100C
9	578	0.06	0.26	0.37	0.47	0.54	1.19	91	100C
10	598	0.07	0.25	0.37	0.46	0.53	0.88	60	100C
Average	**592**	**0.07**	**0.25**	**0.36**	**0.45**	**0.52**	**1.05**	**80**	
Standard deviation	7	**0.02**	**0.02**	**0.02**	**0.03**	**0.03**	**0.23**	**21**	
Minimum	578	0.04	0.20	0.30	0.37	0.43	0.53	37	
Maximum	604	0.09	0.26	0.38	0.47	0.54	1.32	110	

(*) xC: x% cohesive

$$\Delta X_{mean} = 0.91$$

SUMMARY

ETAG GUIDELINE TEST NUMBER	TEST	TEST CONDITIONS	CRITERIA				
			Xmean Mpa	$\Delta X_{mean} \geq 0.75$	$K_{12.5}$ For $0 \leq x\% \leq 12.5$ $0.5 \leq Kx,c/Kx \leq 1.10$	Ru,5	TYPE OF BREAKAGE ($\geq$ 90% C)
5.1.4.1.1	Tension	+23°C	1.15	-	0.35	0.79	100C
		-20°C	1.19	1.03		0.65	100C
		+80°C	0.98	0.85		0.59	100C
5.1.4.1.2	Shear	+23°C	0.82	-		0.67	100C
		-20°C	0.83	1.01		0.58	100C
		+80°C	0.77	0.94		0.52	100C
5.1.4.2.1	H_2O at 45°C + UV	500 h	1.07	0.93			100C
		1000 h	1.09	0.95	$K_{12.5,c}/K_{12.5} = 0.79$		100C
5.1.4.2.2	H_2O + NaCl	480h	1.07	0.93			100C
5.1.4.2.3	H_2O + SO_2	20 cycles	1.05	0.91			100C

xC = x% cohesive

6. CONCLUSION

The results are in compliance with the requirements of the ETAG guideline

D. Libert
Laboratory Chief

S. Lange
Leader Glazings and Components

2819 - 1

November 30th, 2005
(MCO/Essais/canevas/Fiche technique VEC)

ANNEX 1

INISMa

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SAMPLES PREPARATING FOR STRUCTURAL GLAZING TEST

REFERENCE INISMa :

APPLICANT :

1° **Sealant producer : Dow Corning SA**

2° **Address of the laboraty where the samples are been made :**
Parc Industriel- Zone C
7180 Seneffe
Belgium

3° **Sealant product characteristics :**

- **Type : Dow Corning®3362**
- **Conditioning :**
- **N° of batch :** **Base** 00050331N4 Exp.05/2006
  Catalyst 0002321005 Exp.07/2006

4° **Characteristics of supports :**

4.1 **Glass :**

- **Type :**
- **Producer : Glaverbel**
- **Coating :**
  * **Type : Stopsol**
  * **Type of the different layers of the coating : Sunergy / Stopsol SuperSilver**

4.2 **Metal : /**

- **Type : /**
- **Producer : /**

ANNEX 1

5° **Characteristics of primer :**

- **Producer : Dow Corning**
- **Conditioning :**
- **Cleaner : R40 Cleaner**
- **N° of batch :**
- **Application modality :**

6° **Characteristics of other products that can be used :**

7° **Operational instruction :**

- **T° in the local : 23° +/- 2°c**
- **Relative humidity : 50 +/- 5%**

8° **Date to preparation of the samples : 10/02/2006**

9° **Date reception of the samples to INISMa :**

10° **Holds used for the clothes industry of the samples :**

11° **Numbers of the samples : 90**

NAME **SIGNATURE**

Operator of the data preparation department : F.Draou

Operator INISMa :

Leader INISMa :