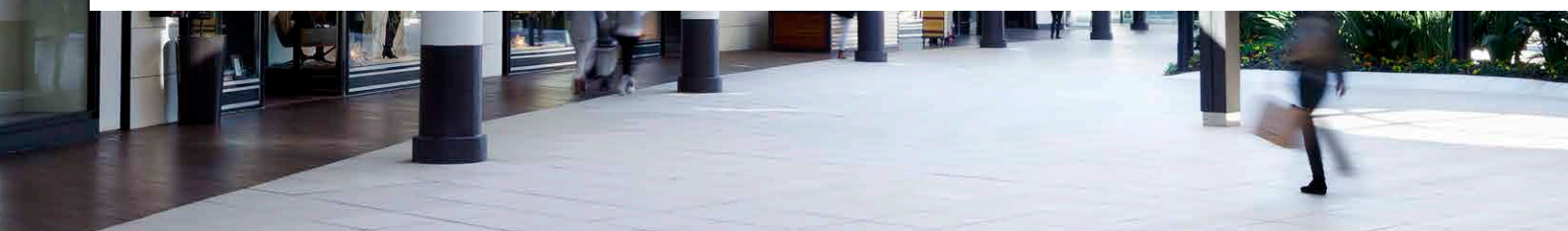
WOOD HYBRID PROFILES TESTS, SPECIFICATIONS & CERTIFICATES

Geolam®

Architectural Eco-Technology



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Sustainability

annex 1 : Humidity absorption of the cross sections

Object	Ink application on the surface of the product, on the cross sections.
Execution date	02.11.2012
Product	Soleo, Careo, Vertigo, Diameo
Outcome	After a week in an ink bath, there is no trace of any ink penetration between the composite wood layer and the aluminum.

The product can be worked like an aluminum profile without taking any particular precaution.

annex 2 : Delamination resistance in tropical conditions (humidity and temperature variation)

Object	Delamination resistance of the composite wood layer after exposure to a temperature of 70 Celsius degrees and a humidity rate of 95% during 30 days.
Execution date	22.02.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	No delamination or fissure occurred. The adhesion of the composite wood layer on the aluminum is perfect

The product can be used in tropical climates conditions without any particular precaution.

annex 3 : Aging due to sun rays exposure

Object	Accelerated aging test through the Sunshine Weather-ometer® procedure
Execution date	17.12.2012
Product	Soleo, Careo, Vertigo, Diameo
Outcome	A delta E of 2.61 after 1000 hours and of 2.53 after 5000 hours for a wood aluminum hybrid profile in the rosewood color. Color variation is tiny.

Profile's color remains perfectly constant in the time.

annex 4 : Aging due to UV light, humidity and temperature variations exposure

Object	UV light resistance test with alternating humidity rates (water projection) and extreme temperatures (from 80 to -50 Celsius degrees).
Execution date	28.03.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	No delamination or fissure occurred. The adhesion of the composite wood layer on the aluminum is perfect. Color stays stable.

The product can be used in any kind of climate, even harshest ones (extreme temperatures, high humidity, very strong sunning).

annex 5 : Resistance of bended profiles to humidity

Object	Resistance of a bended profile to humid atmospheres which contains sulfur dioxide through the DIN EN ISO 3231 standard
Date d'obtention	02.07.2013
Organisme	Institut für Oberflächentechnik GmbH, Germany
Product	Bended Soleo. Radius 500 mm
Outcome	No perceptible change after 24 cycles.

Bended profiles can perfectly be used in humid climates.

annex 6 : Color stability

Object	Samples of different colors are exposed to UV light through the JIS K5400(K5600) standard.
Execution date	15.01.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	Depending on the color and the number of hours, the delta E vary from 0,9 to 10,6.

Profile's color remains perfectly constant in the time. Dark colors are even more stable than light colors.

annex 7 : Resistance of bended profiles to bad weather

Object	Color and shine change due to meteo and solar radiations exposure through the DIN EN ISO 11341 standard.
Date d'obtention	02.07.2013
Organisme	Institut für Oberflächentechnik GmbH, Germany
Product	Bended Soleo. Radius 500 mm
Outcome	No color or shine variation after 1 000 hours of test. Color before the test: ΔE = 39,7 and after the test : ΔE = 37,8. Shine before the test: G = 1,35 and after the test : G = 1,40.

Profile's color remains perfectly constant in the time. Bended profiles can perfectly be used in high sunlight regions.

annex 8 : Termites resistance

Object	Termites resistance through the JIS-K-1571-2010 standard.
Execution date	17.12.2012
Product	Soleo, Careo, Vertigo, Diameo
Outcome	Little 0.5% loss of weight against 36% For Japanese cedar; Termites death rate of at least 47.6% against 23.5% for Japanese cedar.

The product shows an excellent resistance to termites.

annex 9 : Rot resistance

Object	Rot resistance through the JIS-K-1571-2010 standard.
Execution date	17.12.2012
Product	Soleo, Careo, Vertigo, Diameo
Outcome	After 12 weeks of Fomitopsis Palustris infection, minimal 0.5% weight loss against 27.6% for Japanese cedar. After 12 weeks of Trametes Versicolor infection, no weight loss against 33.4% for Japanese cedar.

The product is perfectly rot-proof.

annex 10 : Brinell hardness & wear

Object	Measure of the puncture resistance (high hill shoe) and measure of the loss of weight caused by the wear due to pedestrian traffic.
Execution date	10.03.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	The Soleo profile do have a higher hardness than the teak and the weight loss due to wear is lower than the one of a composite wood product of the second generation, as commonly used for terraces.

The product is extremely wear resistant.

annex 11 : Delamination resistance

Object	Resistance to the detachment of the composite wood layer from the aluminum one, following an incision through the JIS-K-5600-5-6 standard.
Execution date	13.02.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	No delamination on the incised parts. Presence of little scales at the intersection of the incisions.

The composite wood layer is perfectly joint to the aluminum.

Treatment

annex 12 : Treatment and tags cleaning

Object	Possibility to eliminate tags with a solvent-made or preventive solution in order to enable a water cleaning without damaging the surface of the product.
Execution date	14.03.2014
Product	Soleo, Careo, Vertigo, Diameo
Outcome	The GraffiGuardR 2030 enable the elimination of the tag without causing any chemical damage to the surface of the product. This statement is valid for solvent-based paints as well as water-based paint.

Tags on the product can be removed without causing any damage to its surface.

Health – safety – environment

annex 13 : Reflection factor

Object	Reflection test through the JIS-K-5602.
Execution date	03.06.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcomes	The solar radiation is absorbed three times more by the composite wood than by the aluminum.

The absorption of the solar radiation and a very low reflection factor prevent any risk of glare for the neighborhood.

annex 14 : Fire reaction

Object	Fire reaction test using a radiation located 30 mm away from the test tube during 20 minutes through the NF P 92-501 standard.
Date d'obtention	16.04.2013
Organisme	Centre Scientifique et Technique du Bâtiment (CSTB), Département de Sécurité, Structures et Feu, France
Product	Soleo, Careo, Vertigo, Diameo
Outcome	M2 fire ranking awarded.

The product is combustible and hardly flammable.

annex 17 : Absence of radioactivity

Object	Absence of radioactivity in the product.
Date d'obtention	06.12.2012
Organisme	Unitika Environmental Technical Center Ltd., Japon
Product	Soleo, Careo, Vertigo, Diameo
Outcome	No detection of radioactivity

The product is not radioactive.

annex 18 : Absence of toxic elements

Object	Presence of heavy metals and formaldehyde emission.
Execution date	20.12.2012
Organisme	Chemical Evaluation and Research Institute, Japon
Product	Soleo, Careo, Vertigo, Diameo
Outcomes	No emission of heavy metals and/or formaldehyde detected.

The product is nontoxic.

Formaldehyde (CH20) :	0
Cadmium (Cd) :	0
Brominated flame retardants (RFB) :	0
Lead (Pb) :	0
Polyvinyl chloride (PVC) :	0
Selenium (Se) :	0
Mercury (Hg) :	0
Chromium (Cr) :	0
Arsenic (AS) :	0
Perfluorinated compounds (PFC) :	0
Phtalates (PFO, DBP, BBP, DEHP) :	0

annex 19 : Minimal carbon footprint

Object	Determination of the carbon footprint of the product.
Execution date	14.06.2013
Product	Soleo, Careo, Vertigo, Diameo
Outcome	The product has a carbon footprint of 9.005 kg of CO_2 / kg of product.

The carbon footprint is lower than the one of the exotic wood.

annexe 1

Water Penetration Test

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. Objective

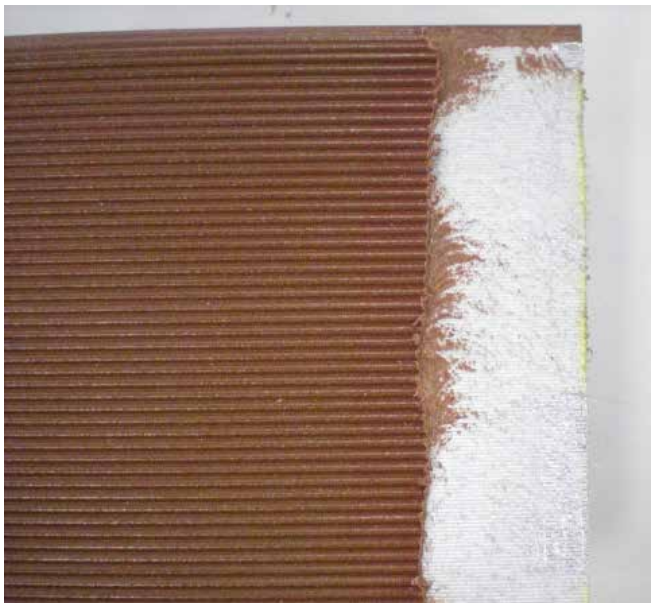
The objective of this test was to examine the strength of the interface between the WPC skin and the Aluminum 6063. By applying ink to the product it can be determined if there is any notable penetration between the Aluminum layer and the WPC core over a period of 1 week.

2. Test method

1. The test samples are treated by accelerated exposure to hot and cold temperatures: 2 hours at -30°C and 2 hours at 80°C for 50 cycles.
2. Dip the WPC-Aluminum Hybrid samples into a tank filled with 40cm of liquid ink (green color on the 2 pictures).
3. Seal up the case to avoid evaporation of ink and keep at 25°C during 1 week.
4. Rinse off samples with water and keep dry for 1 day.
5. Scrape the WPC material from the Aluminum and investigate the interfacebetween those.

3. Results

The pictures bellow show that the yellow ink did not penetrate between the WPC layer and Aluminum core.



Sample 1

Sample 2

Peel-off Test under High Temperature, Humidity & Hot Water

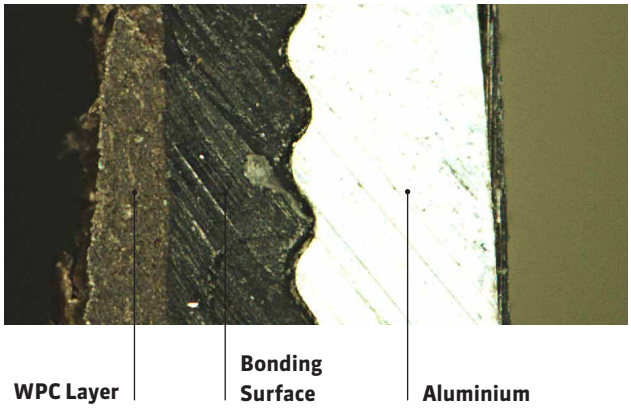
Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Test Method

- Check the peeling off of the (0.25mm) WPC layer from the aluminium surface after constant high temperature (70 degrees Celsius) and high humidity (95%) during 30 days.
- Check the peeling off of the WPC (0.4mm) layer from the aluminium surface after constant immersion in hot water (80 degrees Celsius) during 14 days.

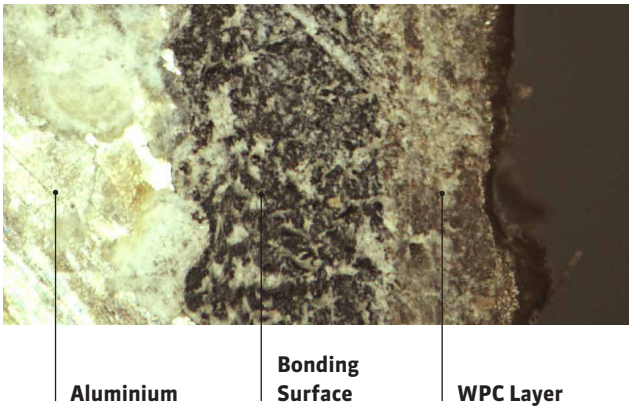
Picture 1

The WPC layer of 0.25mm does not show cracks and is not peeled off from the aluminium surface.



Picture 2

The WPC layer of 0.4mm does not show cracks and is not peeled off from the aluminium surface.



Results

- Pictures 1 and 2 show no cracks nor peeled off WPC from the aluminium surface was found.
- A thinner WPC layer does not decrease the compatibility between the WPC layer and the aluminium surface.
- The thickness of the WPC layer does not reduce the durability or longevity of the hybrid profile.
- The aging process of WPC is not related to its thickness.
- A hybrid profile with a 1mm WPC layer needs to be extruded and sanded with greater care and under stricter tolerances than a profile with a 2mm thick WPC layer.
- The quality inspection will be stricter for hybrid profiles delivered with a 1mm WPC layer thickness.

annexe 5

Aging Test

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Color

Rosewood

Test condition

Black panel temperature: 63 °C

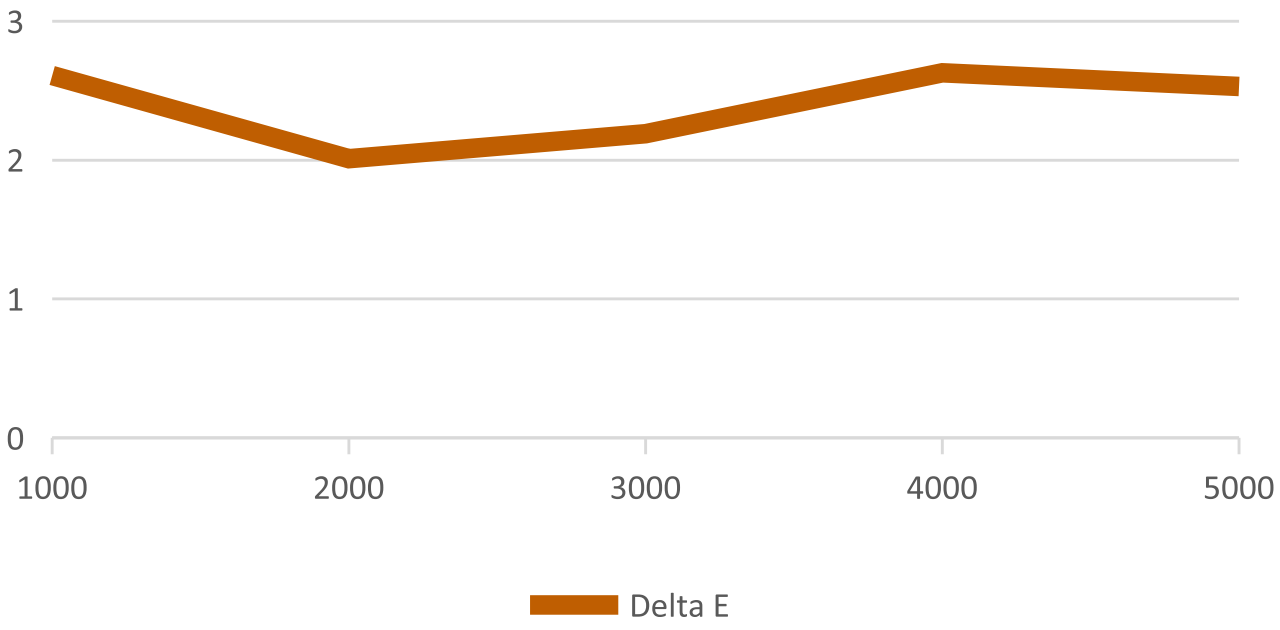
Test method

Accelerated weathering resistance test using Sunshine WeatherMeter, according to JIS-K1571-2010.

Spray cycle

18 minutes in 120 minutes (using ion-exchange water).

Variation of Delta E of the WPC layer:



Test Time (hours)	1000	2000	3000	4000	5000
Delta E	2.61	2.01	2.19	2.63	2.53

Humidity and temperature Test

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. Humidity Test

Test method:

Alternate product between water of 60 degrees Celsius for 5 days and dry conditions at 80 degrees Celsius for 2 days, during 45 cycles.

Results:

Passed without changes to product surface
No cracks nor change in color has been observed.

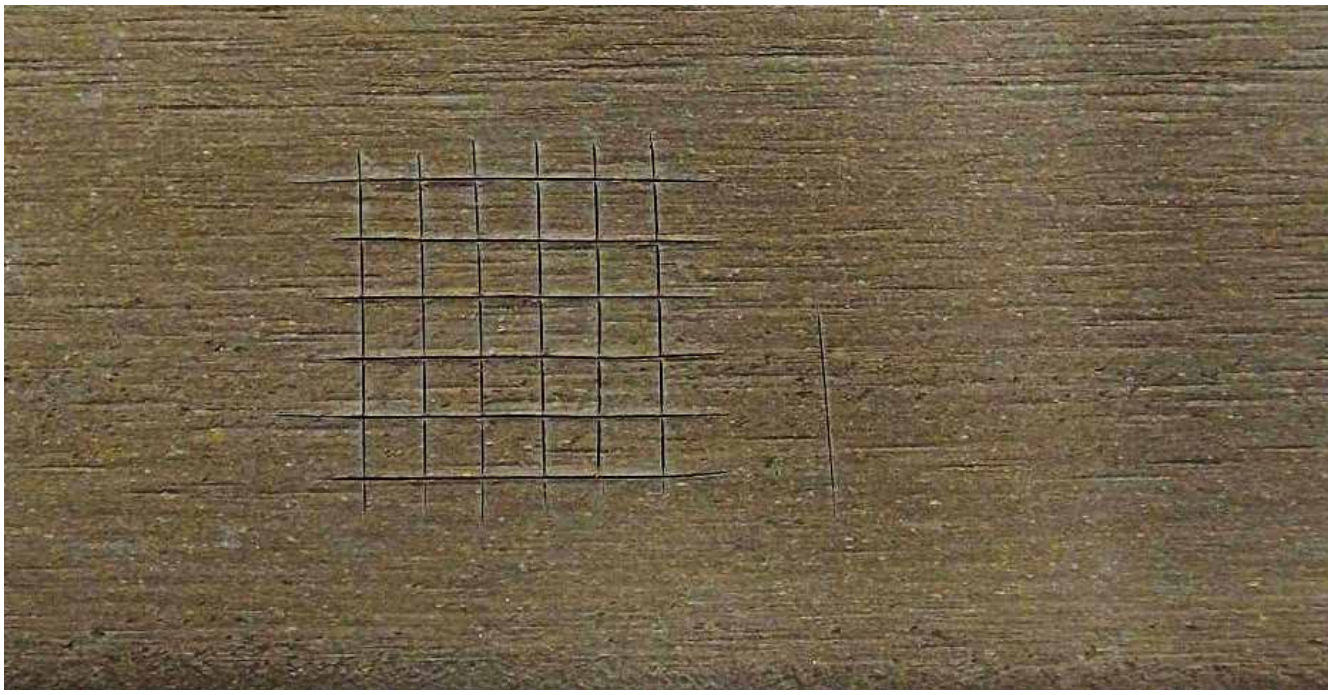
2. Temperature Test

Test method:

Alternate product between -20 degrees Celsius for 2 hours and 80 degrees Celsius for 2 hours, during 50 cycles.

Results:

Passed without changes to product surface.
No cracks nor change in color.



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3. SUV Test

Test method :

Submit product to 2000 hours of UV radiation.

Test Machine :

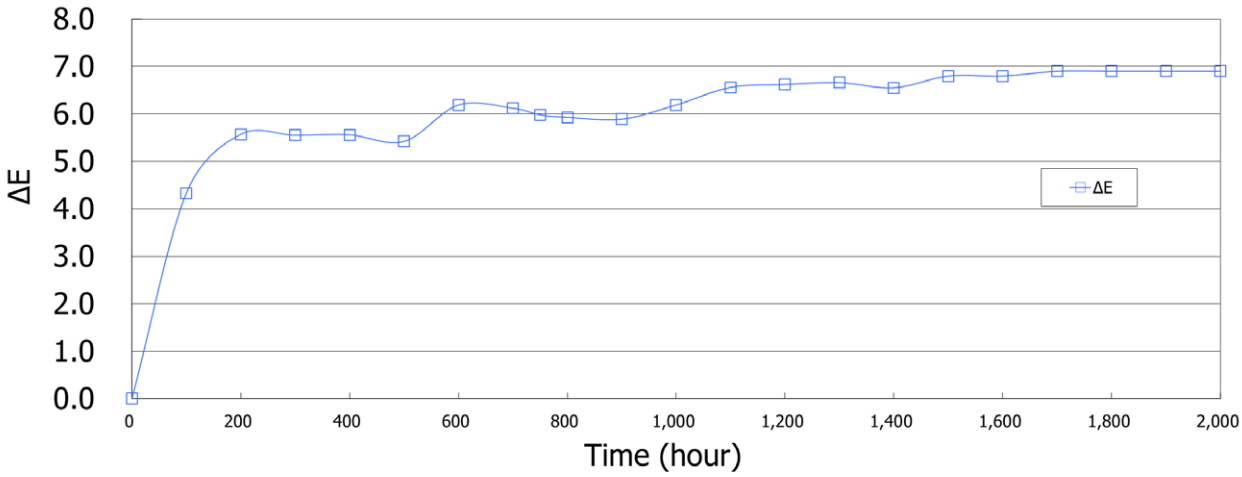
SUV-W151 EYE Super UV tester / Iwasaki Electric co., Ltd.

Results :

- The Total Color Change (Delta E) showed an immediate color change due to fade of wood powder after 100 hours but very little further change up to 2000 hours of exposure.
- Following the test the material surface is smooth and does not show any cracks nor peeled-off surface layers.
- 1000 hours is generally considered equal to twenty years of outdoor usage.

Blank (0 H)

SUV 2 000 H



Time (H)	100	200	300	400	500	600	700	800	900	1,000
ΔE	4.3	5.6	5.6	5.6	5.4	6.2	6.1	5.9	5.9	6.2
Time(H)	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000
ΔE	6.6	6.6	6.7	6.6	6.8	6.8	6.9	6.9	6.9	6.9

Resistance to humidity of bended profiles

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
numéro de commande: SAP-4066

Réception des échantillons:

22.04.2013 (par la poste)

Échantillons:

Nombre	Désignation / N°	Superficie
3 pièces	Profilé en bois cintré Soleo 11	

Test:

Test / Norme	Durée du test	Appareil utilisé pour le test
Eau condensée-variation climatique avec 0,2 l SO_2 selon la norme DIN EN ISO 3231*	24 cycles	A-SC KBG 400, Fa. Liebisch

Exigence:

aprés 24 cycles: aucun changement visible

Résultat:

Échantillons	Date de début	Durée du test	Évaluation
3 échantillons	26.04.13	24 cycles	aucun changement visible

Évaluation:

Les énchantillons ont satisfait aux exigences.

Commentaires / Annexe:

Documentation imagée en annexe

Schwäbisch Gmünd, 02.07.2013

W. Haag

Direction du laboratoire

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Finanzamt Schwäbisch Gmünd
Steuer-Nr.: 83085/24935

annexe 9

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz

numéro de commande: SAP-4066

Documentation imagée

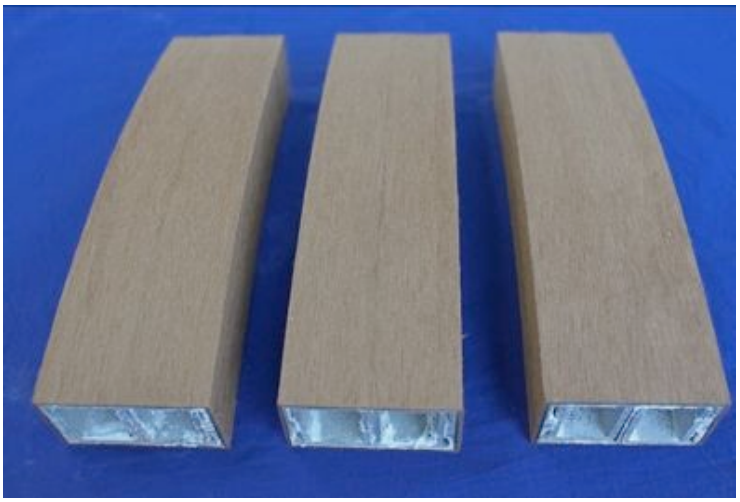

Image 1 – Échantillons aprés le test

Image 2 – Échantillons aprés le test

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Color Stability Test

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Colors:

Rosewood, ebony, paldao, teak.

Objective:

Submit four color samples to SUV and SWOM tests.

Method:

The samples were mounted and exposed to an SUV according to standard JIS K5400 (K5600).

Results:

The initial color and color stability are provided in the following table.

Table 1: EYE Super UV Tester (Accelerated UV Testing)

	Duration	Date	color difference			
			ΔE	ΔL	Δa	Δb
Rosewood	100H	121120	4.3	4.3	0.3	-0.5
	200H	121126	5.6	5.4	0.2	-1.2
	300H	121204	5.6	5.5	0.7	-0.8
	400H	121211	5.6	5.4	0.9	-0.6
	500H	121221	5.4	5.3	1.3	-0.4
	600H	121226	6.2	6.0	1.6	0.2
	700H	130115	6.1	5.8	1.8	0.4
Ebony	100H	121016	0.9	0.1	0.2	-0.9
	200H	121023	3.2	-2.9	0.3	-1.4
	300H	121029	4.3	-3.8	0.1	-2.0
	400H	121108	5.0	-4.5	0.1	-2.2
	500H	121114	5.7	-5.2	0.1	-2.4
Paldao	100H	121016	4.3	4.2	0.5	0.7
	200H	121023	2.8	2.0	1.1	1.6
	300H	121029	2.2	1.3	1.3	1.2
	400H	121108	2.09	0.1	1.5	1.3
	500H	121114	2.4	-1.0	1.7	1.3
Teak	100H	121016	5.0	4.2	1.0	2.7
	200H	121023	7.9	2.6	3.1	6.7
	300H	121029	9.3	1.9	4.5	7.9
	400H	121108	10.1	1.8	5.2	8.4
	500H	121114	10.6	2.0	5.6	8.7

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Table 2: Sunshine Weather Meter (Sunshine Carbon Arc)

	Duration	Date	color difference			
			ΔE	ΔL	Δa	Δb
Ebony	100H	121204	2.46	-0.07	-0.03	-2.46
	200H					
	300H					
	400H					
	500H					
Paldao	100H	121204	4.57	4.51	0.29	-0.68
	200H					
	300H					
	400H					
	500H					
Teak	100H	121204	6.33	5.25	1.63	3.15
	200H					
	300H					
	400H					
	500H					

Resistance to bad weather of bended profiles

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
numéro de commande: SAP-4066

Réception des échantillons:

09.04.2013 (par la poste)

Échantillons:

Nombre	Désignation / N°	Superficie
1 pièce	Profilé en bois cintré Soleo 10	

Test:

Test / Norme	Durée du test	Appareil utilisé pour le test
Intempéries accélérées selon la norme DIN EN ISO 11341*	1000h	XXL+, Fa. Atlas

Exigence:

aprés 1000h: aucun changement de couleur ni d'éclat

Résultat:

Échantillons	Date de début	Durée du test	Évaluation
1 échantillon	15.04.13	1000h	Couleur: avant le test: ΔE = 39,7 aprés le test: ΔE = 37,8
			Éclat: avant le test: G = 1,35 aprés le test: G = 1,40

Évaluation:

L'échantillon a satisfait aux exigences.

Commentaires / Annexe:

Documentation imagée en annexe

Schwäbisch Gmünd, 02.07.2013

Direction du laboratoire

DAkkS Deutsche Akkreditierungsstelle D-PL-11086-01-00

Durch die DAkkS (Deutsche Akkreditierungsstelle GmbH) nach DIN EN ISO/IEC 17025 akkreditiertes Prüflabor. Die akkreditierten Prüfverfahren sind mit dem Symbol * gekennzeichnet.

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annexe 8

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz

numéro de commande: SAP-4066

Documentation imagée

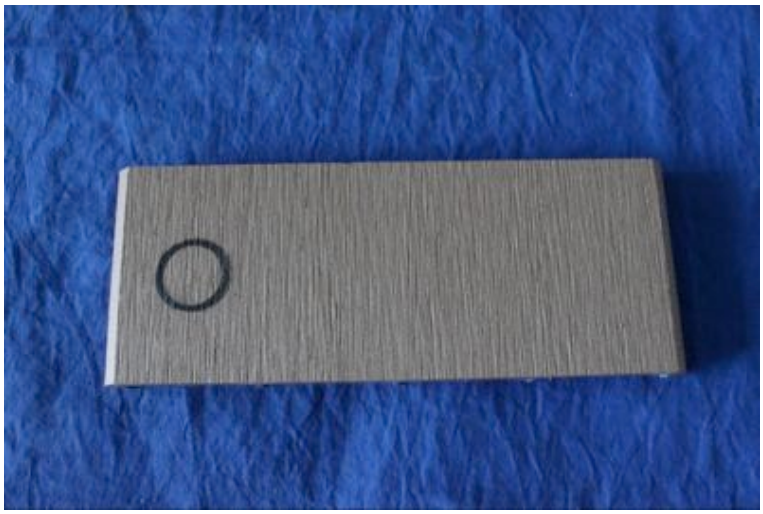

Image 1 – Échantillon testé (point de mesure marqué)

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Steuer-Nr.: 83085/24935

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
4 pieces	Profile: Geolam Type: Soleo 5 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Sulfur dioxide corrosion testing in an alternating atmosphere with 0,2 l SO_2 / DIN EN ISO 3231*	24 Cycles	A-SC KBG 400, Fa. Liebisch

Requirements:

-

Results:

Sample	Test	Time	Evaluation
2 samples	SO_2-test	24 cycles	no visible change

Assessment:

-

Comments / Attachments:

Image documentation after testing. The tested samples from SO_2-test were visually compared with a reference sample.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

W. Noack

Laboratory manager/ Dr. Papendorf

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

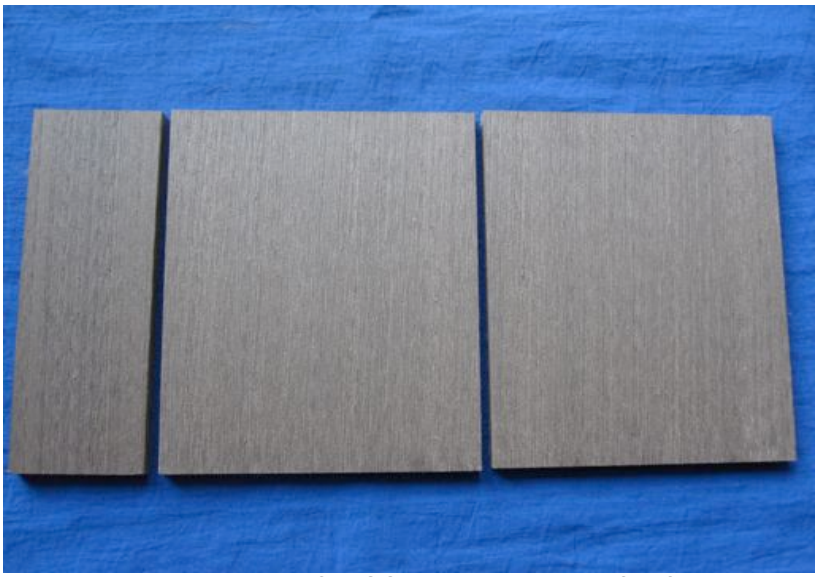

Image 1 – samples after SO_2 testing, on the left reference

Accredited by DAkkS (Deutsche Akkreditierungsstelle GmbH) according to German Industrial Standard DIN EN ISO/IEC 17025 accredited test laboratory. The accredited test methods are marked with the Symbol *.

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IBAN: DE63 6005 0101 0008 0088 91
Inland Revenue Schwäbisch Gmünd
Tax no.: 83085/24935

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
3 pieces	Profile: Geolam Type: Soleo 10 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Sulfur dioxide corrosion testing in an alternating atmosphere with 0,2 l SO_2 / DIN EN ISO 3231*	24 Cycles	A-SC KBG 400, Fa. Liebisch

Requirements:

-

Results:

Sample	Test	Time	Evaluation
2 samples	SO_2-test	24 cycles	no visible change

Assessment:

-

Comments / Attachments:

Image documentation after testing. The tested samples from SO_2-test were visually compared with a reference sample.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

W. Noack

Laboratory manager/ Dr. Papendorf

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

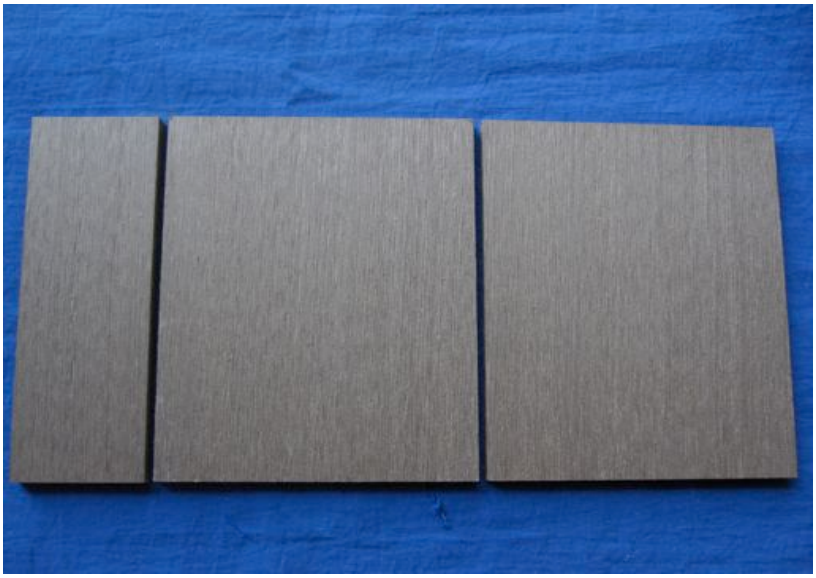

Image 1 – samples after SO_2 testing, on the left reference

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6658

Sample Date:

2014-05-09 (mailing)

Samples:

Count	Name / No.
3 pieces	Profile: Geolam Type: Soleo 7025 Sample size: 130 x 50 x 30 mm curved Radius: 500 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Salt spray tests /DIN EN ISO 9227 NSS*	1000h	MSC 1000, Fa. Liebisch

Requirements:

-

Results:

Sample	Test	Time	Evaluation
3 pieces	NSS	240h	no visible change
		480h	slightly visible change, white spots are salt residues
		720h	Samples appear brighter than at the beginning and the wood surface is roughened.
		1000h	Samples appear brighter and matt than at the beginning and the wood surface is roughened.

Assessment:

-

Comments / Attachments:

Image documentation at the beginning, after 240h, 480h, 720h and 1000h testing.

Schwäbisch Gmünd, 2014-05-20

B. Papendorf

W. Noack

Laboratory manager/ Dr. Papendorf

Deputy of Laboratory manager/ W. Noack

DAkkS Deutsche Akkreditierungsstelle D-PL-11086-01-00

Accredited by DAkkS (Deutsche Akkreditierungsstelle GmbH) according to German Industrial Standard DIN EN ISO/IEC 17025 accredited test laboratory. The accredited test methods are marked with the Symbol *.

IfO - Institut für Oberflächentechnik GmbH
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SWIFT/BIC: SOLA DE ST
IBAN: DE63 6005 0101 0008 0088 91
Inland Revenue Schwäbisch Gmünd
Tax no.: 83085/24935

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6658

Image documentation

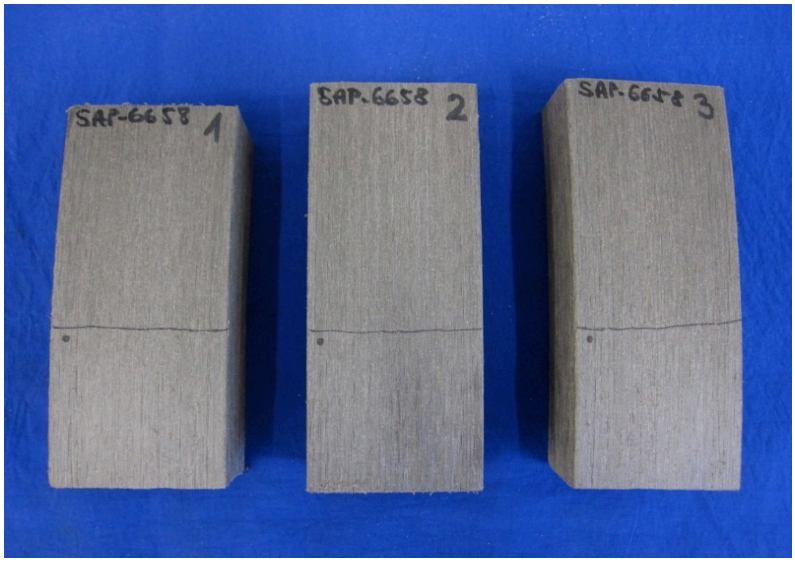

Image 1 – samples at the beginning

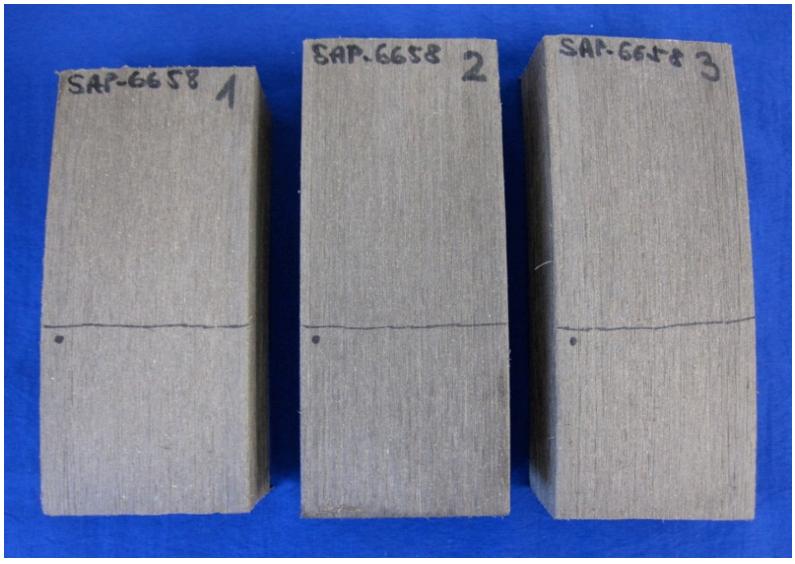

Image 2 – samples after 240h NSS

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6658

Image 3 – samples after 480h NSS

Image 4 – samples after 720h NSS

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6658

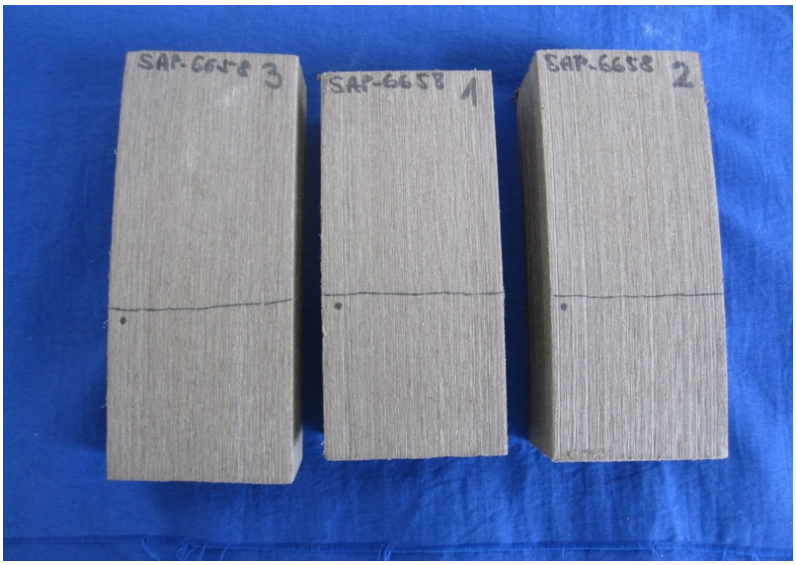

Image 5 – samples after 1000h NSS

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz

numéro de commande: SAP-4066

Réception des échantillons:

09.04.2013 (par la poste)

Échantillons:

Nombre	Désignation / N°	Superficie
1 pièce	Profilé en bois cintré Soleo 10	

Test:

Test / Norme	Durée du test	Appareil utilisé pour le test
Intempéries accélérées selon la norme DIN EN ISO 11341*	1000h	XXL+, Fa. Atlas

Exigence:

aprés 1000h: aucun changement de couleur ni d'éclat

Résultat:

Échantillons	Date de début	Durée du test	Évaluation
1 échantillon	15.04.13	1000h	Couleur: avant le test: ΔE = 39,7 aprés le test: ΔE = 37,8
			Éclat: avant le test: G = 1,35 aprés le test: G = 1,40

Évaluation:

L'échantillon a satisfait aux exigences.

Commentaires / Annexe:

Documentation imagée en annexe

Schwäbisch Gmünd, 02.07.2013

Direction du laboratoire

IfO - Institut für Oberflächentechnik GmbH
Alexander-von-Humboldt-Str. 19
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Geschäftsführer: Hans Pfeifer, Michael Müller
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SWIFT/BIC: SOLA DE ST
IBAN: DE63 6005 0101 0008 0088 91
Finanzamt Schwäbisch Gmünd
Steuer-Nr.: 83085/24935

annexe 8

Rapport d'essais

client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz

numéro de commande: SAP-4066

Documentation imagée

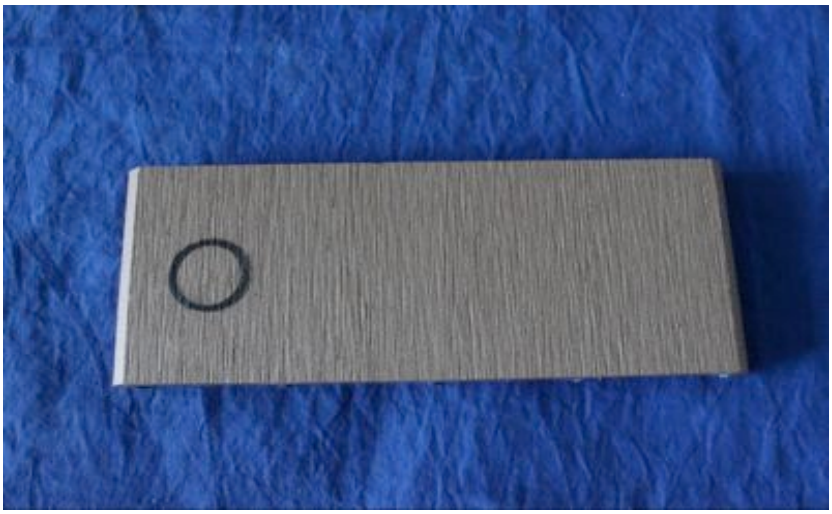

Image 1 – Échantillon testé (point de mesure marqué)

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
2 pieces	Profile: Geolam Type: Soleo 10 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Accelerated Weathering Test acc. DIN EN ISO 16474-2 (DIN EN ISO 11341* withdrawn)	1000h	XXL+, Fa. Atlas

Requirements:

Suntest after 1000h: no changes in color and gloss

Results:

Sample	Test	Time	Evaluation
1 samples	Suntest	1000h	Color after testing: ΔE = 2,4
			Gloss: before testing: G = 3,8 after testing: G = 2,9

Assessment:

The samples fulfil the requirements.

Comments / Attachments:

Image documentation after testing. The color and gloss determination of the sample was carried out by measurement before and after the Suntest on the same sample. The gloss was determined at 85° measuring angle.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

Laboratory manager/ Dr. Papendorf

W. Noack

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

Image 1 – samples after 1000h Suntest, on the left reference

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
2 pieces	Profile: Geolam Type: Soleo 0 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Accelerated Weathering Test acc. DIN EN ISO 16474-2 (DIN EN ISO 11341* withdrawn)	1000h	XXL+, Fa. Atlas

Requirements:

Suntest after 1000h: no changes in color and gloss

Results:

Sample	Test	Time	Evaluation
1 samples	Suntest	1000h	Color after testing: ΔE = 2,7
			Gloss: before testing: G = 1,6 after testing: G = 1,4

Assessment:

The samples fulfil the requirements.

Comments / Attachments:

Image documentation after testing.
The color and gloss determination of the sample was carried out by measurement before and after the Suntest on the same sample. The gloss was determined at 85° measuring angle.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

Laboratory manager/ Dr. Papendorf

W. Noack

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

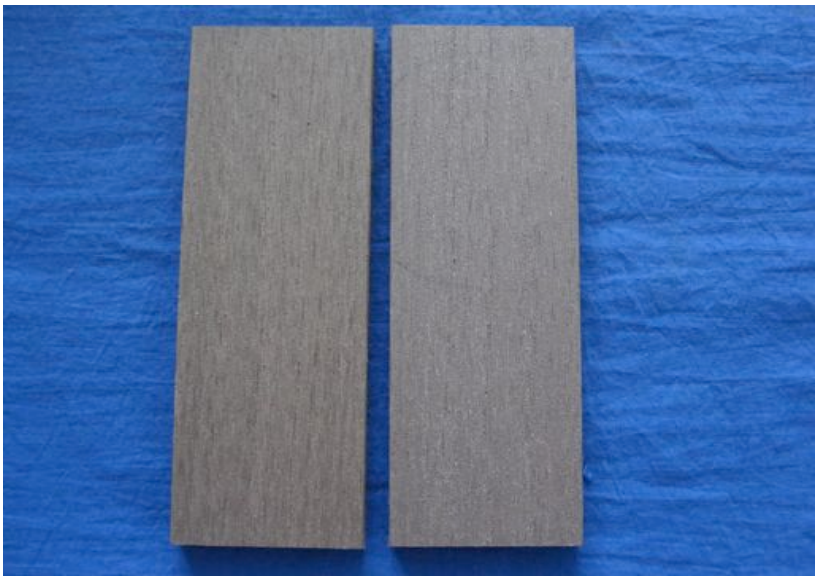

Image 1 – samples after 1000h Suntest, on the left reference

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
2 pieces	Profile: Geolam Type: Soleo 5 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Accelerated Weathering Test acc. DIN EN ISO 16474-2 (DIN EN ISO 11341* withdrawn)	1000h	XXL+, Fa. Atlas

Requirements:

Suntest after 1000h: no changes in color and gloss

Results:

Sample	Test	Time	Evaluation
1 samples	Suntest	1000h	Color after testing: ΔE = 2,7
			Gloss: before testing: G = 5,5 after testing: G = 5,5

Assessment:

The samples fulfil the requirements.

Comments / Attachments:

Image documentation after testing. The color and gloss determination of the sample was carried out by measurement before and after the Suntest on the same sample. The gloss was determined at 85° measuring angle.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

Laboratory manager/ Dr. Papendorf

W. Noack

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DAkkS Deutsche Akkreditierungsstelle D-PL-11086-01-00

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annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

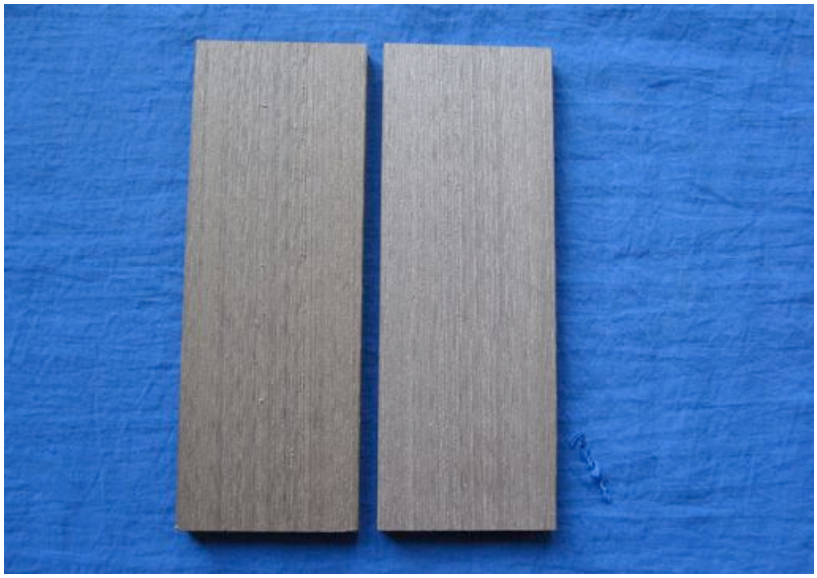


Image 1 – samples after 1000h Suntest, on the left reference

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
2 pieces	Profile: Geolam Type: Soleo 11.0 Sample size: 150 x 50 x 30 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Accelerated Weathering Test acc. DIN EN ISO 16474-2 (DIN EN ISO 11341* withdrawn)	1000h	XXL+, Fa. Atlas

Requirements:

Suntest after 1000h: no changes in color and gloss

Results:

Sample	Test	Time	Evaluation
1 samples	Suntest	1000h	Color after testing: ΔE = 2,6
			Gloss: before testing: G = 3,3 after testing: G = 3,3

Assessment:

The samples fulfil the requirements.

Comments / Attachments:

Image documentation after testing The color and gloss determination of the sample was carried out by measurement before and after the Suntest on the same sample. The gloss was determined at 85° measuring angle.

Schwäbisch Gmünd, 2014-05-19

B. Papendorf

W. Noack

Laboratory manager/ Dr. Papendorf

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

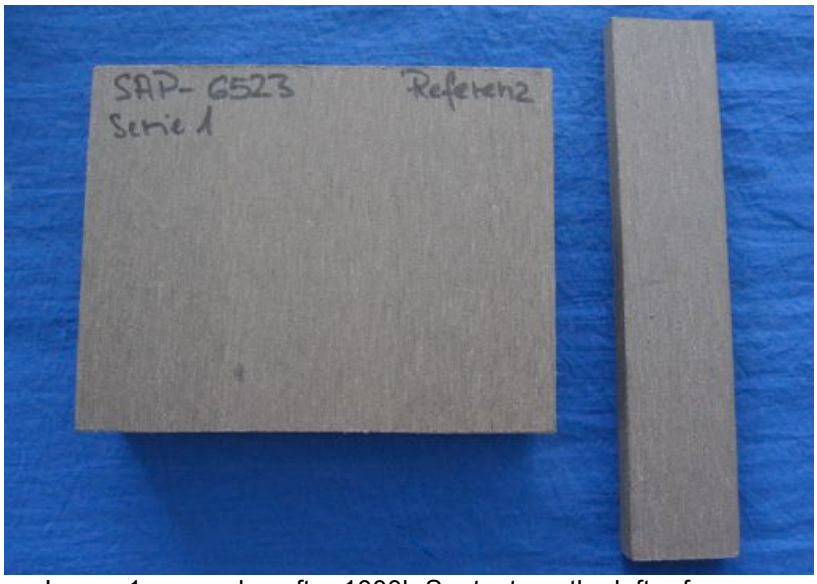


Image 1 – samples after 1000h Suntest, on the left reference

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Sample Date:

2014-02-18 (mailing)

Samples:

Count	Name / No.
4 pieces	Profile: Geolam Type: Soleo 5 Sample size: 150 x 120 x 7 mm Color: ebony

Tests:

Name / Standard	Time	Equipment
Sulfur dioxide corrosion testing in an alternating atmosphere with 0,2 l SO_2 / DIN EN ISO 3231*	24 Cycles	A-SC KBG 400, Fa. Liebisch
Accelerated Weathering Test acc. DIN EN ISO 16474-2 (DIN EN ISO 11341* withdrawn)	1000h	XXL+, Fa. Atlas

Requirements:

SO_2-test after 24 cycles: no visible change
Suntest after 1000h: no changes in color and gloss

Results:

Sample	Test	Time	Evaluation
2 samples	SO_2-test	24 cycles	no visible change
1 samples	Suntest	1000h	Color after testing: ΔE = 2,7
			Gloss: before testing: G = 5,5 after testing: G = 5,5

Assessment:

The samples fulfil the requirements.

Comments / Attachments:

Image documentation after testing.
The tested samples from SO_2-test were visually compared with a reference sample. The color and gloss determination of the sample was carried out by measurement before and after the Suntest on the same sample. The gloss was determined at 85° measuring angle.

Schwäbisch Gmünd, 2014-05-09

B. Papendorf

Laboratory manager/ Dr. Papendorf

W. Noack

Deputy of Laboratory manager/ W. Noack

annexe 8

Test Report

Client: Geolam Management GmbH, Churerstraße 47, CH-8808 Pfäffikon Sz
Job number: 6523

Image documentation

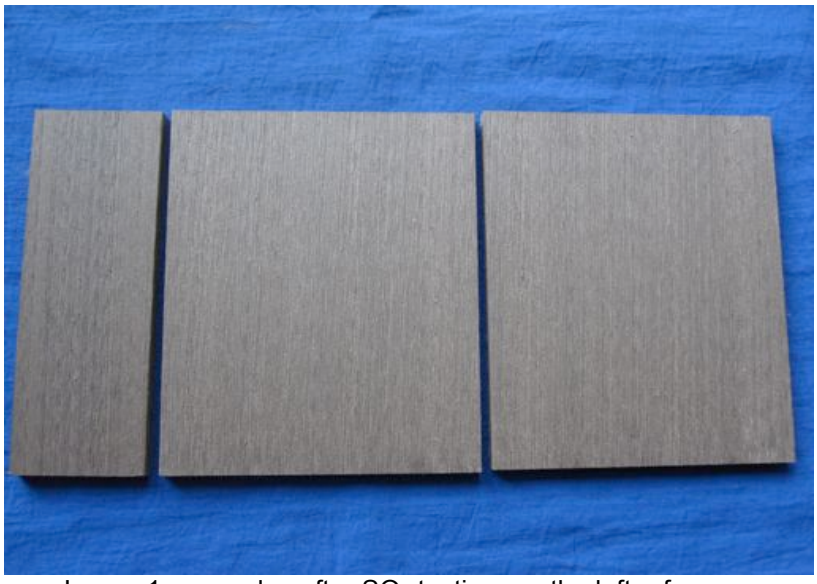


Image 1 – samples after SO_2 testing, on the left reference

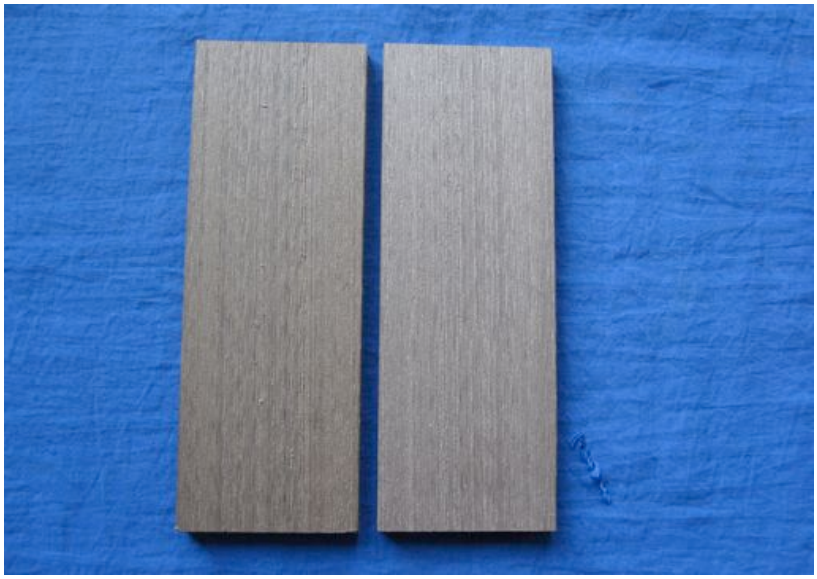


Image 2 – samples after 1000h Suntest, on the left reference

annexe 12

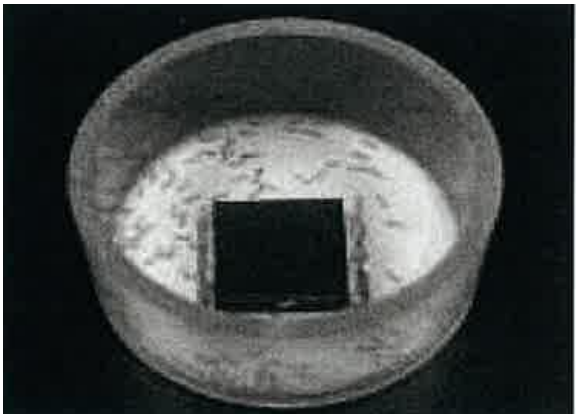
Termite Resistance test

Tested product: **Hybrid samples**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Test method: JIS-K-1571-2010

	Weight loss (mg)	Weight loss (%)	Termite mortality rate (%)
Hybrid profile	4.8	0.1	50.1
Japanese Cedar sapwood	4.8	34.6	23.5

Testing picture:



	WPC-Aluminum Hybrid sanded surface	Japanes Cedar
Before		
After		

annex 9

Rot Resistance test

Tested product: **Hybrid samples**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Test method: JIS-K-1571-2010

	Fomitopsis palustris after 12 weeks	Trametes versicolor after 12 weeks
Hybrid profile - sanded	0.5	0
Hybrid profile – not sanded	0.1	0
Japanese Cedar sapwood	27.6	33.4

Testing picture

Hardness and Abrasion test

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. Hardness - Brinell Scale

The Brinell scale characterizes the indentation hardness of materials through the scale of penetration of an indenter, loaded on a material test-piece. It is one of several definitions of hardness in materials science.

Test results according to standard JIS Z 21010-1994 were as follows :

	Natural wood - Beech	Natural wood - Teak	Soleo (between the rib)	Soleo (on the rib)
Brinell scale (N/mm2)	19.5	24.5	26.8	52.3

Results:

the Soleo profile can be used for decking and is harder than teak and beech natural wood.

2. Abrasion Resistance

Abrasion is a measurement of weight loss by a sample being impacted by repeated abrasion force using sandpaper.

The weight loss in the abrasion test was as follows:

1000g, 500 rotations	Blank (g)	Results (g)	Weight loss (g)
Soleo	51.236	51.168	0.068
WPC dec	79.482	79.253	0.229

Tested by JAS Flooring A method

WPC decking profile

Geolam Soleo

Results:

The abrasion test shows that the Soleo profile do carry as stronger resistance to abrasion than any WPC decking profile.

annexe 2

Resistance to Peeling off of Surface Material

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. Scope

This testing standard is defined by JIS-K-a5600-5-6 (Testing methods for paints - Part 5: Mechanical property of film - Section 6: Adhesion test). It specifies a test method for assessing the resistance of WPC surface layer to separation from the Aluminum surface when a right angle lattice pattern is cut into the WPC surface layer, penetrating through to the Aluminum surface. The property measured by this empirical test procedure depends among other factors, on the adhesion of the WPC surface layer to either the preceding WPC surface layer or the Aluminum surface layer.

2. Apparatus

Cutting tool

Single-blade cutting tool with 20 to 30 degree angle edge and a blade thickness of 0.43mm ± 0.03mm.

Guiding and spacing edges

In order to space the cuts correctly, a series of guiding and spacing edges is necessary when using a single-blade cutting tool. Guiding and spacing edges is ten spacing edges 1mm thick.

Adhesive tape

The adhesive tape has a width of 25mm.

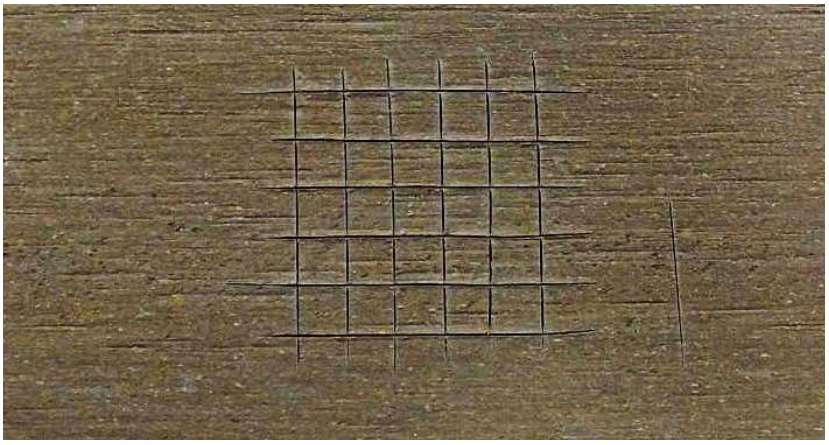
3. Procedure

Number of cuts

- The number of cuts in each direction of the lattice pattern shall be six (4mm cuts to cuts span).
- Hold the cutting tool with the blade normal to the test panel surface. With uniform pressure on the cutting tool and using the appropriate spacing guide, make the agreed number of cuts in the coating at a uniform cutting rate. All the cuts shall penetrate the Aluminum Surface.
- Repeat this operation, making further parallel cuts of equal number, crossing the original cuts at 90° so that a lattice pattern is formed.
- Place the center of the tape over the lattice in a direction parallel to one set of cuts and smooth the tape into place over the area of the lattice and for a distance of at least 20mm beyond with a finger.
- Five min. after having applied the tape, remove the tape by grasping the free end and pulling it off steadily in 0.5 s to 1.0 s at an angle which is as close as possible to 60°

4. Results

Detachment/peeling off of small flakes of the WPC surface layer at the intersections of the cuts. A cross cut area must be below 1/25 (4%) from 4mm cuts * 25 lattice pattern.



Possibility and effects of cleaning paint stains

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Test Method

1. Apply antigraffiti on the WPC-AL Hybrid surface and keep during 48hrs
2. Paint white spray (solvent base) and yellow spray (water base) and keep during 24hrs
3. As shown in table 1, apply graffi guard (remover) and keep during 15 minutes
4. Rinse the surface using high pressure water and investigate effectiveness of high (aprx 7Mpa) and low (2-4Mpa) pressure

Table 1 : Combination antigraffiti and graffi guard

	Antigraffiti	Graffiti Guard
#1	TDS2221	2060
#2	TDS5400	
#3	TDS5020	N/A
#4	TDS2221	2030
#5	TDS5400	

Results

Table 2 shows #4 is the best combination to remove Graffiti.

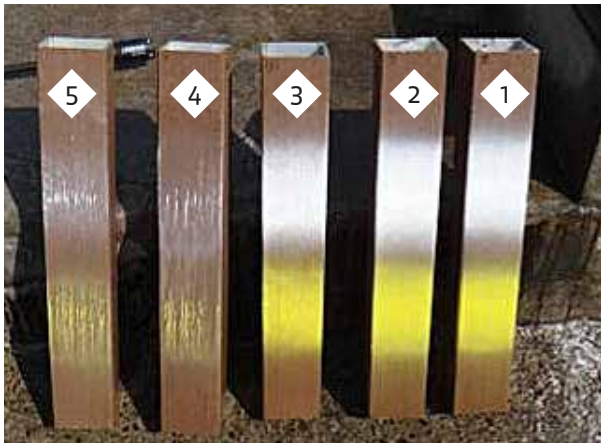
Table 2 : test results

Test	Antigraffiti	Graffiti Guard	Paint	Pressure	
				Low	High
#1	TDS2221	2060	Solvent	1	3
			Water	1	3
#2	TDS5400	2060	Solvent	1	3
			Water	1	3
#3	TDS5020	N/A	Solvent	1	2
			Water	1	2
#4	TDS2221	2030	Solvent	4	5
			Water	4	5
#5	TDS5400	2030	Solvent	4	5
			Water	4	5

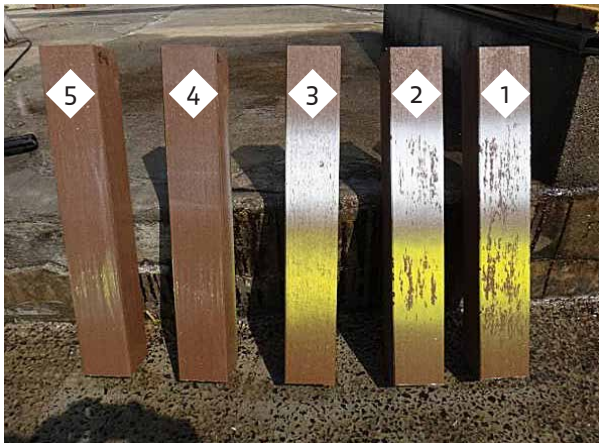
annexe 14

Reference

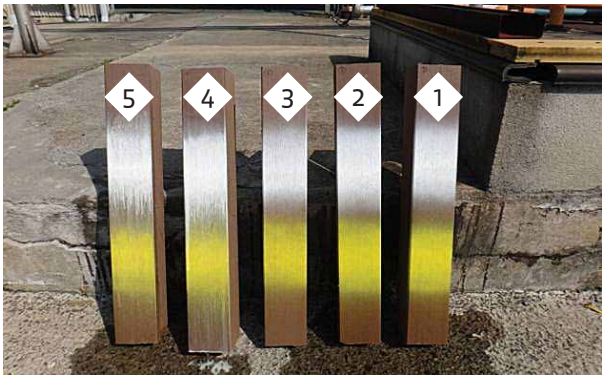
Picture 1 : with low pressure water spray



Picture 2 : with high pressure water spray

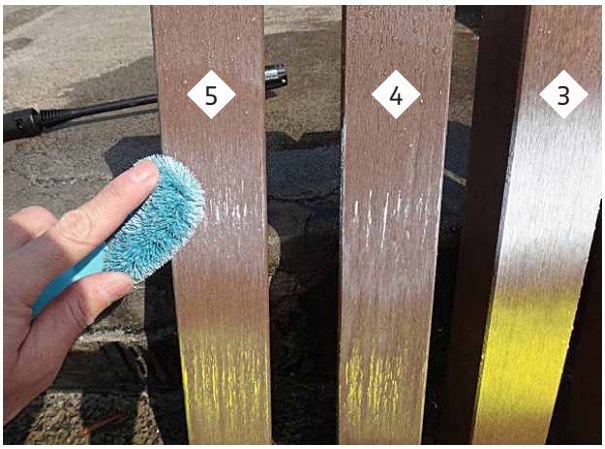


Picture 3 : Apply antigraffiti on the 4G surface and keep during 48hrs



- Sample 4 and 5 with Graffiti Guard 2030 starts
- Sample 1, 2 and 3 do not show the performance
- Sample 4 and 5, graffiti is completely removed
- Sample 1 and 2 , at closer distance water spray helps to remove the graffiti

After low pressure water spray, brushing the surface.



No effect

Apply 2030, brushing and high pressure water spray.

Completely removed

Conclusion

GraffiGuard

GraffiGuardR 2030 shows very good performance as graffiti is completely gone.
Using a brush and water also helps to remove the graffiti.
GraffiGuardR 2060 does not work.

Anti Graffiti

AntiGraffitiGuard TDS2221 shows better performance.
We believe TDS2221 makes the surface flat which removes the paint easily from the surface.

Paint

There is no differences between solvent based paint and water based paint.
Both AntiGraffitiGuard TDS2221 and GraffiGuardR 2030 do not cause chemical damage on the surface of WPC-AL Hybrid.

annexe 15

Solar Reflectance Index (SRI)

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Test method: JIS-K-5602

Test results:

			Solar Reflectance Index (SRI)		
			All wave lengths	Visual light range	Near-infrared range
			300-2500nm	300-780nm	780-2500nm
Hybrid profile	Rosewood	1	15.92	13.96	18.57
		2	14.74	13.11	16.95
		Average	15.33	13.54	17.76
	Teak	1	30.75	24.80	38.75
		2	29.08	23.30	36.85
		Average	29.92	24.05	37.80
	Wenge	1	12.25	11.07	13.82
		2	12.40	11.11	14.13
		Average	12.33	11.09	13.98
	Limba	1	21.28	18.94	24.43
		2	21.30	18.95	24.46
		Average	21.29	18.94	24.45
Aluminum	Silver color	1	71.90	67.40	77.60
		2	71.90	67.40	77.50
		Average	71.90	67.40	77.55
	Bronze color	1	25.70	15.00	39.40
		2	25.50	14.90	39.00
		Average	25.60	14.95	39.20

Fire reaction test

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DEPARTEMENT SECURITE
STRUCTURES ET FEU
Réaction au feu

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ESSAIS

PROCES-VERBAL DE CLASSEMENT DE REACTION AU FEU D'UN MATERIAU

Selon l'arrêté du 21 novembre 2002 relatif à la réaction au feu des produits de construction et d'aménagement
Laboratoire pilote agréé du Ministère de l'Intérieur (arrêté du 05/02/59, modifié)

N° RA13-0125

Valable 5 ans à compter du 16 avril 2013

Matériau présenté par : GEOLAM MANAGEMENT
Churerstrasse 47
8808 PFAFFIKON SZ
SUISSE

Marque commerciale : GEOLAM SOLEO WHS 4G

Description sommaire :
Profilés en aluminium revêtus par co-extrusion d'une couche décorative en bois composite ignifugée composée de résine polypropylène mélangée à de la fibre de bois.
Références des profilés présentés : « Soléo 10 » et « Soléo 11 ».

Masses linéiques nominales : 730 g/m (« Soléo 10 ») et 2330 g/m (« Soléo 11 »).
Epaisseurs nominales des parois extérieures d'aluminium : 1,10 mm (« Soléo 10 ») et 1,40 mm (« Soléo 11 »).
Epaisseurs mesurées de résine de bois : environ 1,7 à 2,0 mm (« Soléo 10 ») et environ 1,2 à 1,7 mm (« Soléo 11 »).
Largeurs nominales : 128 mm (« Soléo 10 ») et 51,5 mm (« Soléo 11 »).
Epaisseurs nominales totales : 53 mm (« Soléo 10 ») et 31,5 mm (« Soléo 11 »).
Essence de fibres de bois présentée (80 %) : Palissandre.

Nature de l'essai : Essai par rayonnement

Classement : **M2 valable pour une gamme d'épaisseurs de résine de bois de 1,2 à 2,0 mm et pour une gamme d'épaisseurs totales de profilés de 31,5 à 53,0 mm**

Durabilité du classement (Annexe 2 – Paragraphe 5) : Non limitée a priori.
compte tenu des critères résultant des essais décrits dans le rapport d'essais N° RA13-0125 annexé.

Ce procès verbal atteste uniquement des caractéristiques de l'échantillon soumis aux essais et ne préjuge pas des caractéristiques de produits similaires. Il ne constitue donc pas une certification de produits au sens des articles L 115-27 à L 115-33 et R 115-1 à R 115-3 du code de la consommation.

Champs-sur-Marne, le 16 avril 2013

Le Technicien
Responsable de l'essai

Mickaël GOULE

Le Chef du laboratoire
Réaction au Feu
P.O Martial BONHOMME

Nicolas ROURE

CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT
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annexe 16

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ACCRÉDITATION N° 1-0001 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR
ESSAIS

RAPPORT D'ESSAIS N° RA13-0125 DE REACTION AU FEU D'UN MATERIAU

Selon l'arrêté du 21 novembre 2002 relatif à la réaction au feu des produits de construction et d'aménagement

Valable 5 ans

L'accréditation de la section Laboratoires du COFRAC atteste de la compétence des laboratoires pour les seuls essais couverts par l'accréditation.

Ce rapport d'essais atteste uniquement des caractéristiques de l'objet soumis aux essais et ne préjuge pas des caractéristiques de produits similaires. Il ne constitue pas une certification de produits au sens des articles L 115-27 à L 115-33 et R 115-1 à R 115-3 du code de la consommation.

En cas d'émission du présent rapport par voie électronique et/ou sur support physique électronique, seul le rapport sous forme de support papier signé par le CSTB fait foi en cas de litige. Ce rapport sous forme de support papier est conservé au CSTB pendant une durée minimale de 10 ans.

La reproduction de ce rapport d'essais n'est autorisée que sous sa forme intégrale.

Il comporte 6 pages.

A LA DEMANDE DE :

GEOLAM MANAGEMENT
Churerstrasse 47
8808 PFAFFIKON SZ
SUISSE

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Rapport d'essais n°RA13-0125

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OBJET

Les essais rapportés par le présent document ont pour but de déterminer le comportement des matériaux, conformément aux essais prescrits par l'Arrêté Ministériel référencé ci-dessous, relatif à la réaction au feu des matériaux de construction et d'aménagement.

TEXTES DE REFERENCE

Arrêté du 21 novembre 2002.
Annexe 2 de l'arrêté du 21 novembre 2002.

NATURE DE (S) L'ESSAI (S)

Essai par rayonnement selon la norme NF P 92-501.

DATE (S) D'ESSAI (S)

15 et 18 mars 2013.

PROVENANCE ET CARACTERISTIQUE DES ECHANTILLONS

Date de livraison	:	08 mars 2013
Matériau présenté par	:	GEOLAM MANAGEMENT Churerstrasse 47 8808 PFAFFIKON SZ SUISSE
N° Identification	:	ES541120812
Marque (s) commerciale (s)	:	GEOLAM SOLEO WHS 4G
Fabricant (s)	:	WPC Corporation 5F Toranomon 5 Mori Building 1-17-1 Toranomon Minato-ku 105-0001 TOKYO JAPON

L'attention est attirée sur le fait que les résultats obtenus avec l'échantillon objet du présent rapport d'essais ne sont pas généralisables sans justification de la représentativité des échantillons et essais.

Champs-sur-Marne, le 16 avril 2013

Le Technicien
Responsable de l'essai

Mickaël GOULE

Le Chef du laboratoire
Réaction au Feu

p.o Martial BOURBIGOT

Nicolas ROURE

Rapport d'essais n°RA13-0125

DESCRIPTION SOMMAIRE

Profilés en aluminium revêtus par co-extrusion d'une couche décorative en bois composite ignifugée composée de résine polypropylène mélangée à de la fibre de bois.
Références des profilés présentés : « Soléo 10 » et « Soléo 11 ».

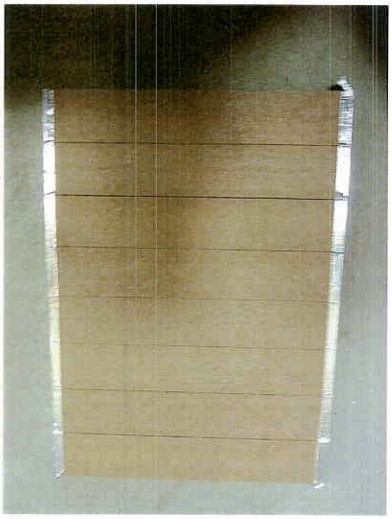
Masses linéiques nominales : 730 g/m (« Soléo 10 ») et 2330 g/m (« Soléo 11 »).
Epaisseurs nominales des parois extérieures d'aluminium : 1,10 mm (« Soléo 10 ») et 1,40 mm (« Soléo 11 »).
Epaisseurs mesurées de résine de bois : environ 1,7 à 2,0 mm (« Soléo 10 ») et environ 1,2 à 1,7 mm (« Soléo 11 »).
Largeurs nominales : 128 mm (« Soléo 10 ») et 51,5 mm (« Soléo 11 »).
Epaisseurs nominales totales : 53 mm (« Soléo 10 ») et 31,5 mm (« Soléo 11 »).
Essence de fibres de bois présentée (80 %) : Palissandre.

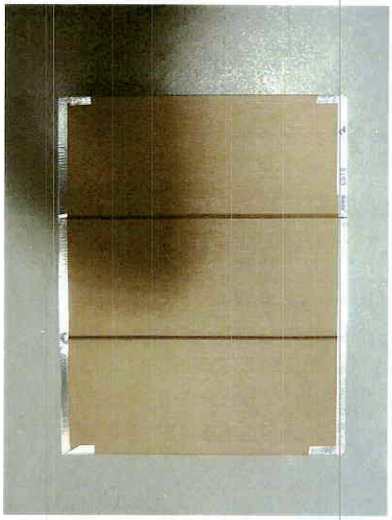
CARACTERISTIQUES COMPLEMENTAIRES

La composition détaillée du produit figure au dossier.
La nature et la quantité d'agent ignifuge figurent au dossier (information confidentielle).

Masses linéiques mesurées : environ 736 g/m (« Soléo 11 ») et environ 2230 g/m (« Soléo 10 »).
Epaisseurs mesurées parois + résine : environ 1,99 à 2,47 mm (« Soléo 11 ») et environ 3,20 à 3,30 mm (« Soléo 10 »).
Epaisseurs totales mesurées : environ 31,7 mm (« Soléo 11 ») et environ 52,1 mm (« Soléo 10 »).
Largeur mesurée du profilé + résine : environ 51 mm (« Soléo 11 ») et 127 mm (« Soléo 10 »).

Photographies des échantillons :





ESSAI PAR RAYONNEMENT

L'échantillon (30 x 40 cm) disposé à 45° est soumis à un rayonnement défini émis par un radiateur électrique dont la surface est à 30 mm du plan de l'éprouvette. Les gaz dégagés passent au contact d'inflammateurs disposés de part et d'autre de l'éprouvette.
Chaque épreuve dure 20 minutes.
Les éléments déterminant sont : le temps d'inflammation initial, les hauteurs de flammes et la durée de l'inflammation.

A. DEFINITION DE L'INDICE DE CLASSEMENT

ti_1 est le temps depuis le début de l'essai où l'inflammation apparaît sur la face exposée.
ti_2 est le temps depuis le début de l'essai où l'inflammation apparaît au dos de l'éprouvette.
td_1 est le temps au bout duquel la flamme dépasse la limite du bord supérieur de la partie plane de la surface radiante de l'épiradiateur sur la face exposée.
td_2 est le temps au bout duquel la flamme dépasse le trait repère zéro au dos de l'éprouvette.
e_1, e_2 sont les temps depuis le début de l'essai où, soit il y a extinction, soit les flammes ne dépassent plus la surface radiante - sur la face exposée (e_1) - au dos de l'éprouvette (e_2).

$$q = \frac{100 \sum h}{ti \sqrt{\Delta t}}$$

t_i est le temps depuis le début de l'essai, où la première inflammation effective apparaît.
h est la longueur maximale exprimée en centimètre atteinte par les flammes au cours de chaque période de 30 secondes durant chaque épreuve.
Σh est la somme des hauteurs pendant la durée de chaque épreuve.
Δt est la durée de combustion vive, soit la durée totale de présence de flamme dépassant la limite supérieure de la partie plane de la surface radiante en une ou plusieurs périodes supérieures ou égales à 5 secondes sur l'une ou l'autre des faces de l'éprouvette ou sur les deux faces.
Par convention, dans le cas particulier des matériaux qui ne s'enflamment pas effectivement (durée inférieure à 5 secondes), il est admis que l'indice q soit nul.

annexe 16

Rapport d'essais n°RA13-0125

B. OBSERVATIONS ET CRITERES DE CLASSEMENT DES DIFFERENTES EPREUVES REALISEES

Résultats : 1 épreuve effectuée par sens sur l'épaisseur 31,5 mm du produit référencé « GEOLAM 4G ».

Eprouvette n° 2 Sens transversal Coloris bois	ti_1	544 s				t_i	544 s
	td_1	544 s				Δt	349 s
	e_1	900 s				Σh	69 cm
	ti_2	—				h_{max}	15 cm
	td_2	—					
	e_2	—				**q =**	**0.68**

Eprouvette n° 4 Sens longitudinal Coloris bois	ti_1	325 s				t_i	325 s
	td_1	325 s				Δt	696 s
	e_1	1 021 s				Σh	258 cm
	ti_2	—				h_{max}	18 cm
	td_2	—					
	e_2	—				**q =**	**3.01**

Observations : nous observons que le sens longitudinal est le sens le plus défavorable. Nous procédons donc à 3 épreuves supplémentaires sur ce sens afin de déterminer le classement.

Eprouvette n° 3 Sens longitudinal Coloris bois	ti_1	398 s				t_i	398 s
	td_1	398 s				Δt	419 s
	e_1	817 s				Σh	165 cm
	ti_2	—				h_{max}	15 cm
	td_2	—					
	e_2	—				**q =**	**2.03**

Eprouvette n° 5 Sens longitudinal Coloris bois	ti_1	260 s				t_i	260 s
	td_1	260 s	516 s ...		1 150 s	Δt	600 s
	e_1	286 s	522 s ...		1 200 s	Σh	357 cm
	ti_2	—				h_{max}	26 cm
	td_2	—					
	e_2	—				**q =**	**5.61**

Eprouvette n° 6 Sens longitudinal Coloris bois	ti_1	214 s				t_i	214 s
	td_1	214 s	398 s	539 s	974 s	Δt	355 s
	e_1	221 s	420 s	852 s	962 s	Σh	264 cm
	ti_2	—				h_{max}	26 cm
	td_2	—					
	e_2	—				**q =**	**6.55**

Indice de classement :

$$\bar{q} = \frac{\Sigma q}{n} = \mathbf{4,30}$$

n est le nombre d'épreuves

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Résultats (suite) : 2 épreuves effectuées par sens sur l'épaisseur 53 mm du produit référencé « GEOLAM 4G ».

Eprouvette n° 1 Sens longitudinal Coloris bois	ti_1	—	t_i	—
	td_1	— Aucune inflammation effective	Δt	—
	e_1	—	Σh	—
	ti_2	—	h_{max}	—
	td_2	—		
	e_2	—	**q =**	**0.00**

Eprouvette n° 2 Sens transversal Coloris	ti_1	—	t_i	—
	td_1	— Aucune inflammation effective	Δt	—
	e_1	—	Σh	—
	ti_2	—	h_{max}	—
	td_2	—		
	e_2	—	**q =**	**0.00**

Eprouvette n° 3 Sens longitudinal Coloris bois	ti_1	766 s	t_i	766 s
	td_1	767 s	Δt	133 s
	e_1	900 s	Σh	36 cm
	ti_2	—	h_{max}	9 cm
	td_2	—		
	e_2	—	**q =**	**0.41**

Eprouvette n° 4 Sens transversal Coloris bois	ti_1	—	t_i	—
	td_1	— Aucune inflammation effective	Δt	—
	e_1	—	Σh	—
	ti_2	—	h_{max}	—
	td_2	—		
	e_2	—	**q =**	**0.00**

Indice de classement :

$$\bar{q} = \frac{\Sigma q}{n} = \mathbf{0,10}$$

n est le nombre d'épreuves

..... FIN DU RAPPORT D'ESSAIS

annexe 16

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DIRECTION SECURITE STRUCTURES ET FEU
Réaction au feu

GEOLAM MANAGEMENT GmbH
A l'attention de M. Manuel GARCIA

Objet : Résultats des essais de Réaction au Feu

Affaire suivie par : M. Mickaël GOULE
Tél : 01.64.68.85.10
N° dossier : ES541130655

A Champs-sur-Marne, le 24 mars 2014

ATTESTATION PROVISOIRE DE CLASSEMENT

Les épreuves sur le produit référencé «**SOLEO 7025 Formulation n° 10** » sont à présent terminées.

Au vu des résultats et dans l'attente de confirmation par le Procès Verbal de classement, votre produit obtient le classement **M2**, valable pour les caractéristiques suivantes :

Profilé en aluminium revêtu par co-extrusion d'une couche décorative en bois composite ignifugée composée de résine polypropylène mélangée à de la fibre de bois.

Référence profilé : « Soléo 7025 ».
Largeur nominale : 50 mm.
Epaisseur nominale : 30 mm.
Teinte : ébène.

Nous vous prions d'agréer, Monsieur, l'assurance de notre considération distinguée.

Le Technicien
Responsable de l'essai

Mickaël GOULE

Les informations contenues dans ce document sont considérées provisoires dans l'attente de leur validation

CSTB
le futur en construction

DIRECTION SECURITE STRUCTURES ET FEU
Réaction au feu

GEOLAM MANAGEMENT GmbH
A l'attention de M. Manuel GARCIA

Objet : Résultats des essais de Réaction au Feu

Affaire suivie par : M. Mickaël GOULE
Tél : 01.64.68.85.10
N° dossier : ES541130655

A Champs-sur-Marne, le 31 mars 2014

ATTESTATION PROVISOIRE DE CLASSEMENT

Les épreuves sur le produit référencé « **SOLEO 7026 Formulation n° 5** » sont à présent terminées.

Au vu des résultats et dans l'attente de confirmation par le Procès Verbal de classement, votre produit obtient le classement **M2**, valable pour les caractéristiques suivantes :

Profilé en aluminium revêtu par co-extrusion d'une couche décorative en bois composite ignifugée composée de résine polypropylène mélangée à de la fibre de bois.

Référence profilé : « Soléo 7026 ».
Largeur nominale : 120 mm.
Epaisseur nominale : 30 mm.
Teinte : ébène.

Nous vous prions d'agréer, Monsieur, l'assurance de notre considération distinguée.

Le Technicien
Responsable de l'essai

Mickaël GOULE

annexe 16

CSTB
le futur en construction

DIRECTION SECURITE STRUCTURES ET FEU
Réaction au feu

GEOLAM MANAGEMENT GmbH
A l'attention de M. Manuel GARCIA

Objet : Résultats des essais de Réaction au Feu

Affaire suivie par : M. Mickaël GOULE
Tél : 01.64.68.85.10
N° dossier : ES541130655

A Champs-sur-Marne, le 24 mars 2014

ATTESTATION PROVISOIRE DE CLASSEMENT

Les épreuves sur le produit référencé « **SOLEO 7026 Formulation n° 10** » sont à présent terminées.

Au vu des résultats et dans l'attente de confirmation par le Procès Verbal de classement, votre produit obtient le classement **M1**, valable pour les caractéristiques suivantes :

Profilé en aluminium revêtu par co-extrusion d'une couche décorative en bois composite ignifugée composée de résine polypropylène mélangée à de la fibre de bois.

Référence profilé : « Soléo 7026 ».
Largeur nominale : 120 mm.
Epaisseur nominale : 30 mm.
Teinte : ébène.

Nous vous prions d'agréer, Monsieur, l'assurance de notre considération distinguée.

Le Technicien
Responsable de l'essai

Mickaël GOULE

Radioactivity test

UNITIKA ENVIRONMENTAL
TECHNICAL CENTER LTD.

23,Ujikozakura Uji Kyoto,Japan
TEL:+81-774-25-2522 FAX:+81-774-25-2355

ATTESTATION

Report No.: RVB7522
DATE: December 06,2012

This is to certify that we tested the following sample in accordance with the request as follows.

Requested by
KURABO INDUSTRIES LTD.

Object of survey: Aluminum-Recycled Wood Compound (LOT:120926)

Destination: –

Shipper: –

Buyer: –

L/C No.: –

Invoice No.: –

Location of Measurement: At the Tokyo Office of UNITIKA ENVIRONMENTAL TECHNICAL CENTER LTD.,Chuo,Tokyo,Japan

Date of Measurement: December 05,2012,17:34

Survey Equipment: NaI (Tl) scintillation Survey Meter "ALOKA γ SURVEY METER TCS-172"

Result of Measurement

Measurement Point	Max. Value (μSv/h)	Min. Value (μSv/h)
Front side	0.07	0.06
Rear side	0.07	0.06
Left side	0.07	0.06
Right side	0.07	0.06
Upper side	0.07	0.06

Measurement Point	μSv/h
Background Radiation	0.07

Certified Radiation Protection Supervisor by Ministry Of Education, Culture,Sports,Science and Technology-Japan

Kenichiro Tokuda

Kenichiro Tokuda

annexe 18

Dissolution test of heavy metals

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

CERI

Chemicals Evaluation and Research Institute, Japan
Tokyo laboratory

Page 1 of 1 page

Report No. : 172-12-H-0187

Test Report

1. Date of Application : December 3,2012 (No.172-12-1-0232)
2. Sample : Aluminum-Recycled Wood Compound Material (LOT : 120926)
one sample
3. Test Items and Methods :
3.1 Dissolution test of the Heavy metals
Testing method regarding metals contained in industrial waste (Environment Agency Notification No.13,1973)
Cadmium (Cd) : JIS K 0102 55.2 Electrothermal type atomic absorption spectrometry
Lead (Pb) : JIS K 0102 54.2 Electrothermal type atomic absorption spectrometry
Mercury (Hg) : Appendix No.1, Environment Agency Notification No.59,1971 Cold vapor atomic absorption spectrometry
Selenium (Se) : JIS K 0102 67.2 Atomic absorption spectrometry by hydride
Arsenic (As) : JIS K 0102 61.2 Atomic absorption spectrometry by hydride
Chromium(VI) : JIS K 0102 65.2.1 Diphenylcarbazide absorption spectrometry
3.2 Determination of formaldehyde emission
: JIS A 1460(2001) Desicator method
4. Test Results :
4.1 Dissolution test of the Heavy metals

Items		Unit	Aluminum-Recycled Wood Compound Material (LOT : 120926)	Lower Limits of detection
Cadmium	(Cd)	mg/L	N.D.	0.002
Lead	(Pb)	mg/L	N.D.	0.01
Mercury	(Hg)	mg/L	N.D.	0.0005
Selenium	(Se)	mg/L	N.D.	0.002
Arsenic	(As)	mg/L	N.D.	0.005
Chromium(VI)		mg/L	N.D.	0.05

N.D.:Less than the lower limits of detection.

4.2 Determination of formaldehyde emission

Item	Unit	Aluminum-Recycled Wood Compound Material (LOT : 120926)	Lower Limits of detection
Formaldehyde emission	mg/L	N.D.	0.1

N.D.:Less than the lower limits of detection.

5. Date of issue : December 20,2012

Approved signatory : T. Kume

Issued by : Hiroshi Tadokoro
General Manager
Tokyo Laboratory
Chemicals Evaluation and Research Institute, Japan
1600, Shimo-takano, Sugito-machi,Kitakatsushika-gun,
Saitama 345-0043, Japan
Tel +81-480-37-2601 Fax +81-480-37-2521

Please receive the approval of this Institute beforehand when you reprint this test report.

Carbon footprint analysis

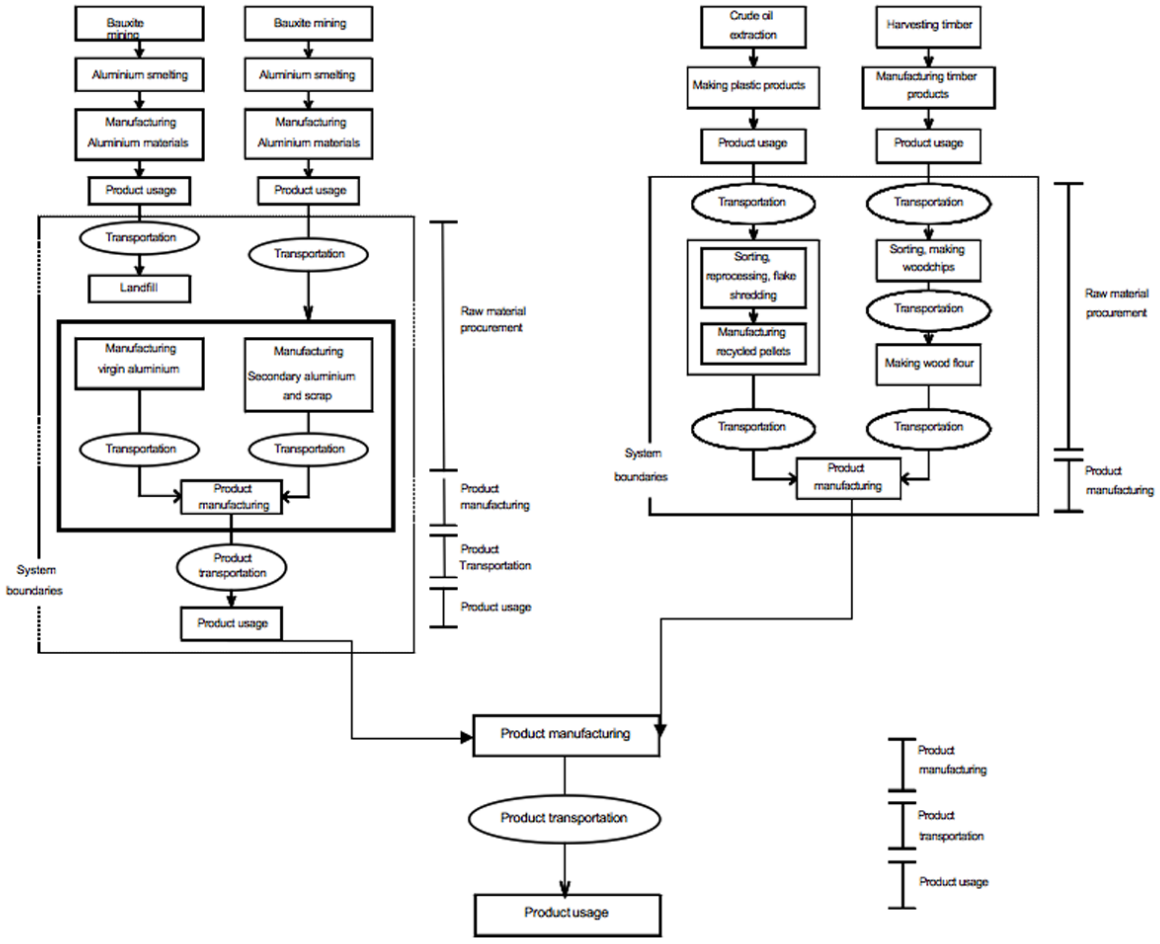
Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. Calculating $LCCO_2$ of Aluminum Hybrid Profiles

System boundaries and scenarios

In this analysis, figure 1 shows the system boundaries.

Fig. 1 : System boundaries



2. Calculating $LCCO_2$ of the WPC Surface

SYSTEM BOUNDARIES AND SCENARIOS

In this analysis, we have adopted the evaluation scope proposed by Wada et al1 for the purpose of assessing how the use of recycled materials in Geolam production affects the LCCO2 value for Geolam. Figure 2 shows the system boundaries. In the case of recycled products, the process of generating raw production materials from original products that were themselves produced from raw materials is included within the system boundaries as a raw material procurement process.

annexe 19

Figure 2 : System boundaries

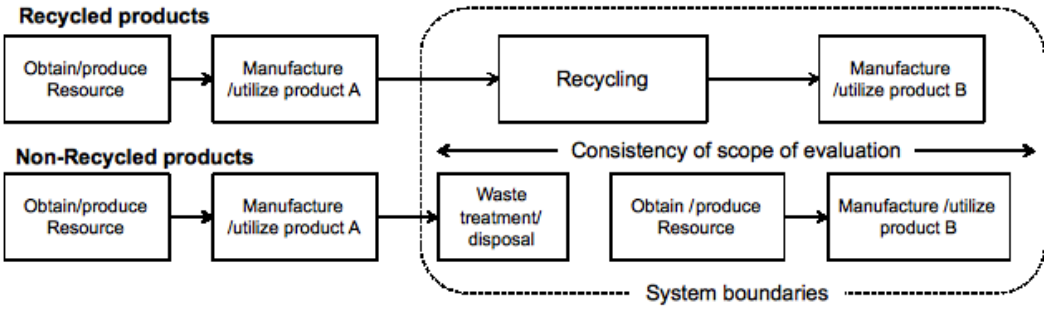
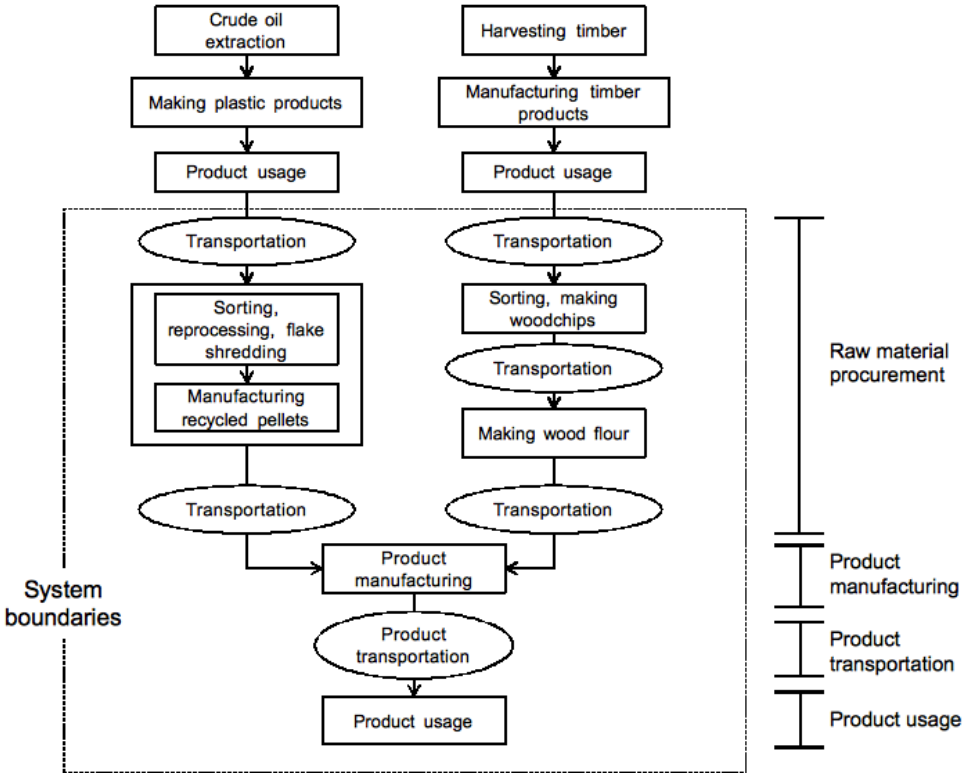


Figure 3 shows the WPC layer scenario discussed in this analysis.



Plastic materials are typically recycled from plastic containers and packaging as well as industrial waste. Wood flour from wood material is timber scrap derived from recycled construction scrap..

Product manufacturing processes consist of mixing the raw materials and sanding processed into the finished product. The ratio of plastic to wood material is an average based on figures supplied by the manufacturers we interviewed. Although Geolam products can take a variety of forms, our discussion here will be restricted to standard hollow panels.

In terms of product usage, we assume that the panels are deployed in outdoor settings.

Our analysis does not include capital goods production (such as building factories and processing facilities) associated with the various processes.

CALCULATION CONDITIONS FOR INDIVIDUAL PROCESSES

This analysis employs bottom-up calculations using foreground data wherever possible. Where process data was unavailable, we have used what we consider to be representative data taken from previous reports and research papers.

Raw material procurement—plastic

From Figure 3, raw material procurement processes for plastics (in the form of recycled pellets) consist of transporting used plastic, sorting, reprocessing, flake shredding, manufacturing recycled pellets, and transporting recycled pellets.

Since all of the Geolam licensee purchase recycled plastic pellets through trading firms, we were unable to obtain foreground data on the sorting, reprocessing, and flake shredding process or the pellet manufacturing process. Instead, we calculated CO2 emissions for these processes based on data provided in past literature.

We used past literature to determine the criteria for calculating CO2 emissions associated with transportation of used plastic products. Based on the scenario of a 10-t truck2 loaded at 62%2 capacity and traveling a distance of 500 km2, unit CO2 emissions were calculated at 0.1300 kg-CO2/t-km2.3 and CO2 emissions per kilogram carried were 0.0650 kg-CO2/kg.

CO2 emissions from sorting, reprocessing and flake shredding were 0.0857 kg-CO2/kg. This figure is based on emissions for manual sorting and disassembly of waste plastic products as stated in past literature7. CO2 emissions from recycled pellet manufacturing were 0.0838 kg-CO2/kg, based on emissions figures for melting and extrusion in the literature7. Product yields were 98.5% for sorting, reprocessing and flake shredding and 99.7% for recycled pellet manufacturing, based on the same literature7.

Once again, CO2 emissions associated with transportation of recycled pellets were calculated on the basis of the criteria stated in past literature. For a 10-t truck2 loaded at 62%2 capacity and traveling a distance of 500 km2, unit CO2 emissions were 0.1300 kg-CO2/t-km2,3 and CO2 emissions per kilogram carried were 0.0650 kg-CO2/kg.

Raw material procurement—wood

From Figure 3, raw material procurement processes for wood (in the form of wood flour) consist of transporting timber scrap, sorting, making woodchips, transporting woodchips, manufacturing wood flour, and transporting wood flour.

We used past literature to determine the criteria for calculating CO2 emissions associated with transportation of timber scrap. Based on the scenario of a 4-t truck5 loaded at 62%2 capacity and traveling a distance of 10 km5, unit CO2 emissions were calculated at 0.2178 kg-CO2/t-km2,3 and CO2 emissions per kilogram carried were 0.0022 kg-CO2/kg.

None of the Geolam licensee manufactures their woodchips in-house, so we were obliged to use background data from past literature5 in regards to sorting and woodchip making processes. Based on the energy consumption values for lumber sorting and crushing (typically using magnetic separators, air graders and/or metal detectors), we arrived at the consumption figures of 0.0233 kWh/kg (for electricity) and 0.00185 l/kg (for diesel). We then multiplied these by the respective emission coefficients set out in the Environment Ministry publication Calculation methodology and emission coefficients for calculation, reporting and publication purposes3 The resulting figure for CO2 emissions associated with sorting and woodchip manufacturing was 0.0179 kg-CO2/kg. Around 70% of woodchip output is considered suitable for Geolam material recycling, with the remaining about 30% used as fuel5.

Next, we calculated power consumption associated with production of wood flour at 0.9084 kWh per kilogram. This is an average figure based on the foreground data obtained from Geolam licensee who produce their own wood flour. Once again, we multiplied this figure by the corresponding CO2 emission coefficient in Calculation methodology and emission coefficients for calculation, reporting and publication purpose3 to calculate the CO2 emissions for wood flour production. The result was 0.5096 kg-CO2/kg. Product yield was 94.3%.

For CO_2 emissions associated with transportation, we used the scenario of a 10-t truck6 loaded at 62% capacity2 traveling a distance of 54.4 km6, based on past literature. The unit emissions value was 0.1300 kg-CO_2/t-km2,3 while emissions per kilogram carried were 0.0071 kg-CO_2/kg. These figures were applied to transportation of both woodchips and wood flour.

Production WPC layer

Power consumption associated with production WPC compound was found to be 1.8220 kWh per kg Geolam, based on the average of foreground data obtained from Geolam licensee. Multiplied by the CO_2 emissions coefficient for electric power6, this leads to an emissions figure of 1.0221 kg-CO_2/kg. Product yield was 94.3%.

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Product transportation

It was difficult to define the CO_2 emissions for the product transportation process because of the variety of different sales channels employed by Geolam licensee from whom we were able to obtain foreground data. For this reason, we used the transportation criteria given in past literature and assumed a scenario of a 10-t truck2 loaded at 62% capacity2 traveling a distance of 500 km2. On this basis, unit emissions were 0.1300 kg-CO_2/t-km2,3 and emissions per kilogram carried were 0.0650 kg-CO_2/kg.

Usage

We assumed that Geolam compound was used as the surface layer of Geolam Aluminum hybrid profiles in an outdoor louvers. Since Geolam does not require ongoing maintenance such as repainting, we assumed zero CO_2 emissions during the period of use.

RESULTS

The $LCCO_2$ value for WPC layer was 1.54 kg-CO_2 per kilogram of WPC layer.

Table 1: $LCCO_2$ for WPRC per kilogram of product— calculation results.

Process			Average	Proportion of CO2 emissions
WPC layer	Input material (plastics)		0.515 kg	
Procurement of raw plastic material	Transportation of used plastics	CO2 emissions	0.033 kg-CO2	2.1%
	Sorting, reprocessing, flake shredding	CO2 emissions	0.044 kg-CO2	2.9%
	Manufacturing recycled pellets	CO2 emissions	0.042 kg-CO2	2.7%
	Transportation of recycled pellets	CO2 emissions	0.033 kg-CO2	2.1%
WPC layer	Input material (woods)	CO2 emissions	0.833 kg	
Procurement of raw wood material	Transportation of timber scrap	CO2 emissions	0.002 kg-CO2	0.1%
	Sorting, making woodchips	CO2 emissions	0.010 kg-CO2	0.6%
	Transportation of woodchips	CO2 emissions	0.004 kg-CO2	0.3%
	Making wood flour	CO2 emissions	0.283 kg-CO2	18.4%
	Transportation of wood flour	CO2 emissions	0.004 kg-CO2	0.3%
Process	Input material (plastics)		0.506 kg	
Process	Input material (woods)		0.555 kg	
Process	WPC compound		1.000 kg	
Process	Yield		94%	
Process		CO2 emissions	1.022 kg-CO2	66.3%
Process	Transportation	CO2 emissions	0.065 kg-CO2	4.2%
Process	Product usage (20 years)	CO2 emissions	0.000 kg-CO2	0.0%
	Total	1.54 kg-CO2 / kg		100%

3. LCCO$_2$ assessment of Aluminium

OVERVIEW

Previously we calculated the LCCO2 value per kg of WPC layer. In this Chapter, We begin by calculating the LCCO2 value per kg of aluminium decking.

CALCULATING LCCO$_2$ FOR ALUMINIUM

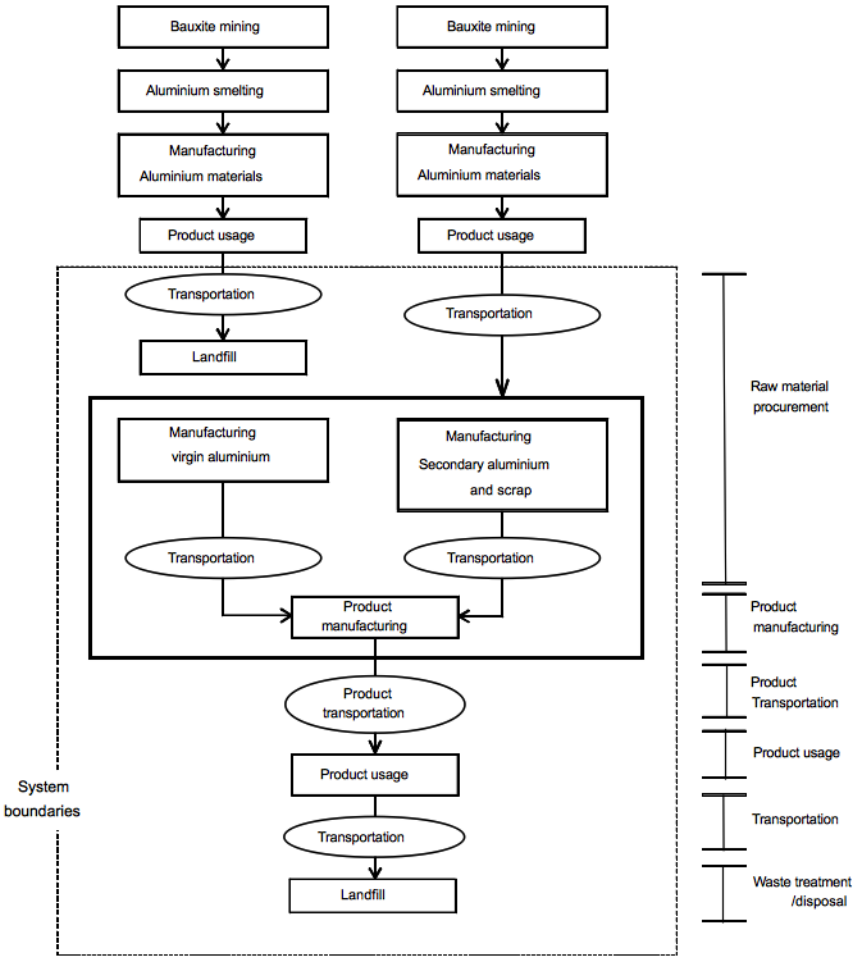
System boundaries and anticipated scenarios

Figure 4 shows the anticipated scenarios and system boundaries. The scenarios involve manufacturing the aluminium materials from a combination of virgin and secondary aluminium as well as scrap. Based on past literature (reference 14), the breakdown was 51.7% virgin aluminium, 25.6% secondary aluminium, 17.2% scrap and 5.6% other metals such as added metals and alloys.

In the virgin aluminium procurement process, in order to align the WPRC system boundaries and evaluation scope, we have added waste disposal and treatment (equivalent to the landfill process for aluminium production material in this section) of the same recycled materials used in the original product (see Figure 2).

For the usage process, we envisage flat boards used in an outdoor setting, the same as for WPRC, with the products being sent to landfill after use.

Figure 4 : Aluminium scenarios



Calculation conditions by process

We calculated LCCO2 values for aluminium materials based on background data from past literature. Among the scenarios in Figure 4, combined CO2 emissions associated with the processes enclosed within double lines, including some of the raw material procurement and product manufacturing processes, is taken from LCI Data for Rolled Aluminum Products14) from the Japan Aluminium Association (JAA). Emissions per kg of aluminium materials associated with the processes enclosed in double lines was 7.11 kg-CO2.

Calculation conditions for other processes are described below.

Raw materials procurement processes

Among the raw material procurement processes, the transportation process (as far as the landfill facility) and landfill process generated 0.0016 kg-CO2 per kg, based on past literature (7).

The conditions for calculating CO2 associated with the transportation process (as far as the secondary aluminium manufacturing facility) was taken from past literature. Transportation by 10-ton truck5) over a distance of 500 km5) at 62%5) loading generated 0.1300 kg-CO2 per ton per km5)6) resulting in CO2 emissions of 0.0650 kg-CO2/kg.

Product transportation process

We plotted the anticipated WPRC transportation route and determined the conditions from past literature. Transportation by 10-ton truck5) over a distance of 500 km5) at 62%5) loading generated 0.1300 kg-CO2 per ton per km5)6) resulting in CO2 emissions of 0.0650 kg-CO2/kg.

Product usage process

As with WPRC, the usage process assumed flat boards used as outdoor construction materials. It was assumed that no CO2 was emitted during the usage period.

Waste treatment/disposal process

The waste treatment/disposal process consists of transportation to the landfill site and disposal in landfill, as shown in Figure 4.

CO2 emissions associated with transportation to the landfill site were 0.0016 kg-CO2/kg, based on past literature (7).

3.2 RESULTS

Table 2 shows the calculation results. The LCCO2 value for aluminium materials was 7.19 kg-CO2 per kg.

Table 2: LCCO2 calculation results for aluminium materials (CO2 per kg product)

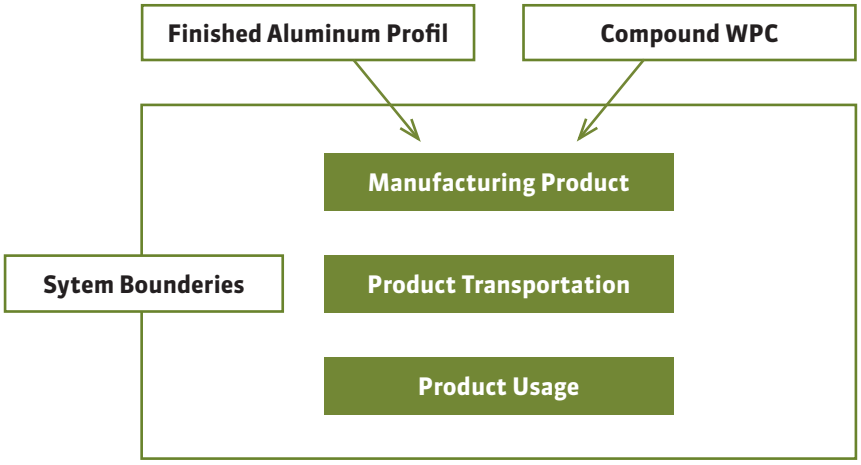
Process			Quoted value	Proportion of CO2 emissions
Raw material procurement (up to landfill)	Transportation (to secondary aluminium manufacturing facility)	CO2 emissions	0.017 Kg-CO2	0.2%
	Transportation (to landfill)	CO2 emissions	0.001 Kg-CO2	0.0%
	Landfill	CO2 emissions		0.0%
Raw material procurement (from raw material manufacturing to product manufacturing)		CO2 emissions	7.11 Kg-CO2	98.8%
Product transportation	Transportation	CO2 emissions	0.065 Kg-CO2	0.9%
Product usage	Product usage (20 years)	CO2 emissions	0.000 Kg-CO2	0.0%
Waste treatment/ disposal	Transportation	CO2 emissions	0.002 Kg-CO2	0.0%
	Incineration	CO2 emissions		0.0%
		Total	**7.19 Kg-CO2/kg**	**100%**

4 Calculating LCCO2 of Aluminum Hybrid Profiles

SYSTEM BOUNDARIES AND SCENARIOS

Figure 5 shows the Geolam Aluminum Hybrid profile scenario discussed in this analysis.

Figure 5 :



WPC surface materials are calculated in section2 and Aluminum profile is calculated in section 3.

Geolam aluminum hybrid profile , the material is composed of WPC on the surface, a special glue in the middle to increase the interface compatibity and Aluminum in the core. The ratio of WPC surface layer to Aluminum profile is an average based on figures supplied by the manufacturers we interviewed. Although Geolam Aluminum hybrid profiles can take a variety of forms, our discussion here will be restricted to standard hollow panels EW6008.

CALCULATION CONDITIONS FOR INDIVIDUAL PROCESSES

This analysis employs bottom-up calculations using foreground data wherever possible. Where process data was unavailable, we have used what we consider to be representative data taken from previous reports and research papers.

Raw material procurement—WPC surface and Aluminum profile

For raw material that are the same as the WPC layer scenario in Figure 2, we used the calculation results from Section 2 Calculating LCCO2 of WPC layer and from Section 3 Calculating LCCO2 of Aluminum profile .

Production Geolam Aluminum Hybrid profile

Power consumption associated with production WPC layer obtained from Geolam licensee multiplied by the CO2 emissions coefficient for electric power, this leads to an emissions figure of 0.21CO2/kg.

Product transportation

It was difficult to define the CO2 emissions for the product transportation process because of the variety of different sales channels employed by Geolam licensee from whom we were able to obtain foreground data. For this reason, we used the transportation criteria given in past literature and assumed a scenario of a 10-t truck2 loaded at 62% capacity2 traveling a distance of 500 km2. On this basis, unit emissions were 0.1300 kg-CO2/t-km2,3 and emissions per kilogram carried were 0.0650 kg-CO2/kg.

Usage

We assumed that Geolam Aluminum hybrid profile was used as outdoor louvers. Since Geolam does not require ongoing maintenance such as repainting, we assumed zero CO2 emissions during the period of use.

RESULTS

The LCCO2 value was 9.005kg-CO2 per kilogram of Geolam. (EW6008)

Table 3 : LCCO2 for WPRC per kilogram of product— calculation results

Process			Average	Proportion of CO2 emissions
WPC layer Procurement of WPC layer	**Table 1	CO2 emissions	1.54 kg-CO2	17.1%
Aluminum profile Procurement of Aluminum profile	**Table 2	CO2 emissions	7.19 kg-CO2	79.8%
Raw material procurement (from raw material manufacturing to product manufacturing) Product transportation	Input material (WPC)		0.178 kg	
	Input material (Aluminum)		0.822 kg	
	Geolam Aluminum Hybrid profile		1.000 kg	
		CO2 emissions	0.21 kg-CO2	2.3%
Product transportation	Transporta-tion	CO2 emissions	0.065 kg-CO2	0.0%a 0.7%
Product usage	Product usage (20 years)	CO2 emissions	0.000 kg-CO2	0.0% 0.0%
		Total	**9.005 kg-CO2 / kg**	**100%**

5 Conclusions

The following conclusions were drawn from our analysis.
The LCCO2 for Geolam aluminum hybrid profile was 9.005 kg-CO2/kg.

6 References

1. Yasuhiko Wada, Hiroyuki Miura, and Akiyasu Hirata: Study of recycling phase evaluation methodologies in Life Cycle Assessment, Environmental Systems Research, Vol. 22, pp. 141-146, 1994

2. Secretariat of the CFP Trial Project (Mizuho Information and Research Institute): Product Category Rules (PCR) (accredited PCR number = PA-BG-01)—Plastic flat palette for cargo and transportation, http://www.cfp-japan.jp/common/pdf_authorize/000035/12696087511.pdf, July 30, 2010 (reference)

3. Ministry of the Environment: Calculation methodology and emission coefficients for calculation, reporting and publication purposes, http://www.env.go.jp/earth/ghg-santeikohyo/material/itiran.pdf, July 30 2010 (reference)

4. Plastic Waste Management Institute, Technical Development Committee, Environmental Impact Assessment WG: Recycling LCA of copiers, vehicle bumpers and ATMs, Plastic Waste Management Institute, March 2006

5. Seiji Hashimoto, Takaumi Ohara, and Yasushi Terashima: Environmental evaluation of recycling of timber scrap, Collections of the Japan Society of Civil Engineers, No. 643/VII-14, pp. 37-48, February 2000

6. Takuya Shimase: Domestic transportation distances for woodchips, Abstracts from the Autumn 2006 conference of the Japanese Forest Economic Society, November 2006

7. Plastic Waste Management Institute: LCI data study on petrochemical products, Plastic Waste Management Institute, July 1999

8. Wood miles forum http://woodmiles.net/english/index.htm

Methods Used for Durability Tests

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

1. The mechanical property of WPC-Aluminum Hybrid products is investigated using the Japan Industrial Standard (JIS) test methods, methods of analysis and inspection aproach.
2. Since there are variety of testing methods to comply with a variety applications and usage environment the testing method shall be chosen according to client technical needs.
3. We are commited to continuously review and improve testing methods in order to increase product quality.

Test method	Test Item	Purpose	Test method	Criteria	Test logic/ reason for selecting test method
JIS	Sunshine weather meter test	Check the accelerated weather resistance.	5000 hours JIS K5400	Free from cracking or peeling of the surface layer by resin	1000Hr is generally considered equal to two years for outdoor usage. Test Machine: 300 Sunshine Weather Meter WEL300 / Suga Test Instruments Co.,Ltd
Test methodestablished by our technicians based on Client needs	Cold-Hot repeat test	Check the peeling off of the WPC layer from the Aluminum surface due to expansion and contraction	2 hours at -10C and 2 hours at 80C, 50 cycles		Under Japanese weather condition, the expected minimum surface temperature of material is minus 10C. The expected maximum surface temperature of material (dark color) is 80C. Test Machine: INCUBATOR / Sanyo The expected duration to stabilize the material from expansion/contraction is two hours. The expected duration per cycle is 0.2 years thus 50cycles is estimated equal to 10 years.
	Hot water and dry environment	Check the peeling off of the WPC layer from the Aluminum surface due to expansion/ contraction and change in humidity	Heavy condition: 5 days in 60C hot water/ 2days dry at 80C, 15 cycles Light condition 5 hours in 60C hot water / 2hrs dry at 80C, 15 cycles		Under Japanese weather conditions, the expected maximum water temperature is 60C. The expected maximum surface temperature of the material (dark color) is 80C. The expected duration to dry and wet condition is 2days (48Hrs) The peel off phenomenon will occur after 7-10 cycles, thus we specified to test 15 cycles.
	Constant temperature and humidity	Check the peeling off of the WPC layer from the Aluminum surface due to constant high temperature and high humidity	70C 95% humidity, 30 days duration		General testing standard for outdoor decoration material. Test Machine:PR-2KP / ESPEC Corp.
	Water Absorption	Check the peeling off of the WPC layer from the Aluminum surface due to water absorption	Immersion for 30 days at a normal (20C) temperature condition		General testing standard for outdoor decoration material. The peel off phenomenon will occur at 20days, thus we specified to test 30 days.
	Hot Water resistance	Check the peeling off of the WPC layer from the Aluminum surface due to hot water absorption	Immersion for 14 days at a hot (80C) temperature condition		General testing standard for outdoor decoration material. The peel off phenomenon will occur at 7days, thus we specified to test 14 days. As the plastic material starts to soften over 80C, we specified the testing temperature at 80C.
	SUV	Check acceleratied weather resistance	500 hours		SUV is a rapid test to check color fading as well as surface deterioration. However, the correlation between laboratory testing and actual tests shows that SWOM is more reliable than SUV. Test Machine: SUV-W151 EYE Super UV tester, IWASAKI ELECTRIC CO., LTD. 100Hr is generally considered equal to two years of outdoor usage.

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Material Safety Data Sheet

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Material characteristics

Compound:

Metal-resin composite

Chemical composition:

Surface layer: Polypropylene resin extrusion
Polypropylene resin: 60% - 70%
Wood flour: 15% - 25%
Pigments/additives: 5% - 25%
Adhesive layer: Ethylene copolymer resin
Core: Aluminum alloy

UN classification:

n/a

Hazard/toxicity classification:

No classification

First Aid Measures

Eye contact:

Can cause injury to eyeball. Wash gently in plenty of clean running water. Do not rub. If foreign matter remains in the eye, seek advice from a specialist.

Skin contact:

For dust, remove by washing with soap and water. For hot melt, douse clothing in cold water to cool, then remove affected garments and seek medical advice.

Inhalation:

For significant quantities of dust, seek medical advice. For significant quantities of molten resin gas, relocate to a fresh air environment.

Ingestion:

For small quantities, induce vomiting where practicable. If patient still feels unwell, seek medical advice.

Fire Fighting Measures

Warnings:

Wear fireproof clothing and respiratory equipment. Beware of intense heat, thick black smoke, carbon dioxide, carbon monoxide and nitrogen oxide gas.

Extinguishing media:

Water/water spray, powder, foam or carbonic acid gas.

Accidental Release Measures

- Sweep up and dispose of dust generated during cutting and finishing work.
- Dust can be highly slippery under foot. Ensure floors are properly cleaned and maintained.
- Collect and remove all surface spills, particularly in drainage system.

Handling and Storage

Handling

Although the product does not ignite at normal temperature, it should be stored properly and kept away from sources of flame in the workplace.

Do not store resin in powder form as it can potentially explode.Product is flammable. Keep well away from ignition sources during use.

Product has an aluminum alloy core which may be exposed at the ends. Wear protective gloves and handle with care.

Storage

Product is a designated flammable material and as such is subject to special provisions on storage and handling. Store well away from sources of flame.

Exposure Controls

Concentration in workplace environment:

n/a

Allowable concentration:

n/a

Ventilation:

Ventilation equipment should be installed where processing heat generates low molecular weight substances.

Protective gear:

Dust masks and safety goggles should be worn where dust is given off.

Physical and Chemical Properties

Melting point: Data not available
Volatility: n/a
Solubility: Not soluble in water

Hazard Information

Flammability:

Flammable

Ignition point:

Data not available

Oxidizability:

Data not available

Dust explosion properties:

Explosive

NB: Aluminum dust can be explosive.
Beware dust from aluminum core during cutting and working.

Stability/reactivity:

Stable and nonreactive under normal storage conditions.

Toxicological Information

Skin causticity:

None

Skin/eye irritant:

Data not available (NB: May act as physical stimulant)
Subacute toxicity Data not available

Chronic toxicity:

Data not available

Carcinogenicity:

Data not available

Disposal Considerations

1. The product is a compound of aluminum alloy and synthetic resin and should be disposed of as a flammable substance in accordance with applicable laws and regulations and the relevant handling provisions.
2. Should be disposed by incineration, landfill or entrusted to an industrial waste disposal contractor. Dispose of product in accordance with the requirements of the Waste Management and Public Cleansing Law.
3. Incineration can generate black smoke and/or toxic fumes with potential environmental consequences.

Transport Information

1. Exercise due care during transportation to prevent damage.
2. Product should be treated as flammable and subject to the handling and storage provisions detailed above.

Applicable Legislation

Fire Service Act:

- Designated flammable substances—synthetic resin, 3 000 kg
- Law Concerning Pollutant Release and Transfer (PRTR Law): n/a
- Industrial Safety and Health Act: n/a
- Waste Management and Public Cleansing Act

Other Information

The information presented in this MSDS is based on currently available data. This MSDS does not in any way constitute a warranty or guarantee in relation to any of the physical and chemical properties of the product nor its hazard and toxicity characteristics.
The advice and warnings provided in this MSDS are predicated on standard usage and handling procedures. Additional safety measures may be required for non-standard usage or handling of the product.

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Product Delivery Specifications

Tested product: **Soleo**
Concerned products: **Soleo, Careo, Vertigo, Diameo**

Base Materials

Part	Material	
Core	Aluminum Type	A6063S, as per JIS H4100
	Surface finish	AA10 equivalent, as per JIS H8601
	Tensile strength	150 N/mm2 or better
	Load bearing capacity	110 N/mm2 or better
	Elongation	8% or better
Bonding layer	Olefin resin	
Surface layer	Regenerated wood flour resin containing PP-based non-halogenated flame retardant	

Product Specifications

Category	Requirement
Sectional dimensions	See data sheets
Length dimensions	As per JIS B0405 lower grade (e.g. ±4 mm at up to 4000 L)
Warp/bend	Within L/800 (e.g. within 5 mm for product length of 4,000 mm)
Color	Consistent with color sample
Dirt, scratches, dents, contamination	Not visible when viewed from a distance of two meters
Sanding finish	Consistent with standard sample
Adhesion	Surface layer bonds with aluminum with no evidence of peeling
Combustibility	CSTB, LNE, Effectis France combustion tests

Note: Initial values shown

Product Inspection

Inspection item	Procedure	Frequency	Equipment
Sectional dimensions Length dimension	Measured in-process	Every 50 articles	Calipers Convex
Warping	Measured in-process as per Figure 1	Every 50 articles	Specific tool
Bending	Measured in-process as per Figure 2	Every 50 articles	Specific tool
Color	Compared to standard sample (in-process)	100%	Visual inspection
Dirt, scratches, dents, contamination	Not visible when viewed from a distance of two meters (in-process)	100%	Visual inspection
Sanding finish	Compared to standard sample (in-process)	100%	Visual inspection
Initial adhesion	Visual inspection (in-process)	100%	Visual inspection
	Immerse 50-mm test piece in water at 80° C for 24 hours, then check for surface layer peeling from aluminum base	Daily	Visual inspection
	Peeling off test type JIS-K-a5600-5-6	8 hours	
Bending strength	Measure maximum stress in 800-mm span subject to loading at test speed of 20 mm/min	Once per lot*	Autograph

* Refers to lot of aluminum core. (Once per aluminum core lot, n = 3).

Perform the inspections listed above, record the results on the prescribed inspection record form and retain records.

Inspection records must be produced upon request.

Place the product against the measuring jig and measure the gap in the center section.

Warping is defined as vertical defection relative to the extrusion direction (Figure 1).

Bending is transverse deflection (Figure 2).

Figure 1: Warping

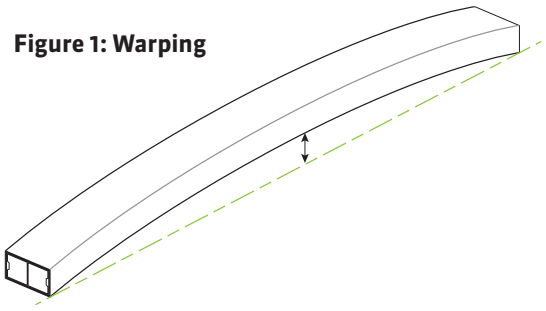
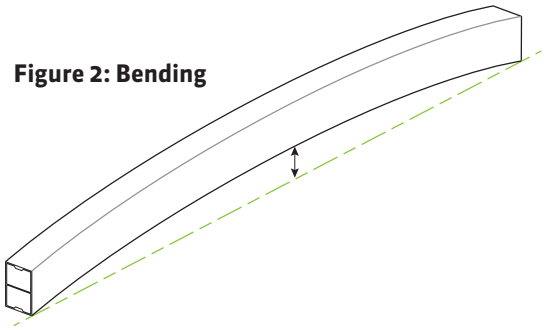


Figure 2: Bending



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Durability Evaluation Results

Test	Type	Method	Criteria	Results	
Immersion	in-house tests	Immersed in water at room temperature Continuously accelerated for 30 days	Absolute absence of evidence of surface peeling		
Heating and cooling		50 cycles of -10°C to 80°C every two hours x 50 cycles accelerated			
Hot water immersion and drying		Immersed in water heated to 60°C for five hours followed by drying at 80°C for two hours x 15 cycles accelerated (lighter conditions)			
		Immersed in water heated to 60°C for five days followed by drying at 80°C for two days x 15 cycles accelerated			
Normal temperature and humidity		Subjected to 70°C, 95% humidity environment continuously accelerated for 30 days			
Hot water immersion		Immersed in water heated to 80°C continuously accelerated for 14 days			
Boiling water immersion		Immersed in water heated to 98°C continuously accelerated for 14 days			
Weathering SUV accelerated	-	500 hours		DE	5.42
				DL	5.25
				Da	1.28
				Db	-0.36
Weathering SWOM accelerated	JIS A 1415	5 000 hours		DE	2.1
				DL	1.4
				Da	0.1
				Db	-1.5

Lots

Definition

A lot is the collective term for all products processed on a given day.

Labeling

The display format is as per the Packaging Specifications:
PO number, number of pieces, length, color, type.

Packaging and Stacking for Transport

As per the Packaging Specifications.

Usage and Handling

Storage

- Store indoors on a level surface. Do not lean the product at an angle.
- Use spacers to compensate for any irregularities.
- Spacers should all be the same height and no further apart than one meter.
- To prevent deflection, do not store product that is bent.
- If storing outdoors, cover with sheeting to protect from rain and other water sources.
- Ensure that any load from heavy objects on the product is evenly dispersed.
- Note that excessive load may lead to deformation or damage.
- Keep well clear of naked flame and other heat sources to prevent possible deformation or discoloration.

Transportation

- Handle the product with due care during transportation.
- Rough treatment may lead to damage.

Product Characteristics

Usage

- The products shall be used as a louver or as a cladding. It is not intended to be used as a structure or load-bearing element.
- The product must be designed and manufactured to the appropriate safety standards including resistance to wind pressure. (These specifications apply to the use of the material as a louver and do not extend to issues arising from the manner of installation.)

Color

- The product is made of reconstituted wood flour resin, which is subject to potential fading and discoloration as well as other forms of deformation and degradation. Product color may vary between batches at the time of delivery. The rate of fading and discoloration over time may also vary between batches.
- The product is sanded during manufacture to produce an authentic wood feel. The sanding process produces a directional grain. Thus, the appearance and color of the product may differ depending on the angle of viewing and the direction of the incident light.

Surface Coatings

- The surface layer contains Polypropylene and is unsuitable to be covered for most commercially available surface coatings.

Drainage

- The product should be installed with a sufficient angle to ensure good drainage and prevent water from pooling on the surface or internally. It may be necessary to consider additional drainage holes or slopes.

Maintenance

Recommended maintenance procedures are outlined below.

Exterior dirt

- Dirt and contamination on the surface of the product should be wiped off with a cloth or high pressure water.
- If a cleaning agent is required, use a mild, neutral detergent that does not contain acid or ammonia.

Scratches and cigarette burns

- Use sandpaper (grain 24) to remove any scratches or cigarette burns on the surface of the product.
- For best results, rub the sandpaper in the longitudinal rather than transverse direction.
- Avoid excessive sanding, which could remove the surface resin and expose the aluminum core material.

Modifications

These documents may be modified or amended only with the approval of the purchaser or end user (which may be a subcontractor).

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