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N° d'accréditation : 37-T
selon ISO 17025

TEST REPORT N° 2006B COU 2751-1

Including 5 pages + 1 annex
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Mons, September 21st, 2006

REQUESTED BY : Mr. Roquiny
GLAVERBEL CRD
2 rue de l'Aurore
6040 Jumet
BELGIQUE

REFERENCE OF THE REQUEST : Order Glaverbel CRD Roquiny 14/07/2006

CONCERNED MANUFACTURER: **GLAVERBEL S.A.**
CHAUSSEE DE LA HULPE, 166
B-1170 BRUXELLES
BELGIQUE

NUMBER OF SAMPLES AND IDENTIFICATION : See page 2

PURPOSE OF THE REQUESTED : Determination of the photo-energetic properties
according to EN 1096-1 standard and Durability
test according to EN 1096-3 standard

SAMPLES RECEIVED ON : August 14th, 2006

REMARK : * Test under BELTEST accreditation
Annex 1 : Calculation documents – 8 pages

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

DESCRIPTION OF THE MATERIAL

Name of the applicant	GLAVERBEL S.A. CHAUSSEE DE LA HULPE, 166 B-1170 BRUXELLES BELGIQUE	
Commercial name of the product	GLAVERBEL STOPRAY VISION-50T (Heat treated)	
Customer's references	PE 30552 reference, PE 30xxx-A, PE 30xxx-B	
Internal reference	CCOU2751/1	
Sampling	under responsibility of the applicant	
Sampling information	traceability of the samples is under responsibility of the applicant	
Class of Coating	C	
Coating position	2	
Low emissivity	Yes	
Glass Substrate	clear float glass (EN 572-2)	
Normal emissivity of clear glass (ϵ_n)	0.89	
Samples	Heat strengthened glass	IGU
Number of samples	3 (50 x 50 mm)	3 (350 x 250 mm)
Nominal Thickness	6 mm	
Nature of gas		Argon
Composition of IGU		6/15/4
Test starting date	July 28 th , 2006	

PHOTO-ENERGETIC PROPERTIES - EN 1096-1

Technical description	For emissivity	For optical properties
Spectrophotometer	PerkinElmer PARAGON 1000	PerkinElmer LAMDA 19
Type	Single Beam (FTIR)	Double Beam
Reflectance accessory	PerkinElmer	
Type of references	SnO2 Coated Glass	Primary surface Ag Mirrors
	Gold Mirror	Secondary surface Ag Mirrors
Measurement Responsible	JS	JS

Notes : Uncertainty calculated on emissivity measurement is ± 0.01
Reproducibility on emissivity measurement is estimated to ± 0.005

Considered parameters for the calculation of g and Ug	
Composition of the insulating glass	6/15/4
Position of the coating	2
Filling up	90% Argon

PHOTO-ENERGETIC PROPERTIES VISION-50T	COATED GLASS ACCORDING TO NBN EN 1096-1	IGU ACCORDING TO NBN EN 673
U.V. range (280 – 380 nm)		
• Transmission τ_{uv}	11.70 %	9.34 %
Visible range (380 – 780 nm) – Ill D65/obs 2°		
• Transmission τ_v	55.49 %	49.56 %
• Reflection coated side ρ_v	17.30 %	/
• Reflection opposite side ρ'_v	17.47 %	/
• Colour		
- transmission L^*	79.32	/
a^*	- 2.24	/
b^*	2.01	/
- reflection coated side L^*	48.63	/
a^*	7.28	/
b^*	12.99	/
Solar range (300 – 2500 nm)		
• Transmission τ_e	31.80 %	23.63 %
• Reflection coated side ρ_e	46.27 %	/
• Reflection opposite side ρ'_e	33.47 %	/
• Solar factor coated g	0,37	0.31
Thermal range (5000 – 50000 nm)		
• Emissivity ϵ_n	0.021	/
• Thermal coefficient U_g	/	1.08 W/m ² °K

RESISTANCE TO U.V. IRRADIATION

EN1096-3

1. INITIAL EXAMINATION

Technical Description	Dew point measurement
Roscan	Optical measurement with mirror, nitrogen cooling, calibrated in accordance to EN 1279-2 Annex A
Measurement Responsible	DL

<i>Sample N°</i>	<i>Real thickness (mm)</i>	<i>Dew point (°C)</i>
1	21.54	-72.7
2	21.83	<-110

2. EXAMINATION AFTER U.V. AGEING

Technical Description	Ageing
Equipment	Irradiation panel 1m ² , in accordance to EN 1279-2, Annex C
Irradiation source	16 lamps OSRAM Ultravitalux 300 W
Energetic xxx	900 ± 100 W/m ²
Reference black glass temperature	Relevant test conditions - 56 ± 3 °C
Irradiation time	1000 hours
Measurement responsible	DL

Comparing to initials samples :

- Colour modification : nothing visible
- Punctual defects : none

Criteria : no additional defects acceptable

3. PHOTOMETRIC MEASUREMENTS

Technical Description	For optical properties
Spectrophotometer	PerkinElmer LAMDA 19
Type	Double Beam
Type of reference	Primary surface Ag Mirrors Secondary surface Ag Mirrors
Relevant information	Transmission measurements on IGU (in accordance with EN 1096-3 Annex A). Reflection measurements on fragments.
Measurement responsible	JS

	λ nm	Initial (1)	Aged (2)	(1) - (2)
Transmission %	550	50.4	50.2	-0.2
	900	11.9	12.1	0.2

Criteria : (1) - (2) \leq 3 %

	λ μ m	Initial (1)	Aged (2)	(1) - (2)
Reflection %	8	95.3	94.3	-1.0

Criteria : (1) - (2) \leq 2 %

CONCLUSION :

The samples concerned by this is report are in conformity with EN 1096-1 and EN 1096-3 requirements.

D. LIBERT
Chief of Laboratory

Glazing & Components



S. LANGE
Head of Department

INISMa Analyses

Mesure de l'emissivite à 30 lambda

Microns	Reflexion
5.5	97.81
6.6	97.79
7.4	97.93
8.1	97.91
8.6	97.97
9.2	98.00
9.7	97.96
10.2	97.92
10.8	97.91
11.3	97.99
11.8	98.02
12.4	97.95
13.0	97.93
13.6	97.93
14.2	97.98
14.8	98.40
15.6	98.13
16.3	97.99
17.2	98.03
18.1	98.07
19.2	98.09
20.3	98.09
21.7	97.97
23.3	98.09
25.3	97.94
27.8	97.90
30.9	97.95
35.7	97.37
43.9	97.27

Reflexion Moyenne	Emissivite
97.94	0.021 +/- 0.01

Mesures	c27511	c27512
Etalons	thp2c101	thp2c102
QC	slc101	slc102
	0.039	0.038

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 INISMa : CRIBC

CALCUL DU COEFFICIENT K

REFERENCE DU VITRAGE : ccou2751

CARACTERISTIQUES

VITRAGE DOUBLE A BASSE EMISSIVITE

EPAISSEURS DES FEUILLES		EMISS Normales	Effectives	Calculées

FEUILLE EXT	6 mm	.021	.030	.026
FEUILLE INT	4 mm	.880	.845	.829

EPAISSEUR DE LA COUCHE DE GAZ	NATURE DU GAZ
15 mm	MELANGE/

ISO 10292 et EN 673

 * CONSTANTES UTILISEES *
 * *
 * he = 23 W M-2 K-1 *
 * hi = 8 W M-2 K-1 *
 * *
 * VALEURS INTERMEDIAIRES *
 * *
 * pr= 0.13 W M-2 K-1 *
 * pc= 1.21 W M-2 K-1 *
 * pg= 1.34 W M-2 K-1 *
 * *
 * Rt= 0.76 W M-2 K-1 *

K = 1.08 +/- 0.03 W M-2 K-1 ISO 10292 et EN 673

LEG IDE

he: coef. d'echange thermique de surface exterieure
 hi: interieure
 pg: permeance thermique de l'espace de gaz
 pr: composante radiative de pg
 pc: convective de pg
 Rt: resistance thermique du vitrage

NB DE PRAND	NB DE GRASHOF	NB DE NUSSELT	NB DE NUSSELT UTILISE
0.6832	10622.801	1.0261	1.0261

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 INISMa

TECHNICAL PROPERTIES OF GLAZING UNITS

Calculated from normal incidence measurements

Norme : EN410

IDENTIFICATION OF THE GLAZING UNIT

Single glazing Unit
 CCOU2751

6 mm

Coating in position 1

WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB	WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB
* 390	* 35.94	* 26.01	* 38.05	** 580	* 55.55	* 19.70	* 24.75
* 400	* 43.05	* 22.13	* 34.82	** 590	* 55.23	* 20.40	* 24.37
* 410	* 47.21	* 18.64	* 34.15	** 600	* 55.15	* 20.96	* 23.89
* 420	* 49.74	* 15.81	* 34.45	** 610	* 54.75	* 21.45	* 23.80
* 430	* 51.47	* 13.75	* 34.78	** 620	* 54.32	* 21.88	* 23.80
* 440	* 52.61	* 12.24	* 35.15	** 630	* 53.85	* 22.30	* 23.85
* 450	* 53.63	* 11.21	* 35.17	** 640	* 53.39	* 22.68	* 23.93
* 460	* 54.42	* 10.66	* 34.93	** 650	* 52.76	* 23.13	* 24.11
* 470	* 54.93	* 10.48	* 34.58	** 660	* 52.19	* 23.66	* 24.15
* 480	* 55.19	* 10.68	* 34.12	** 670	* 51.27	* 24.30	* 24.43
* 490	* 55.47	* 11.15	* 33.38	** 680	* 50.30	* 25.16	* 24.53
* 500	* 55.62	* 11.89	* 32.49	** 690	* 49.19	* 26.24	* 24.57
* 510	* 55.83	* 12.81	* 31.37	** 700	* 47.77	* 27.62	* 24.61
* 520	* 55.89	* 13.83	* 30.28	** 710	* 46.27	* 29.22	* 24.51
* 530	* 56.02	* 14.90	* 29.08	** 720	* 44.58	* 31.07	* 24.34
* 540	* 55.98	* 15.98	* 28.04	** 730	* 42.51	* 33.22	* 24.27
* 550	* 55.99	* 17.02	* 26.99	** 740	* 40.47	* 35.62	* 23.91
* 560	* 55.99	* 18.00	* 26.01	** 750	* 38.31	* 38.20	* 23.49
* 570	* 55.77	* 18.92	* 25.31	** 760	* 36.02	* 40.91	* 23.07

Proprietes lumineuses
 Light properties Illuminant D65
 Licht Eigenschaften

Transmission lumineuse	(TL)	
Light transmittance	(LT)	55.5 +- .5%
Lichtdurchlassigkeit	(LR)	
Reflexion lumineuse	(RL)	
Light reflectance	(LR)	17.3 +- .75%
Lichtrefexion	(LR)	
Absorption lumineuse	(AL)	
Light absorption	(LA)	27.2 +- 1%
Lichtabsorption	(LA)	

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IDENTIFICATION OF THE GLAZING UNIT
 Single glazing Unit
 CCOU2751

6 mm

Coating in position 1

WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB	WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB
300	0.02	22.58	77.40	950	7.92	82.03	10.05
320	0.39	30.26	69.34	1000	5.56	85.16	9.28
340	7.15	28.00	64.85	1050	4.10	88.26	7.64
360	16.30	32.20	51.50	1100	3.15	90.24	6.61
380	26.99	30.09	42.92	1150	2.34	91.49	6.17
400	43.05	22.13	34.82	1200	2.00	91.95	6.04
420	49.74	15.81	34.45	1250	1.53	92.91	5.56
440	52.61	12.24	35.15	1300	1.27	93.50	5.23
460	54.42	10.66	34.93	1350	1.03	93.62	5.35
480	55.19	10.68	34.12	1400	0.87	93.88	5.24
500	55.62	11.89	32.49	1450	0.82	93.21	5.97
520	55.89	13.83	30.28	1500	0.65	93.01	6.33
540	55.98	15.98	28.04	1550	0.59	93.14	6.27
560	55.99	18.00	26.01	1600	0.45	93.70	5.84
580	55.55	19.70	24.75	1650	0.39	95.29	4.33
600	55.15	20.96	23.89	1700	0.36	95.72	3.92
620	54.32	21.88	23.80	1750	0.28	96.13	3.60
640	53.39	22.68	23.93	1800	0.32	95.85	3.82
660	52.19	23.66	24.15	1850	0.17	96.29	3.54
680	50.30	25.16	24.53	1900	0.00	95.96	4.04
700	47.77	27.62	24.61	1950	0.33	96.69	2.98
720	44.58	31.07	24.34	2000	0.06	97.34	2.60
740	40.47	35.62	23.91	2050	0.00	98.44	1.56
760	36.02	40.91	23.07	2100	0.00	98.50	1.50
780	31.50	46.66	21.84	2200	0.00	98.17	1.83
800	27.14	52.63	20.23	2300	0.00	98.16	1.84
850	17.64	65.14	17.22	2400	0.00	98.50	1.50
900	11.95	76.28	11.77	2500	0.00	98.50	1.50

Proprietes energetiques
 Energy properties
 Energetische Eigeschaften

SOLAIRE GLOBALE AM1 (EN 410)

Transmission energetique	(TE)		
Energy transmittance	(ET)	31.8	+ - .5%
Energie Transmission	(ET)		
Reflexion energetique	(RE)		
Energy reflectance	(ER)	46.3	+ - .75%
Energie Reflexion	(ER)		
Absorption energetique	(AE)		
Energy absorption	(EA)	21.9	+ - 1%
Energie Absorption	(EA)		

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IDENTIFICATION OF THE GLAZING UNIT

Single glazing Unit
CCOU2751

6 mm

Coating in position 1

Facteur solaire	(FS=TET)			
Solar factor	(SF)	37.3	+ - 1%	K = 5.8 W/M2K
Gesamte Energiedurchgang	(GED/g)			
Shading coefficient	(SC)			
Shading coefficient	(SC)	.42		
Schattenfaktor	(b)			

Proprieties uv
uv properties
uv Eigenschaften

Transmission uv	(Tuv)			
uv transmittance	(uvT)	11.7	+ - .5%	
uv Transmission	(ET)			
Reflexion uv	(RE)			
uv reflectance	(ER)	29.8	+ - .75%	
uv Reflexion	(ER)			

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 INISMa

TECHNICAL PROPERTIES OF GLAZING UNITS

Calculated from normal incidence measurements

Norme : EN410

IDENTIFICATION OF THE GLAZING UNIT

Single glazing Unit
 ccou 2751

6 mm

Coating in position 2

WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB	WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB
390	35.94	25.35	38.71	580	55.55	16.29	28.16
400	43.05	27.95	29.01	590	55.23	15.91	28.85
410	47.21	27.85	24.94	600	55.15	15.56	29.29
420	49.74	26.81	23.45	610	54.75	15.21	30.03
430	51.47	25.80	22.73	620	54.32	14.92	30.76
440	52.61	24.76	22.62	630	53.85	14.68	31.46
450	53.63	23.89	22.48	640	53.39	14.53	32.08
460	54.42	23.17	22.42	650	52.76	14.49	32.74
470	54.93	22.39	22.68	660	52.19	14.59	33.22
480	55.19	21.63	23.18	670	51.27	14.83	33.90
490	55.47	20.85	23.68	680	50.30	15.28	34.42
500	55.62	20.21	24.17	690	49.19	15.91	34.90
510	55.83	19.62	24.56	700	47.77	16.79	35.44
520	55.89	19.01	25.11	710	46.27	17.87	35.86
530	56.02	18.45	25.53	720	44.58	19.13	36.28
540	55.98	17.96	26.05	730	42.51	20.58	36.91
550	55.99	17.50	26.51	740	40.47	22.18	37.35
560	55.99	17.07	26.94	750	38.31	23.92	37.77
570	55.77	16.69	27.54	760	36.02	25.68	38.30

Proprietes lumineuses
 Light properties Illuminant D65
 Licht Eigenschaften

Transmission lumineuse (TL)	55.5	+ - .5%
Light transmittance (LT)		
Lichtdurchlassigkeit (LR)		
Reflexion lumineuse (RL)	17.5	+ - .75%
Light reflectance (LR)		
Lichtreflexion (LR)		
Absorption lumineuse (AL)	27.0	+ - 1%
Light absorption (LA)		
Lichtabsorption (LA)		

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IDENTIFICATION OF THE GLAZING UNIT
Single glazing Unit
ccou 2751

6 mm

Coating in position 2

WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB	WL (nm)	TOTAL TRANS	TOTAL REFLE	TOTAL ABSORB
300	0.02	5.89	94.09	950	7.92	49.51	42.56
320	0.39	5.26	94.35	1000	5.56	51.22	43.22
340	7.15	7.09	85.76	1050	4.10	53.17	42.73
360	16.30	15.06	68.64	1100	3.15	54.74	42.11
380	26.99	20.37	52.65	1150	2.34	56.08	41.58
400	43.05	27.95	29.01	1200	2.00	57.23	40.77
420	49.74	26.81	23.45	1250	1.53	58.95	39.52
440	52.61	24.76	22.62	1300	1.27	60.96	37.76
460	54.42	23.17	22.42	1350	1.03	62.87	36.10
480	55.19	21.63	23.18	1400	0.87	64.68	34.45
500	55.62	20.21	24.17	1450	0.82	66.76	32.42
520	55.89	19.01	25.11	1500	0.65	68.79	30.56
540	55.98	17.96	26.05	1550	0.59	70.59	28.82
560	55.99	17.07	26.94	1600	0.45	72.25	27.30
580	55.55	16.29	28.16	1650	0.39	74.12	25.49
600	55.15	15.56	29.29	1700	0.36	74.62	25.02
620	54.32	14.92	30.76	1750	0.28	74.70	25.02
640	53.39	14.53	32.08	1800	0.32	74.20	25.48
660	52.19	14.59	33.22	1850	0.17	74.22	25.61
680	50.30	15.28	34.42	1900	0.00	73.47	26.53
700	47.77	16.79	35.44	1950	0.33	73.90	25.77
720	44.58	19.13	36.28	2000	0.06	74.38	25.55
740	40.47	22.18	37.35	2050	0.00	75.30	24.70
760	36.02	25.68	38.30	2100	0.00	75.65	24.35
780	31.50	29.38	39.12	2200	0.00	70.47	29.53
800	27.14	33.07	39.80	2300	0.00	72.27	27.73
850	17.64	40.60	41.76	2400	0.00	73.01	26.99
900	11.95	46.60	41.46	2500	0.00	68.47	31.53

Proprietes energetiques
Energy properties
Energetische Eigenschaften

SOLAIRE GLOBALE AM1 (EN 410)

Transmission energetique Energy transmittance Energie Transmission	(TE) (ET) (ET)	31.8 +- .5%
Reflexion energetique Energy reflectance Energie Reflexion	(RE) (ER) (ER)	33.5 +- .75%
Absorption energetique Energy absorption Energie Absorption	(AE) (EA) (EA)	34.7 +- 1%

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IDENTIFICATION OF THE GLAZING UNIT

Single glazing Unit
ccou 2751

6 mm

Coating in position 2

Facteur solaire	(FS=TET)				
Solar factor	(SF)	40.6	+ -	1%	K = 5.8 W/M2K
Gesamte Energiedurchgang	(GED/g)				
Shading coefficient	(SC)				
Shading coefficient	(SC)	.46			
Schattenfaktor	(b)				

Proprietes uv
uv properties
uv Eigenschaften

Transmission uv	(Tuv)				
uv transmittance	(uvT)	11.7	+ -	.5%	
uv Transmission	(ET)				
Reflexion uv	(RE)				
uv reflectance	(ER)	11.3	+ -	.75%	
uv Reflexion	(ER)				

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