naturalbond
Aluminium Composite Panel

NATURALBOND TECHNICAL CATALOGUE

JAN 2009

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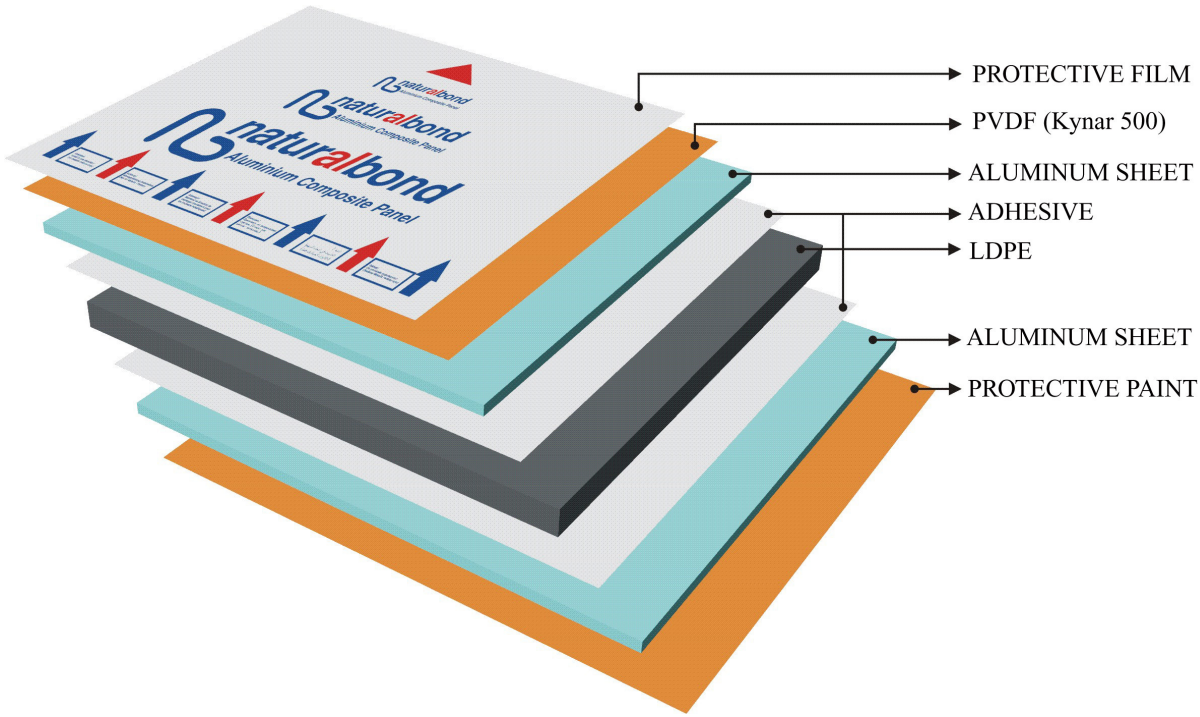
General Characteristics
Naturalbond® is a contemporary building material with a smooth, esthetic, chic appearance, used in design of architectural buildings that are spacious restrictors of our social life.
This manual has been prepared to furnish you with more detailed information needed about our product.

Components
Naturalbond® consists of two aluminum sheets the standard flesh thickness of which is 0.5 mm and polyethylene (Idpe) between these sheets. In order to present solutions appropriate for different needs in accordance with requests received, composite panel production can be made at our plants, with thicknesses ranging from 3mm to 6mm.

<u>For Standard 4 mm Aluminum Composite Panel:</u>
Aluminum sheet: (EN AW-3005 (A) (Al Mn 1Mg 0.5) acc. EN 573) H42
Material in Between: 3 mm of low density polyethylene (IDPE)
Outer surface: Pvdf (25 microns) – Kynar 500 painted
Inner surface: Protective Paint (polyester based – 5 microns)



Some of the advantages offered by Naturalbond which has a wide range of use, are listed in the following:

- When compared with aluminum sheets at similar resistance, it is 40 % lighter due to its thinner flesh thickness.
- Its surface is smooth.
- It is a material resistant to atmospheric terms (against corrosion and wind load).
- The panel can be shaped into any form wished due to its availability for Processing (Cutting, punching, assembling, bending, etc.)

Rigidity of Naturalbond®
Being a composite material consisting of two aluminum sheets the standard flesh thickness of which is 0.5 mm and polyethylene (Idpe) in between these sheets, Naturalbond is a material at the same rigidity with the aluminum sheets in average 40 % higher than itself.

Rigidity Comparison Table for Naturalbond®

	Thickness (mm)	Weight (kg/m2)	Weight Rate (%)
Naturalbond®	3	4.6	63
Aluminum Sheet	2.7	7.3	

	Thickness (mm)	Weight (kg/m2)	Weight Rate (%)
Naturalbond®	4	5.5	62
Aluminum Sheet	3.3	8.9	

	Thickness (mm)	Weight (kg/m2)	Weight Rate (%)
Naturalbond®	6	7.4	61
Aluminum Sheet	4.5	12.2	

Color Alternatives
Acting from the idea that different designs have different needs, our firm offers you, the users, alternatives of metallic colored, dull colored and patterned surfaces. Please see the color card for the purpose of acquiring detailed information about our color and pattern alternatives.

Our product is being produced with the ASAŞ assurance and the guarantee period is 20 years.

Naturalbond® and Reaction to Fire

COUNTRY	**TEST STANDARD**	**SAMPLE**	**RESULT AND CLASSIFICATION**
ITALY	UNI 9177:1987	4 mm	CLASS 1

Naturalbond® Design Guide
Basic points to be considered while projecting and applying by Naturalbond®;

- Structural Resistance Strength,
- Thermal expansion
- Thermal insulation
- Water insulation
- Panel sizes and joint details

Structural Resistance Strength
The composite panel used in front siding and the sub-construction are required to resistant against the received wind load.
In the studies to be made, calculations are to be made of load distribution to be created on panel due to wind intensity in priority already at the project phase. Otherwise:

- When the received wind load is more than the resistance strength of panel, it may cause deformation both in the panel and at the lower construction of the panel.
- When absorption and tensile strengths received by panel are higher than resistance strength of panel, breakings may occur at connection points.

When the necessary calculations are being made, security stress of Naturalbond is to be taken as 110N/mm2. In the calculations:

- Wind load
- Sub-construction
- **Naturalbond®** thickness,
- Aluminum sheet thickness and security strength
- **Naturalbond®** panel dimensions are to be taken into consideration.

In case the values obtained as the result of these calculations remain within the given limits, the deformation on the panel is not permanent and the panel can keep its first form. When the calculations are being made:

- Material flexibility,
- Joint (Connection) axle range
- Load that falls on panel due to wind strength in the environment are to be taken into consideration.

Another important subject to be considered in this subject is the requirement that maximum sinking of sub-construction is to be less than L/200 as required by DIN 18056.
When applying **Naturalbond®** , joint elements are required to be resistant against wind load. Points to be considered regarding subject are as follows:

- The distance of the hole center to be opened for connection, to the panel side is not to be less than twice the hole diameter.
- In manufacturing of connection elements, aluminum or stainless steel material resistant to corrosion, is to be preferred.
- In cases where use of aluminum or stainless steel material is not possible, connection elements, connection element is required to be coated with a protective layer of 25 microns thick.

Thermal Expansion
It bears great significance that the mounting method designates the thermal expansion coefficient of sub-construction material preferred for mounting. In case aluminum profile is preferred as a sub-construction material, then since the thermal expansion coefficient is the same with Naturalbond, twisting problem is not experienced between the two materials. In case stainless steel is preferred, since the thermal expansion coefficient of stainless steel is lower, proper connection methods are to be used in order not to experience the twisting problem.

MATERIAL	**Rate of Elongation (/ ºC)**	**50º longer in 1m longer**
Naturalbond®	24 x 10 -6	1.2 mm
Aluminum	24 x 10 -6	1.2 mm
Steel	12 x 10 -6	0.6 mm
Concrete	24 x 10 -6	0.6 mm

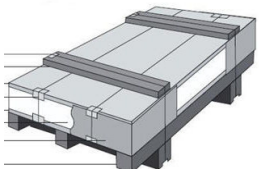
Thermal Insulation
If **Naturalbond®** is planned to be used as wall coating material at the outside part, thermal permeability of the system is to be taken into consideration.
3 main topics are to be considered in heat transfer. These are radiation, thermal diffusion, and conduction. If 2 different temperatures arise inside and outside, a heat flow occurs from higher temperature to lower temperature.

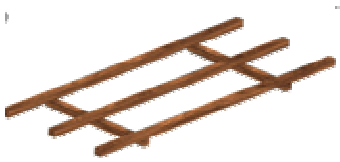
Use of Panel

In case metallic colored composite is preferred, panels are to be mounted with the arrows on bands showing the same direction. Otherwise, after the mounting protective bands are removed, the same linear view cannot be obtained.

The protective band on **Naturalbond®** panels is to be removed right after the mounting.

Standard Palette Dimensions





Bending Limit

Bending Radius is between 40-55mm by press, 200-300mm with triple bending machine.

Cleaning

Cleaning may be made with soft sponge and Water.

Storing Method

Don’t unpack wooden crate until use. Wooden crate until use after unpacking,restore remaining panels horizontally into crate as orginal condition.Keep panels flat and avoid warping and bending during storing.avoid pilling defferen sizes together,as panel surface might be scratched or dented with panel edges.

Technical Characteristics

Sheet Chemical Composition

	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ga	V	Ti	Her	Total	Al
Min.				1	0.20	0.1								
Maks.	0.70	0.80	0.30	1.5	0.60	0	-	0.40	-	-	0.10	0.05	0.15	Rest

Thickness of Aluminum Sheet : 0.5 mm
Alloy : EN AW-3005 (A) (Al Mn 1Mg0.5) acc. EN 573
Temper : H42 acc. EN 1396
Chemical Composition : acc. EN 573-3 (1994)
Strain Resistance : 136,76 N/mm2
Flexibility Module : 32392,89 N/mm2
Elongation : >5%
Specific Weight : 1.38
Weight : 5.5 kg/m2
Expansion : 24 x 10-6/C
Thermal Conduction : 0.39 kcal/m.hr.C
Twisting heat : 115 C

For Composite panel:

Tensile strength : 50,57 N/mm2
0.2% strain resistance : 42.02 N/mm2
Spraining strength : 150 N/mm2
Bending elasticity : 49000 N/mm2
Inertia moment, l : 1580 mm4/m
Module section, Z : 1060 mm3/m
Rigidity : 0.110 kNm2/m
Sound conveyance loss : 26 db
Elasticity module : 7792,64 N/mm2
% elongation : 29.01

For Aluminum Sheet:

%0.2 strain resistance : 110 N/mm2
Module Elasticity : 68600 N/mm2

Production data:

Composite Panel thickness : 3 mm – 6 mm (acc. EN 485-4)
Composite panel width : 1250 mm, 1500 mm
Maximum production length : 6000 mm
Standard production lengths : 1250 mm * 3200 mm
: 1500 mm * 3200 mm

Production tolerances:
Composite panel thickness : ±0.2 mm
Composite panel width : -0 mm / +2.0 mm
Composite panel length : -0 mm / +4.0 mm
Diagonal difference : max. 3.0 mm
Linearity (in width and length) : +/- 0.2 mm

Inclination : if panel length is <1500 mm, max. 5 mm
: if panel length is 1500-3000 mm, max. 7 mm
: if panel length is >3000 mm, max. 10 mm

Weight data : if thickness is 3 mm = 4.6 kg/m2
: if thickness is 4 mm = 5.5 kg/m2
: if thickness is 6 mm = 7.4 kg/m2

Paint:

Outer sheet: visible surface: Pvdf Paint
Inner surface: Protective paint or HOT AC eloxal
Inner sheet: visible surface: Pvdf Paint or HOT AC eloxal
Inner surface: Protective paint or HOT AC eloxal

Elongation in Naturalbond®.

Stress : A.r.L2/m2

L: Short side length of panel
A: Coefficient dependent on the rate of panel width /height
R: wind pressure
M2: 6.33 mm2 (0.2% strain resistance: for 110 N/mm2)

The result obtained from this calculation is not to exceed 110 N/mm2. Otherwise permanent deformation occurs.

Maximum Stress in Naturabond®

R,kPa (kg/m2)	l (panel width)	a (Panel length) 900	1200	1500	1800	2100	2400	2700	3000	>3000
0.5	600	13	14	14	14	14	14	14	14	14
(51)	900	20	27	30	32	32	32	32	32	32
	1200	27	35	45	51	55	57	57	57	57
	1500	30	45	55	68	77	83	87	88	89
1.0	600	26	28	28	28	28	28	28	28	28
(102)	900	39	53	61	64	64	64	64	64	64
	1200	53	70	90	103	110*	113*	114*	114*	114*
	1500	61	90	109	136*	155*	166*	173*	177*	178*
1.5	600	39	42	43	43	43	43	43	43	43
(153)	900	59	80	91	95	96	96	96	96	96
	1200	80	105	135*	154*	135*	170*	171*	171*	171*
	1500	91	135*	164*	204*	232*	250*	260*	265*	267*

Other than dimensions specified as " * " , panels can be applied without reinforcement. Those specified with " * " are to be reinforced.

Sub-Construction Resistance
When making the sub-construction calculations, the following points are to be taken into consideration;

- it should not exceed the allowed maximum stress,
- maximum stress should not be higher than L/200.

Accordingly;
Stress;
S > R* L2 / (8* Stres0.2)

Sinking
To be 5 * R * L4 / 384 * E * M < (L/200)

S: sub-construction cross section module (mm3)
R: wind pressure received by sub-construction (N/mm)
L: sub construction supports (mm)
Stres0.2: 0.2% sub construction resistance (N/mm2)
E: sub-construction elasticity module (N/mm2)
M: sub-construction inertia moment (mm4)

Stress at Connection Points
Stress arises due to several forces at connection points of 2 **Naturalbond®** with rivets, nuts and bolts. This stress has to be within the limits of elastic limits. Stress at a connection point;

Maximum stress force = is to be calculated with the formula Elastic Stress x **Naturalbond®** thickness x hole diameter.

Hole Diameter (mm)	Distance of Hole diameter to Panel side (mm)	Maximum Elastic Stress (N/mm2)	Maximum Stress Force (N)
5	5	21	320
	10	48	720
	15	55	820

Hole Diameter (mm)	Distance of Hole diameter to Panel side (mm)	Maximum Elastic Stress (N/mm2)	Maximum Stress Force (N)
10	9	20	590
	19	38	1150
	30	39	1170

General Characteristics for filling materials

General Characteristics		Silicon
Capacity to Bond		Perfect
Deterioration	Due to Aging	Very small
	Due to Temperature	Very small
Tensile after filling		Small
Temperature range beneficial		-40/120 C
Resistance to air conditions		Perfect
Resistance against fatigue		Perfect

General Characteristics		Polyurethane
Capacity to Bond		Good
Deterioration	Due to Aging	Medium
	Due to Temperature	Medium
Tensile after filling		Small
Temperature range beneficial		-20/80 C
Resistance to air conditions		Perfect-Good
Resistance against fatigue		Good

General Characteristics		Polyurethane
Capacity to Bond		Good
Deterioration	Due to Aging	Medium
	Due to Temperature	Medium
Tensile after filling		Small
Temperature range beneficial		-20/70 C
Resistance to air conditions		Good

Processes

Cutting  Cutting works can be made through saw or fret saw

Opening Grooves For 90 degrees of corner return, it should be notched by a notching blade of 110 degrees is recommended. While notching, a nucleus part of 0.2 ~ 0.4 mm is required to be left in the outer part.

Boring  This process is to be made with twisted drill.

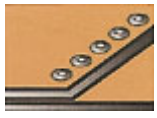
Contour  This process is to be made by fret saw, contour saw and milling machine

Hewing  This process is to be made by guillotine

Boring  This process is to be made by boring machine.

Bending  This process can be made by brake pressure device and folding table. For 3 mm and 4 mm, minimum bending radius is 40 mm for single, 50 mm for parallel; for 6 mm, minimum bending radius is 55 for single, 80 mm for parallel.

Sticking  his process can be made by metal sticking.

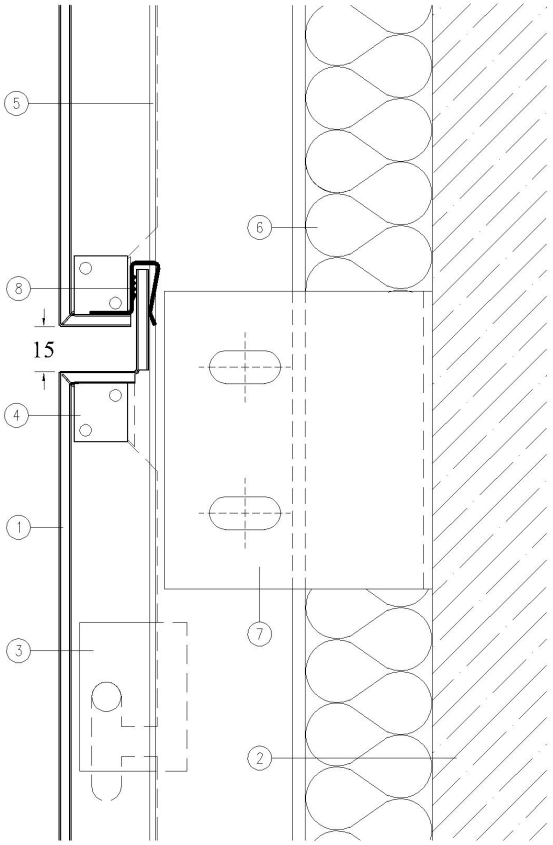
Riveting  This process can be made by rivet.

Screwing  This process can be made by metal screws.

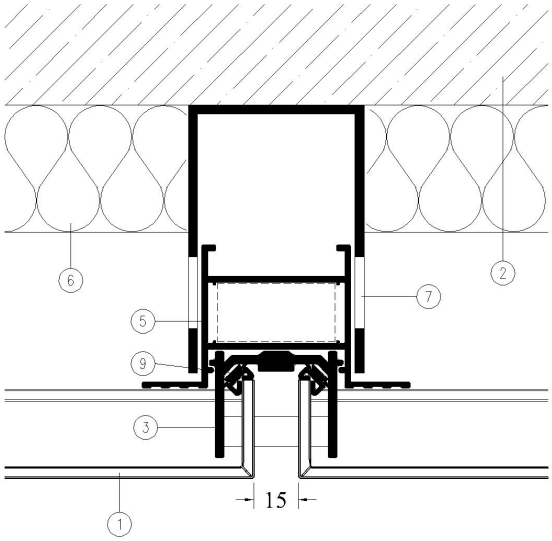
Welding  This process can be made by hot air welding.

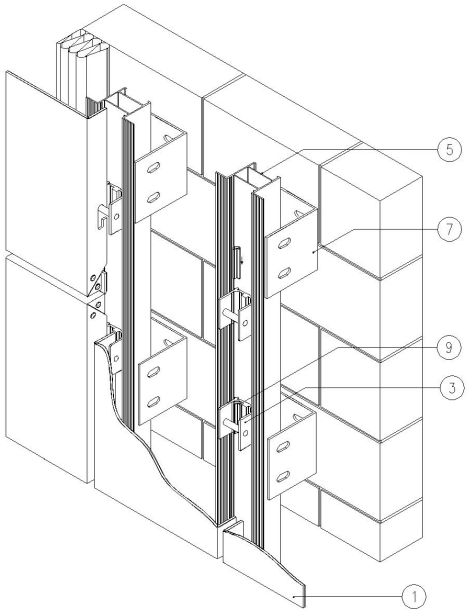
Coupling This process can be made with corner assembling profiles.

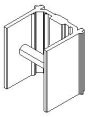
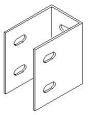
TYPIAL DETAILS



1. NATURALBOND
2. CONCREATE
3. COMPOSITE CONNECTING ANHORAGE (08.01.04)
4. 20x20x1.2mm ALUMINIUM PROFILE (163)
5. ALUMINIUM MULLION PROFILE (10634)
6. ISOLATION
7. ALUMINIUM ANHORAGE (08.01.03)
8. ALUMINIUM CONECTING PROFILE (6773)
9. EPDM GASKET (01.07.10.50R)





	COMPOSITE CONNECTING ANHORAGE (08.01.04)
	ALUMINIUM ANHORAGE (08.01.03)