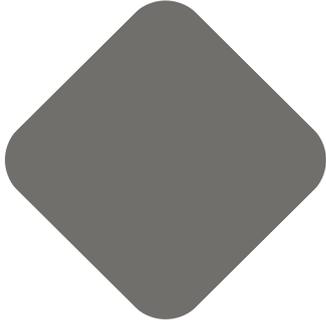


**SHIPRADE**  
**DIŐ TİCARET**



**ALUMINIUM**  
**COMPOSITE PANEL**

**TECHNICAL**  
**DATA SHEET**

[WWW.SHIPRADE.COM](http://WWW.SHIPRADE.COM)

## Aluminium Composite Panel

Shiprade Aluminum Composite Panel is a building material composed of two aluminum sheets and a low-density polyethylene core in between. The adhesion of the polyethylene to the aluminum sheets is ensured through adhesive granules or film. Thanks to the painted surface of the top aluminum sheet, it provides superior surface durability. Our composite panels are distinguished by their lightweight structure, aesthetic appearance, fast and easy installation, high sound and heat insulation, a wide range of colors, and flexible application options for various projects.

# CONTENTS

## 1. GENERAL FEATURES OF ALUMINIUM COMPOSITE PANEL AND APPLICATION AREAS

- 1.1 Why Shipradebond?
- 1.2 General Application Areas of Shipradebond

## 2. PRODUCT RANGE

- 2.1 Mineral Filled FR Products
- 2.2 Mineral Filled A2 Class Products
- 2.3 LDPE Core Products

## 3. TOLERANCES FOR PRODUCT

- 3.1 Dimensional Tolerances
- 3.2 Weight Tolerances

## 4. PAINT TYPES AND SPECIFICATIONS

- 4.1 Pvd coating (2 Layer) test methods and specifications
- 4.2 Hdpe coating test methods and specifications
- 4.3 Polyester coating test methods and specifications

## 5. PROCESSING METHODS

- 5.1 Cutting
- 5.2 Grooving and Folding
  - 5.2.1 Grooving with portable hand saw
  - 5.2.2 Grooving with vertical saw machines
  - 5.2.3 Flat cutting machine
  - 5.2.4 Routing with CNC machines
  - 5.2.5 Folding
- 5.3 Punching
- 5.4 Perforation
- 5.5 Bending
  - 5.5.1 Bending with roll bending machine
  - 5.5.2 Bending with brake press
  - 5.5.3 Bending with folding machine

## 6. JOINTING AND FIXING METHODS

- 6.1 Thermal Expansion and Contraction
- 6.2 Drilling and Countersinking
- 6.3 Riveting
- 6.4 Screwing
- 6.5 Sticking

## 7. ASSEMBLING METHODS

- 7.1 Application with Notchnig
- 7.2 Clipping Application
- 7.3 Application with Joint Strip
- 7.4 Application with H Profile

## 8. WATER PROOFING METHODS

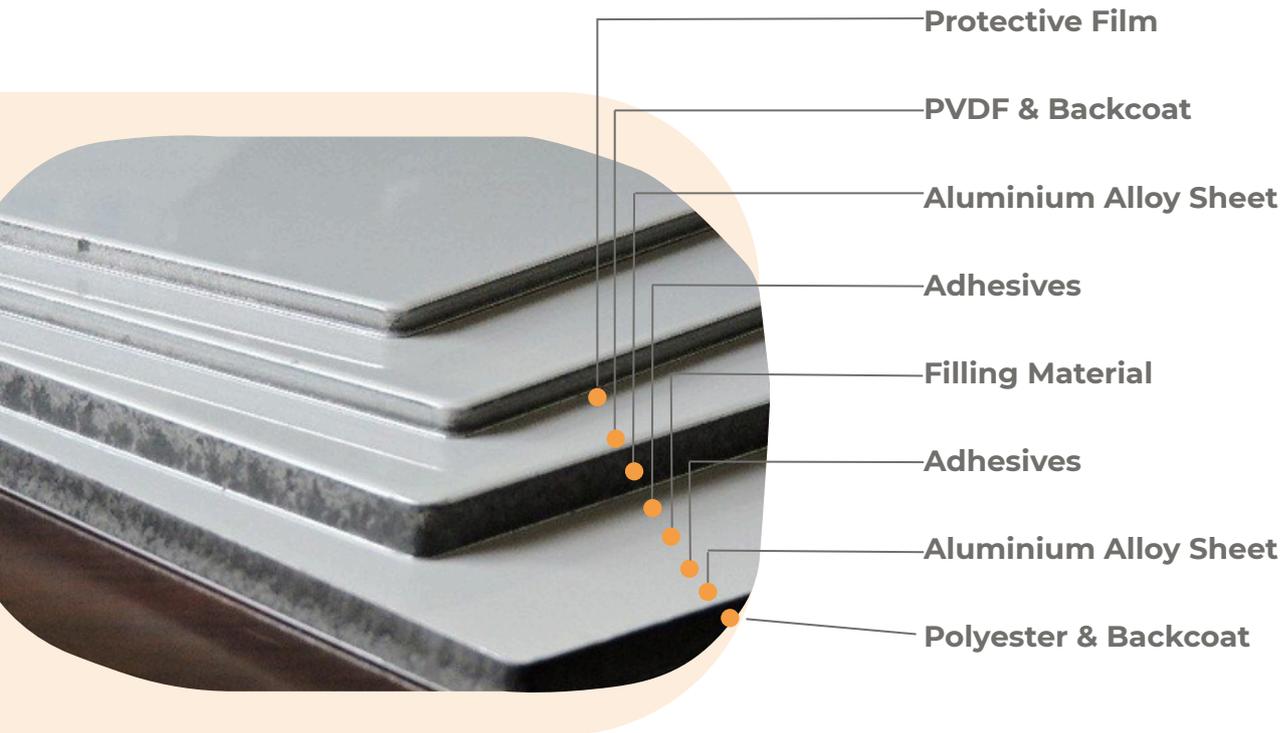
- 8.1 Open Grooved Solutions
- 8.2 Silicone Filled Solutions

## 9. WIND LOAD AND STRES

## 10. PACKAGING-CARRYING AND STORING

## 11. PROTECTIVE FILM AND ASSEMBLING DIRECTION

## 12. CLEANING AND MAINTENANCE



## 1. GENERAL FEATURES OF ALUMINIUM COMPOSITE PANEL AND APPLICATION AREAS

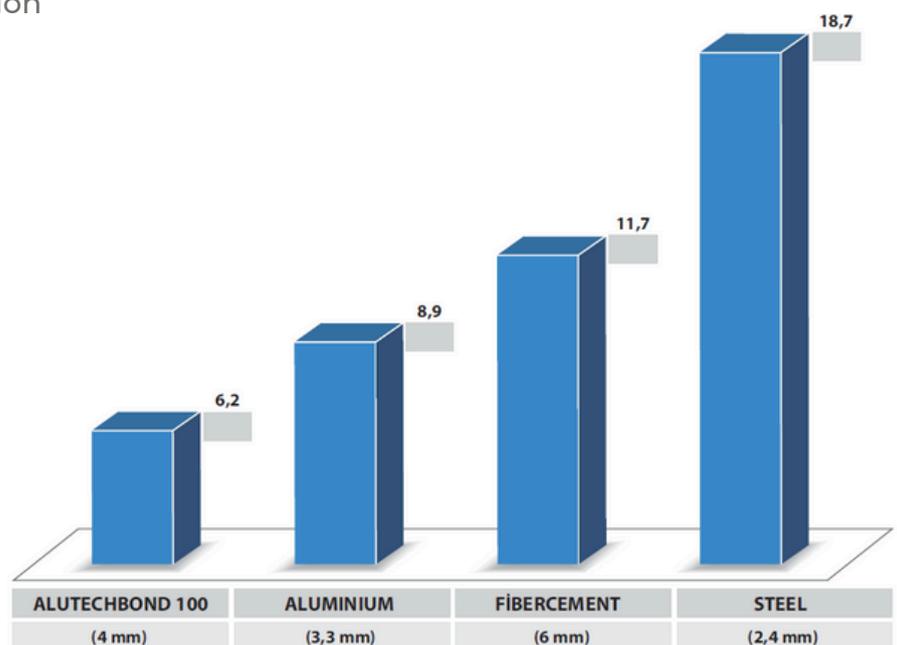
### 1.1 Why Shipradebond?

- Unlimited Color and Effect Option
- Super Fast Delivery
- Both Sides Coated Panels Available
- Flexibility on Special Dimension Production
- A2, B1 and LDPE types core options

### General Features

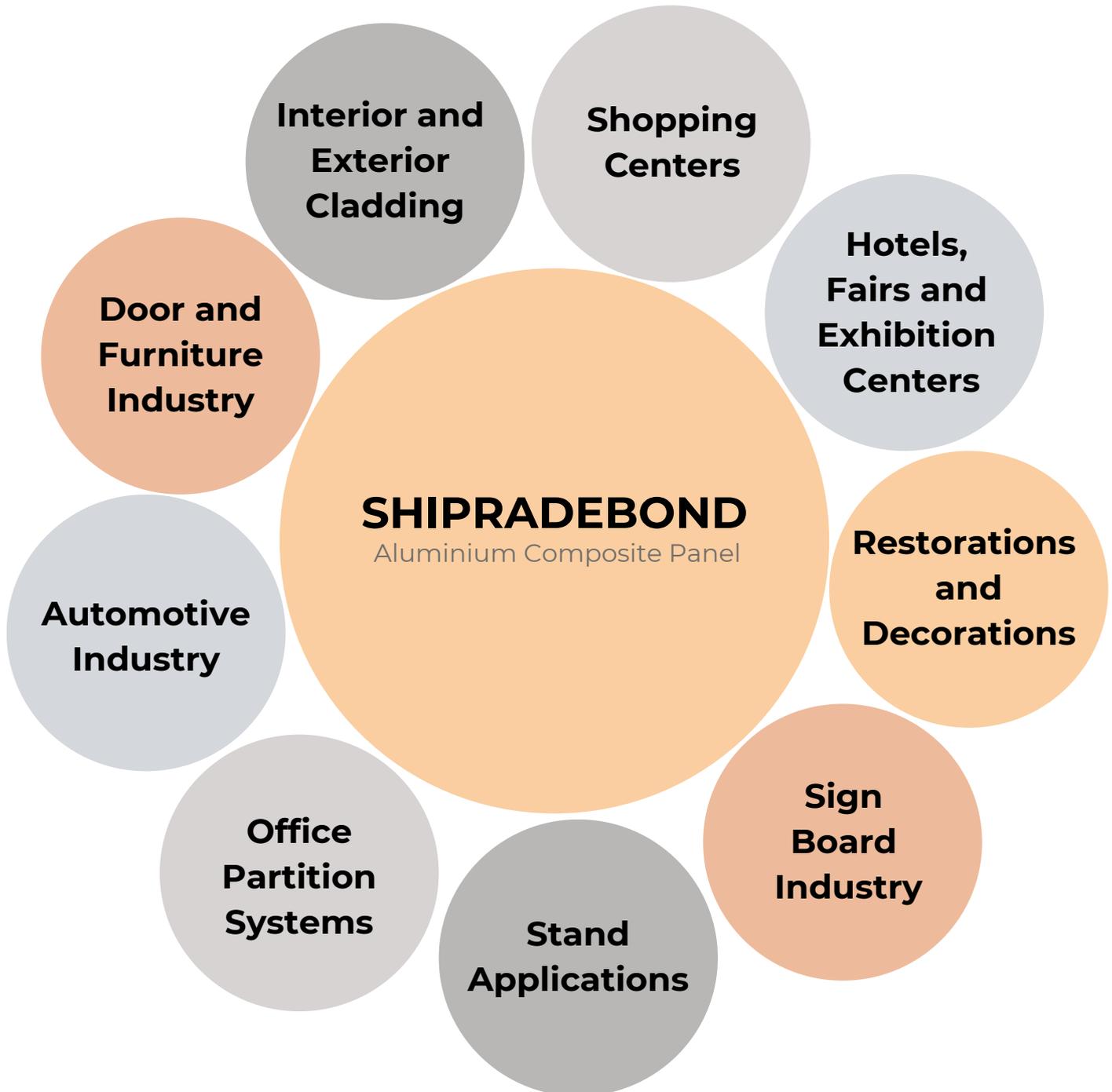
- Highly durable rigid and light weight
- Unlimited color & design option
- Sound & heat isolation
- Resistant to all weather conditions
- Easy and fast application
- Aesthetic and elegant appearance
- Eco-Friendly. 100% recyclable

“Aluminium composite panel is composed of filling different types of core material between two aluminium sheets. It has superior surface resistance, smooth appearance, and it is aesthetic, durable and easy maintenance”. Shipradebond, which consists of two aluminium sheets 0,5 mm thickness and there between low density polyethylene, is as rigid as the other sheets which are heavier than them.



## 1.2 General Application Areas of Shipradebond

• Shipradebond composite panels are especially preferable below given areas.



## 2. PRODUCT RANGE

Aluminium composite panels are produced with three different types of core material in our facilities.

- Mineral filled FR Core
- Mineral filled A2 Core
- Ldpe Core

Feature	A2 s1 d0	FR (B S1d0)	LDPE
			
Amount of inorganic materials		> % 70	30%
Amount of polymer	< %10	< 30%	70%
Calorific heat potential of core material	≤3MJ / kg	≤14MJ / kg	≤ 30 MJ / kg

### 2.1 Mineral Filled Fire Retardant (FR) Products

Mineral filled composite panels are produced with three different brand in our factory according to **EN 13501-1**.

These products especially preferred for their resistance to fire with middle level.

Product	SHIPRADEBOARD 100 B1	SHIPRADEBOARD 200 B1	SHIPRADEBOARD 300 B1
Paint Type	Pvdf 2L	Hdpe	Hdpe
Alloy	3003-3105-4115	3003-3105-4115	3003-3105-4115
Temper of cover sheets	H46-H42	H46-H42	H46
Thickness of aluminium coils (Top/Bottom)	0,5 / 0,5	0,4 / 0,4	0,3 / 0,3
Peeling Strenght	> 17,5 kgf/2,5cm	> 17,5 kgf/2,5cm	> 17,5 kgf/2,5cm
Witdh (mm)	1000-1250-1500-2000	1000-1250-1500-2000	1000-1250-1500-2000
Lenght (mm)	2000-8000	2000-8000	2000-8000
Yield strength	42 N/ mm <sup>2</sup>	38 N/ mm <sup>2</sup>	26 N/ mm <sup>2</sup>
Tensile strength	48 N/ mm <sup>2</sup>	45 N/ mm <sup>2</sup>	32 N/ mm <sup>2</sup>
Elongation at rupture	19,3 ( l0=5,65 A012- % )	14 ( l0=5,65 A012- % )	12 ( l0=5,65 A012- % )
Seperation	13,5 N/mm	12,90 N/mm	12,15 N/mm
Bending strength	106 Mpa	101 Mpa	97 Mpa
Bending elastic modulus	9992 Mpa	9870 Mpa	9601 Mpa
Tensile strength in high temperature	8,09 Mpa	8,09 Mpa	8,09 Mpa
Heat transfer coefficient	5,5 (Wm2/K)	5,5 (Wm2/K)	5,5 (Wm2/K)
Sound insulation	≥24 dB	≥27 dB	≥35 dB
Rigidity (4 mm)	0.354 kN m <sup>2</sup> /m	0.354 kN m <sup>2</sup> /m	0.354 kN m <sup>2</sup> /m
Section modulus (4 mm)	2,58 cm <sup>3</sup> /m	2,58 cm <sup>3</sup> /m	2,58 cm <sup>3</sup> /m
Rigidity (3 mm)	0.177 kN m <sup>2</sup> /m	0.177 kN m <sup>2</sup> /m	0.177 kN m <sup>2</sup> /m
Section modulus (3 mm)	1,65 cm <sup>3</sup> /m	1,65 cm <sup>3</sup> /m	1,65 cm <sup>3</sup> /m

## 2.2 Mineral Filled A2 Class Products

A2 class composite panels are produced under two different brand in our facilities. Using the A2 class aluminium composite panels become an obligation in most of countries for the facade above 20 meter. Fire retardancy behaviour of A2 class panels are highly superior than the B1 class panels.

Product	SHIPRADEBOARD 100 A2	SHIPRADEBOARD 200 A2
Paint Type	Pvdf 2L	Hdpe
Alloy	3003-3105-4115	3003-3105-4115
Temper of cover sheets	H46-H42	H46-H42
Thickness of aluminium coils (Top/Bottom)	0,5 / 0,5	0,4 / 0,4
Peeling Strength	> 15 kgf/2,5cm	> 15 kgf/2,5cm
Witdh (mm)	1000-1250-1500	1000-1250-1500
Lenght (mm)	2000-6000	2000-6000
Yield strength	42 N/ mm <sup>2</sup>	38 N/ mm <sup>2</sup>
Tensile strength	48 N/ mm <sup>2</sup>	45 N/ mm <sup>2</sup>
Elongation at rupture	19,3 (I0=5,65 A012- %)	14 (I0=5,65 A012- %)
Seperation	13,5 N/mm	12,90 N/mm
Bending strength	106 Mpa	101 Mpa
Bending elastic modulus	9992 Mpa	9870 Mpa
Tensile strength in high temperature	8,09 Mpa	8,09 Mpa
Heat transfer coefficient	5,80 (Wm2/K)	5,8 (Wm2/K)
Sound insulation	≥24 dB	≥27 dB
Rigidity (4 mm)	0.354 kN m <sup>2</sup> /m	0.354 kN m <sup>2</sup> /m
Section modulus (4 mm)	2,58 cm <sup>3</sup> /m	2,58 cm <sup>3</sup> /m
Rigidity (3 mm)	0.177 kN m <sup>2</sup> /m	0.177 kN m <sup>2</sup> /m
Section modulus (3 mm)	1,65 cm <sup>3</sup> /m	1,65 cm <sup>3</sup> /m

## 2.3 LDPE Core Products

Aluminum composite panels with LDPE core are produced under four different brand for the applications that fire retardancy is not expected. Preferring A2 class or B1 class ACP for facade application is highly recommended rather than using ACP which have a LDPE core material for safety.

Product	SHIPRADEBOARD 100	SHIPRADEBOARD 200	SHIPRADEBOARD 300	SHIPRADEBOARD 400
Paint Type	Pvdf	Hdpe	Polyester	Hdpe
Alloy	3003-3105-4115	3003-3105-4115	3003-3105	3003
Temper of cover sheets	H46-H44-H42	H46-H44-H42	H46	H44
Thickness of aluminium coils (Top/Bottom)	0,5 / 0,5	0,4 / 0,4	0,3 / 0,3	0,21 / 0,21
Peeling Strength	> 17,5 kgf/2,5cm	> 17,5 kgf/2,5cm	> 17,5 kgf/2,5cm	> 17,5 kgf/2,5cm
Witdh (mm)	1000-1250-1500-2000	1000-1250-1500-2000	1000-1250-1500-2000	1000-1250-1500-2000
Lenght (mm)	2000-6000	2000-6000	2000-6000	2000-6000
Yield strength	42 N/ mm <sup>2</sup>	38 N/ mm <sup>2</sup>	26 N/ mm <sup>2</sup>	26 N/ mm <sup>2</sup>
Tensile strength	48 N/ mm <sup>2</sup>	45 N/ mm <sup>2</sup>	32 N/ mm <sup>2</sup>	32 N/ mm <sup>2</sup>
Elongation at rupture	19,3 (I0=5,65 A012- %)	14 (I0=5,65 A012- %)	12 (I0=5,65 A012- %)	12 (I0=5,65 A012- %)
Seperation	13,5 N/mm	12,90 N/mm	12,15 N/mm	12,15 N/mm
Bending strength	106 Mpa	101 Mpa	97 Mpa	97 Mpa
Bending elastic modulus	9992 Mpa	9870 Mpa	9601 Mpa	9601 Mpa
Tensile strength in high temperature	8,09 Mpa	8,09 Mpa	8,09 Mpa	8,09 Mpa
Heat transfer coefficient	5,5 (Wm2/K)	5,5 (Wm2/K)	5,5 (Wm2/K)	5,5 (Wm2/K)
Sound insulation	≥24 dB	≥27 dB	≥35 dB	≥35 dB
Rigidity (4 mm)	0.354 kN m <sup>2</sup> /m			
Section modulus (4 mm)	2,58 cm <sup>3</sup> /m			
Rigidity (3 mm)	0.177 kN m <sup>2</sup> /m			
Section modulus (3 mm)	1,65 cm <sup>3</sup> /m			

### 3. TOLERANCES FOR PRODUCT

#### 3.1 Dimensional Tolerances

Dimensional tolerances for aluminium composite panel is below given table.

Dimensions	Tolerances
Panel Thickness (mm)	+ / - 0,2 mm
Panel Length (mm)	2000 - 8000 mm ( $\pm$ 1mm / m)
Width of Panel (mm)	- 0 / + 4 mm
Squareness Tolerance (mm)	Max 5 mm
Curvature	Panel Boyu 1000 mm - 1500 mm: Max. 5 mm
	Panel Boyu 1500 mm - 3000 mm: Max. 7 mm
	Panel Boyu >3000 mm: Max. 10 mm

#### 3.2 Weight Tolerances

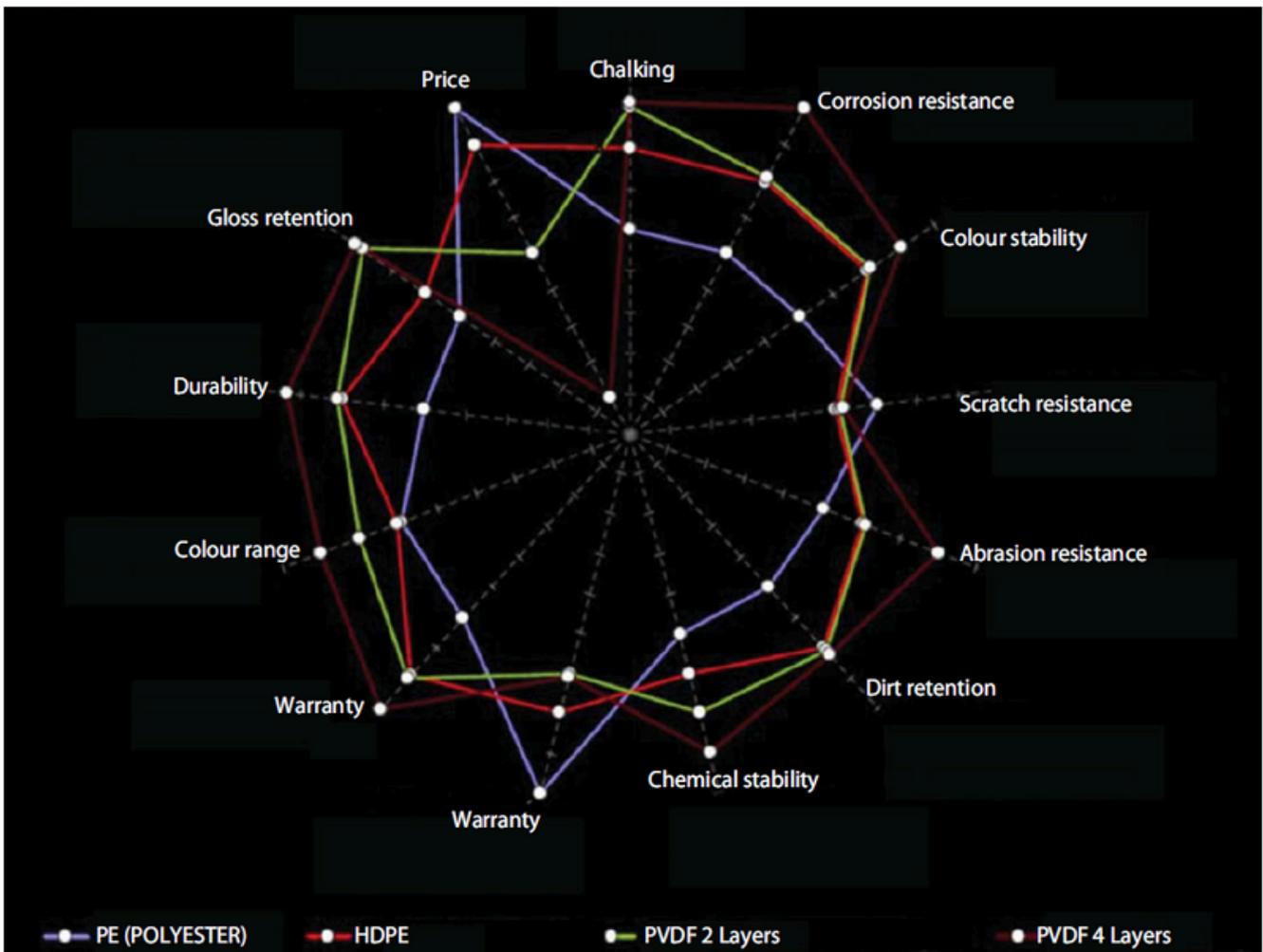
Weight informations belong to aluminium composite panels can be found in below given table

Weights of Panels (Kg/m <sup>2</sup> )				
Product	Panel Thickness (mm)	A2	B1	LDPE
SHIPRADEBOARD / 100	2	-	-	3,83
	3	-	5,77	5,01
	4	8,37	7,33	6,19
	5	-	8,89	7,37
	6	-	10,45	8,55
SHIPRADEBOARD / 200	2	-	-	3,53
	3	-	5,54	4,71
	4	7,82	7,10	5,89
	5	-	8,66	7,07
	6	-	10,22	8,25
SHIPRADEBOARD / 300	2	-	-	3,22
	3	-	5,31	4,40
	4	-	6,87	5,58
	5	-	8,43	6,76
	6	-	9,99	7,94
SHIPRADEBOARD / 400	2	-	-	2,95
	3	-	5,11	4,13
	4	-	6,67	5,31
	5	-	8,23	6,49
	6	-	9,79	7,67

Due to thickness tolerance of ACP, weight of panels can be changed +/- 0,24 kg/m<sup>2</sup>

#### 4. PAINT TYPES AND SPECIFICATIONS

Type of paint should be determined according to application areas for **ACP**. Polyester, **Hdpe** and **Pvdf** painted aluminium coils are currently used in our facilities. Type of paints except these groups can be used according to customer request. If we need to give brief comparison between paint types, the application which needs resistance in long term against atmospheric conditions should be choosed Pvdf paint on the other hand the application which needs scratch resistance or repaintability or low price should be choose polyester paint. Hdpe painted coils are preferred for the applications which have suitable technical expectations between Pvdf and Polyester paint.



Comparisons of paint types

## 4.1 Pvd coating (2 Layer) test methods and specifications

TOPCOAT TYPE	PVDF Polyvinylidene fluoride Coating (%70)	
PRIMER TYPE	Polyester Primer	
Test Types	Standard	PVDF COATING 2L
Topcoat Dry Film Thickness (µm)	EN 13523-1	20µ +/- 2µ
Primer Dry Film Thickness (µm)	EN 13523-1	5µ +/- 2µ
Backcoat Dry Film Thickness (µm)	EN 13523-1	7µ +/- 2µ
Topcoat Colour Difference (ΔE)	EN 13523-3	ΔE < 1 (Solid colors) ΔE < 2 Metallic colors
60° Topcoat Gloss	EN 13523-2	Semi Matt:23-40
60° Backcoat Gloss	EN 13523-2	Topcoat gloss +/- 20
Topcoat Solvent Resistance Test	EN 13523-11	> 100 Double Rubb
Backcoat Solvent Resistance Test	EN 13523-11	> 40 Double Rubb
Topcoat Adhesion After Indentation	EN 13523-6	% 0 No peel After cupping Min 4,5 mm
Topcoat Pencil Hardness	EN 13523-4	Min HB
Topcoat T - Bend Test	EN 13523-7	Max 2,5 T (Depending on Metal Quality)
Uv Resistance UV-A-340- D65/10°	EN 13523-10	2000 Hrs ( ΔE < 5Gloss %50)
Humidity Resistance	EN 13523-25	1000 Hrs No influence
Salt Spray Test Resistance (%0,2 acetic acid, %5 NaCl)	EN 13523-8	500 Hrs (Less than 3 mm or 2 mm respectively of under creep corrosion)
Uv Resistance Category	EN 1396	RUV 4
Corrosion Resistance Category	EN 1396	RC 3

## 4.2 Hdpe coating test methods and specifications

TOPCOAT TYPE	High Durable Polyester Coating	
PRIMER TYPE	Polyester Primer	
Test Types	Standard	HDPE COATING 2L
Topcoat Dry Film Thickness (µm)	EN 13523-1	20µ +/- 2µ
Primer Dry Film Thickness (µm)	EN 13523-1	5µ +/- 2µ
Backcoat Dry Film Thickness (µm)	EN 13523-1	7µ +/- 2µ
Topcoat Colour Difference (ΔE)	EN 13523-3	ΔE < 1 (Solid colors) ΔE < 2 Metallic colors
60° Topcoat Gloss	EN 13523-2	Matt: 0-20 / Semi Matt: 20-40 / Semi Gloss: 40-60 / Gloss: 60-80 / High Gloss > 80
60° Backcoat Gloss	EN 13523-2	Topcoat gloss +/- 20
Topcoat Solvent Resistance Test	EN 13523-11	> 100 Double Rubb
Backcoat Solvent Resistance Test	EN 13523-11	> 40 Double Rubb
Topcoat Adhesion After Indentation	EN 13523-6	% 0 No peel After cupping Min 4,5 mm
Topcoat Pencil Hardness	EN 13523-4	Min F
Topcoat T - Bend Test	EN 13523-7	Max 2,5 T (Depending on Metal Quality)
Uv Resistance UV-A-340- D65/10°	EN 13523-10	2000 Hrs ( ΔE < 5Gloss %50)
Humidity Resistance	EN 13523-25	1000 Hrs No influence
Salt Spray Test Resistance (%0,2 acetic acid, %5 NaCl)	EN 13523-8	500 Hrs (Less than 3 mm or 2 mm respectively of under creep corrosion)
Uv Resistance Category	EN 1396	RUV 4
Corrosion Resistance Category	EN 1396	RC 3

## 4.3 Polyester coating test methods and specifications

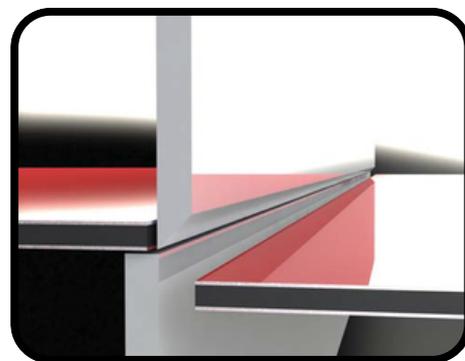
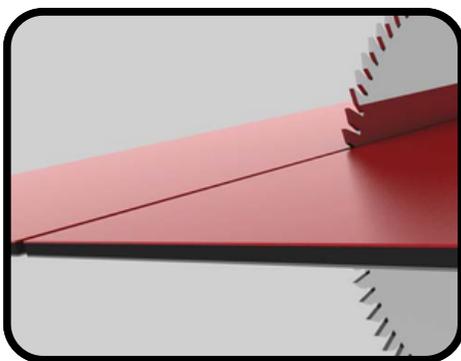
TOPCOAT TYPE	Polyester Coating	
PRIMER TYPE	Polyester Primer	
Test Type	Standard	POLYESTER COATING
Topcoat Dry Film Thickness (µm)	EN 13523-1	20µ +/- 2µ
Primer Dry Film Thickness (µm)	EN 13523-1	5µ +/- 2µ
Backcoat Dry Film Thickness (µm)	EN 13523-1	7µ +/- 2µ
Topcoat Colour Difference (ΔE)	EN 13523-3	ΔE < 1 (Solid colors) ΔE < 2 Metallic colors
60° Topcoat Gloss	EN 13523-2	Matt: 0-20 / Semi Matt:20-40 / Semi Gloss: 40-60/ Gloss: 60-80 / High Gloss > 80
60° Backcoat Gloss	EN 13523-2	Topcoat gloss +/- 20
Topcoat Solvent Resistance Test	EN 13523-11	> 100 Double Rubb
Backcoat Solvent Resistance Test	EN 13523-11	> 40 Double Rubb
Topcoat Adhesion After Indentation	EN 13523-6	% 0 No peel After cupping Min 4,5 mm
Topcoat Pencil Hardness	EN 13523-4	Min F
Topcoat T - Bend Test	EN 13523-7	Max 2,5 T (Depending on Metal Quality)
Uv Resistance UV-A-340- D65/10°	EN 13523-10	2000 Hrs ( ΔE < 5Gloss %50)
Humidity Resistance	EN 13523-25	1000 Hrs No influence
Salt Spray Test Resistance (%0,2 acetic acid, %5 NaCl)	EN 13523-8	500 Hrs (Less than 3 mm or 2 mm respectively of under creep corrosion
Uv Resistance Category	EN 1396	RUV 4
Corrosion Resistance Category	EN 1396	RC 3

## 4. PAINT TYPES AND SPECIFICATIONS

Main processing methods on aluminium composite panels are cutting , grooving and folding, punching, perforating and bending.

### 5.1 Cutting

Cutting process can be done by using a guillotine or saw machine. One of the most important point is choosing a carbide tipped saw in order to cut properly. By shearing, it is impossible to avoid 1 or 2 degrees of heaving at the edge of composite panels. In order to prevent surface defects and ridges, protective foil shouldn't be removed from the surface of composite panels and the cut pieces should be removed and environment should be cleaned. Cut edges can be smoothed by rubbing with sandpaper.



In order to saw mineral filled A2 composite panel properly Ø230 x 3,2 x 30 Z:24 circular panel saw is recommended for the products which have LDPE core can be saw properly with Ø230 x 3,2/2,5 x30 Z64 circular saw.

## 5.2 Grooving and Folding

**Shipradebond** aluminium composite panels can be shaped with simple methods. V shaped or rectangular grooves are routed on the rear of ACP using below given tools where by the aluminium cover sheet at the back side and part of the core material are retained. The small thickness of retained material then allows folding by hand.

### 5.2.1 Grooving with portable hand saw

Portable routing machines are suitable for grooving small quantities of composite panels which require simple design. It is not suitable for massive productions and complex designs. In order to have easy processing min 800 W powered machines are recommended.



### 5.2.2 Grooving with vertical saw machines

Vertical panel saw machines are suitable for massive production which have not a complex grooving design. Cutting and grooving operations can be handled easily with rapid tool changing. It is especially suitable for 4 mm panels.



In order to groove in vertical saw machines tool in the left side picture can be used. Ideal dimension for the tool : 200 x 11/2 x 30 z:12 90°



In order to cutting A2 panels in vertical saw machines tool in the left side picture can be used. Ideal dimension for the tool :230 x 3,2 x 30 z:24



In order to cutting LDPE panels in vertical saw machines tool in the left side picture can be used. Ideal dimension for the tool :230 x 3,2 /2,5

### 5.2.3 Flat cutting machine

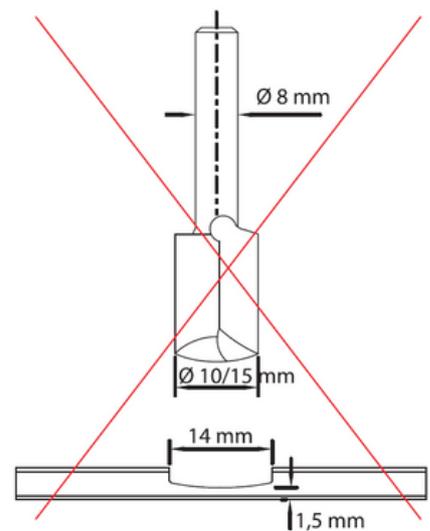
Straight grooving with flat cutting machine is ideal for operations which is need to be done in building site.



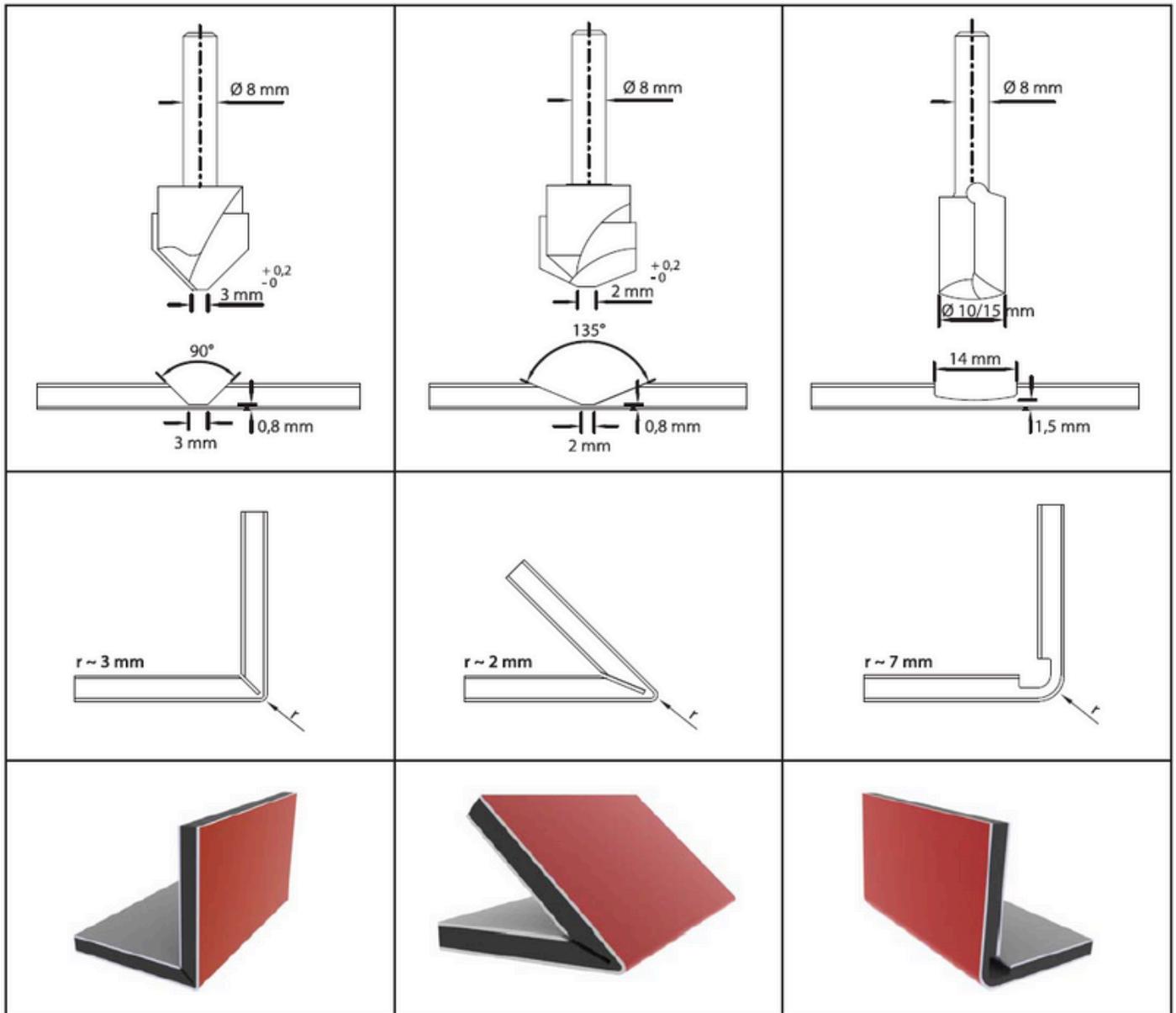
### 5.2.4 Routing with CNC machines

Straight grooving and angle grooving can be done in CNC machines.

Due to folding angle grooving tools are changed. Regular folding angles are 90° and 135° however rectangular grooving also an option according to requested design. In order to fold it clearly after grooving operation, 0,2-0,4 mm core material must be remained on backside. Rectangular groove is not suitable for mineral filled A2 class composite panels.

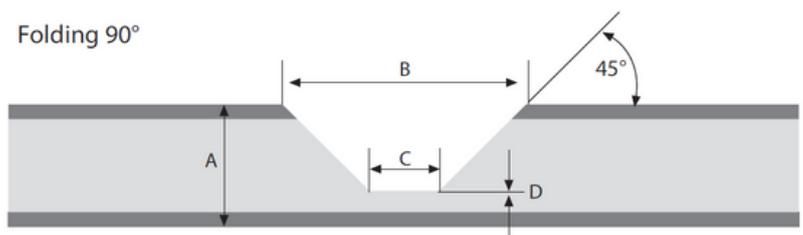


SHIPRADEBOND 100 A2 not suitable for

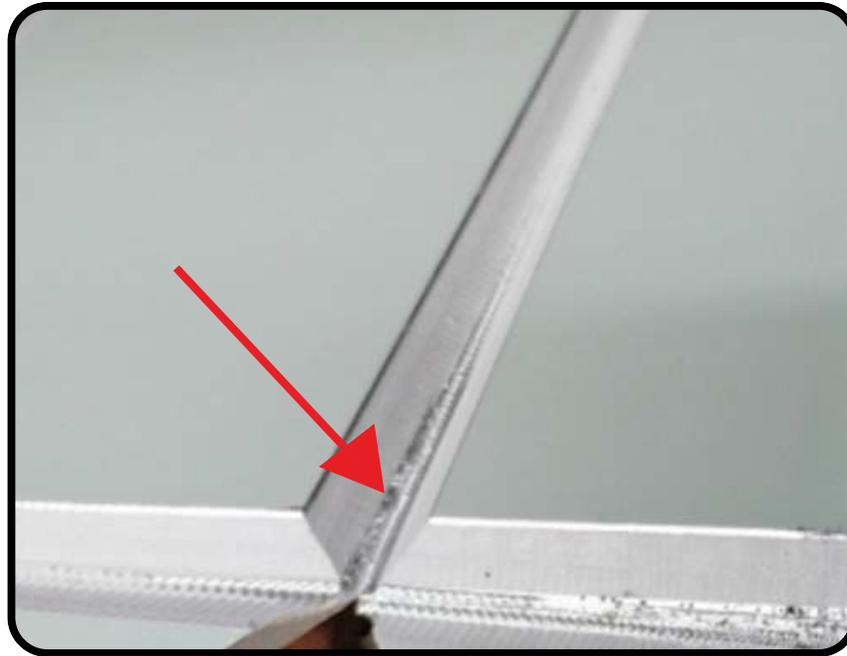


Below given picture shows that ideal dimensions of grooving for 90° folding

A (mm)	=	4	5	6
B (mm)	=	~9.3	~11.3	~13.3
C (mm)	=	~2,7	~2,7	~2,7
D (mm)	=	0,2	0,2	0,2



If the amount of remain core materials at bottom become below 0,2-0,4 mm, a/cp will be break after folding.



**Grooving fault**

The life time of grooving and cutting tools which are already used for **LDPE** core become very short if they used during **A2 grade** panels processing. In order to increase the life time of the tools, specialized tools must be used for **A2 grade** panels. **CNC** machines are recommended for grooving operation of **SHIPRADEBOARD 100 A2** grade panels. 10 mm diameter dia grooving tools are highly recommended for grooving process. Minimum 6 mm diameter cutting tools should be used for cutting process which have carbide coating. In order to process easily, capacity of the **CNC** machines are preferred as **24.000 rpm**. During the process rotating speed of the tools should be **12.000 rpm** and moving speed of the tools can be increased maximum **5000 mm/min**



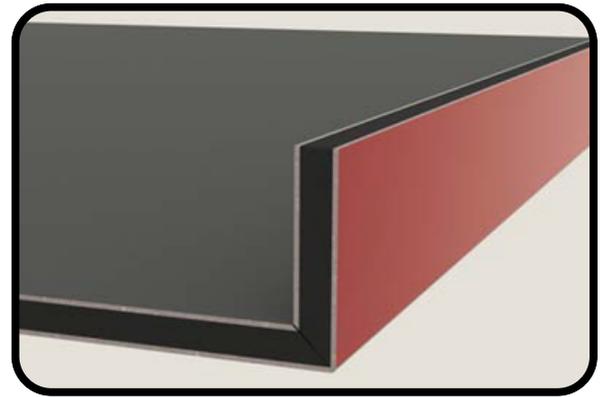
**Carbide cutting tools**



**Grooving tool for A2**

### 5.2.5 Folding

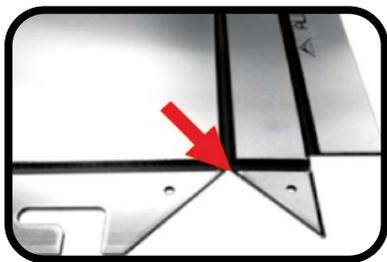
After the grooving, folding can be applied by using the suitable gauge. It is important that the composite panel is processed on a flat surface. Otherwise folding won't be along the determined axis. The folding radius should be between 2-3 mm in order to prevent cracks from happening.



Folding

At the values below that, defects may be seen on the coating surface. During the folding process temperature play a very important role and it shouldn't be below **20 °C**. By every folding, grooves lengthen **0,5 - 1 mm**. That's why in order to bend the panels correctly those lengthening measures should be taken into account. After the bending practice the correctness of angles and axes should be checked with the aid of suitable gauge. If necessary at the edges where bending process is applied, aluminium support profiles can be used. To prevent tearing and deformations on panels during grooving; groove angle, thickness and afterwards applied bending should be performed with care. For example to achieve an **90 degree** angled folding **110 degree** grooving can be performed. By end milling, applying the outer filling until **0,2-0,4 mm** to the surface is very important for a suitable folding.

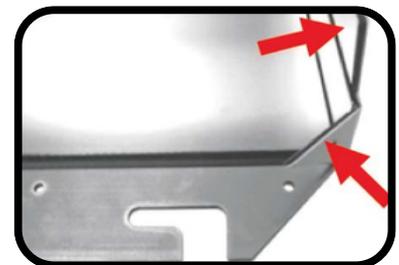
a) Cut V grooves according to 6.2.4 section.



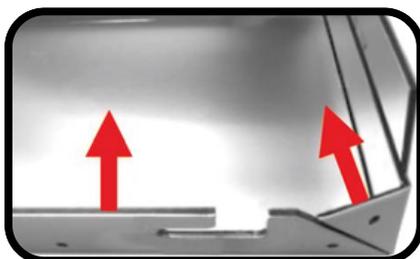
b) Fold the edge side more than 90°



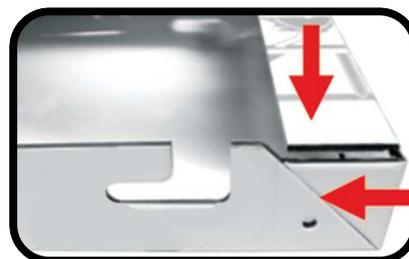
c) Fold back to a little more than 90° and slightly fold triangle.



d) Fold the triangle together with longitudinal edge

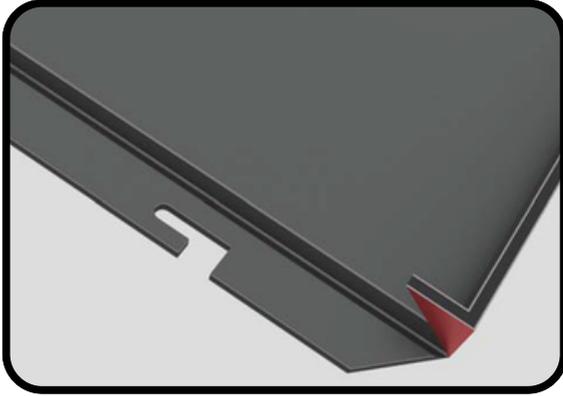


e) Folding the upper edges. Owing to pre stressing when folding more than 90°, the two edges of the V grooves fit tight.



### 5.3 Punching

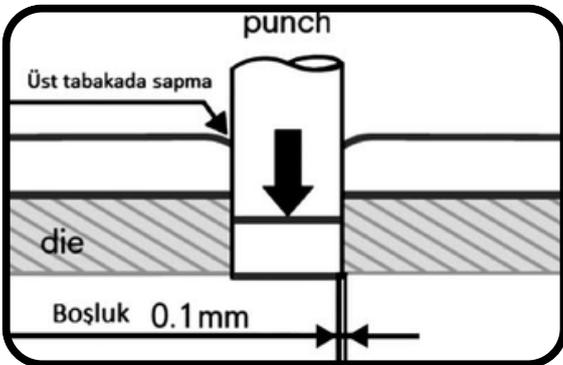
Notching process in composite panels is done with a punch press. Optimal space between the surface to be punched and the mold It should be detected at 0.1 mm and below. This measure can be said to be approximately 2% of the panel thickness.



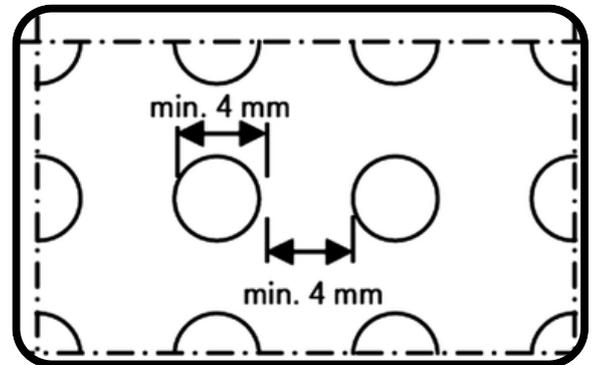
Punching



Punching



The milling can be done with Punch press. The ideal distance between the panel surface and mold has to be 0,1 mm and less. (2% of the panel thickness)

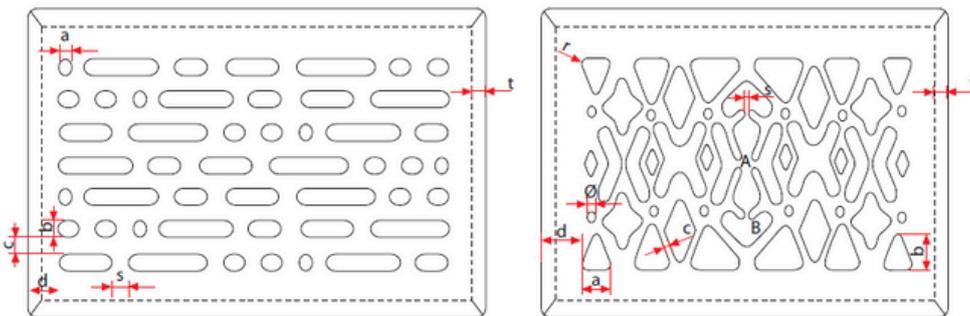


Holes of a minimum diameter of 4 mm can be punched. The minimum width between hole edges are also need to be 4 mm.

### 5.4 Perforation

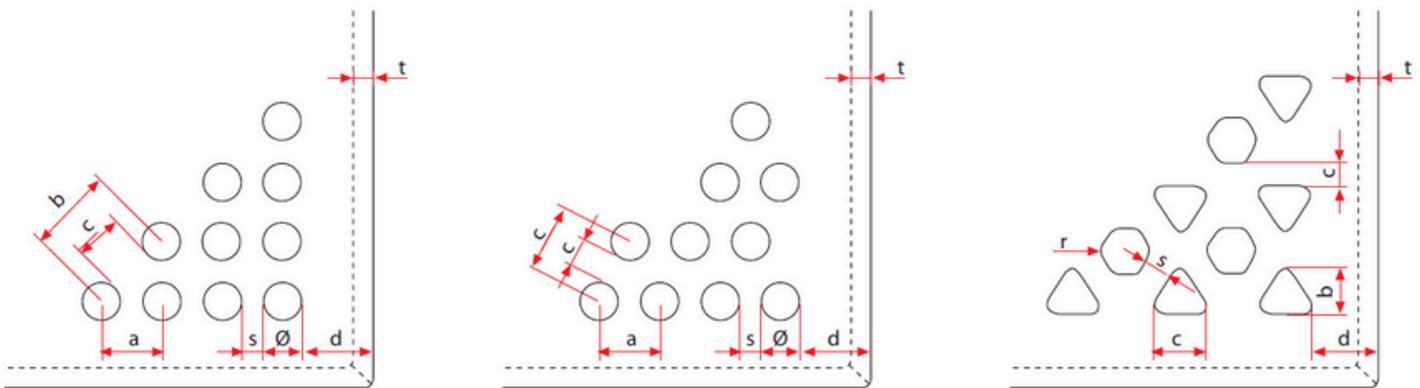


Due to wind load pressure and exposure to weathering cares needs to be taken on designing and processing. Perforation rate should be between % 35-40



	Processing with CNC			Processing with NCT		
	3 mm	4 mm	5 mm	3 mm	4 mm	5 mm
Thickness of ACP	3 mm	4 mm	5 mm	3 mm	4 mm	5 mm
Applicability	B2/B1		B2/B1	B2/B1		B2/B1
Processing limits	Ø ≥ 4 mm			Ø ≥ 4 mm		
	a ≥ 4 mm			a ≥ 6 mm		
	b ≥ 4 mm			b ≥ 6 mm		
	c ≥ 6 mm			c ≥ 6 mm		
	d ≥ 18 mm			d ≥ 25 mm		
	r ≥ 2 mm			r ≥ 1,5 mm		
	s ≥ 6 mm			s ≥ 6 mm		
Limits of Perforation Rate	≤ 50 %		≤ 40 %	≤ 45 %		≤ 40 %
Minimum Bending Radius	≥300 mm			≥350 mm		

Perforated ShipradeBond composite panels can be bended by roll bending machines and also these panels can be applied in curved shapes. It can be fixed using various systems such as hook on, SZ-20, frame 90 and cover strip joint systems. To combine different diameters within the same panel, or special dimensions and perforations, please consult.



	Processing with CNC			Processing with NCT		
	3 mm	4 mm	5 mm	3 mm	4 mm	5 mm
Thickness of ACP	3 mm	4 mm	5 mm	3 mm	4 mm	5 mm
Applicability	B2/B1		B2/B1	B2/B1		B2/B1
Processing limits	$\varnothing \geq 4 \text{ mm}$	$\varnothing \geq 4 \text{ mm}$	$\varnothing \geq 4 \text{ mm}$	$60 \text{ mm} \geq \varnothing \geq 4 \text{ mm}$	$\varnothing \geq 4 \text{ mm}$	
	$a \geq 8 \text{ mm}$	$a \geq 8 \text{ mm}$	$a \geq 10 \text{ mm}$	$a \geq 8 \text{ mm}$		$a \geq 10 \text{ mm}$
	$b \geq 8 \text{ mm}$	$b \geq 8 \text{ mm}$	$b \geq 10 \text{ mm}$	$b \geq 8 \text{ mm}$		$b \geq 10 \text{ mm}$
	$c \geq 4 \text{ mm}$	$c \geq 4 \text{ mm}$	$c \geq 6 \text{ mm}$	$c \geq 4 \text{ mm}$		$c \geq 6 \text{ mm}$
	$d \geq 12 \text{ mm}$	$d \geq 15 \text{ mm}$	$d \geq 18 \text{ mm}$	$d \geq 25 \text{ mm}$		$d \geq 25 \text{ mm}$
	$r \geq 2 \text{ mm}$	$r \geq 2 \text{ mm}$	$r \geq 2 \text{ mm}$	$r \geq 1,5 \text{ mm}$		$r \geq 1,5 \text{ mm}$
	$s \geq 4 \text{ mm}$	$s \geq 4 \text{ mm}$	$s \geq 6 \text{ mm}$	$s \geq 4 \text{ mm}$		$s \geq 6 \text{ mm}$
Limits of Perforation Rate	$\leq 50 \%$	$\leq 45 \%$	$\leq 40 \%$	$\leq 45 \%$	$\leq 40 \%$	$\leq 40 \%$
Minimum Bending Radius	$\geq 200 \text{ mm}$	$\geq 250 \text{ mm}$	$\geq 300 \text{ mm}$	$\geq 200 \text{ mm}$	$\geq 250 \text{ mm}$	$\geq 300 \text{ mm}$

Before starting serial mechanical process testing minimum bending radius on single acp is highly recommended.

**A2 class mineral filled aluminium composite panels are not suitable for perforation process due to slight water absorption of the core material.**

## 5.5 Bending

The desired values for bending process can be exerted to the composite panels. The important point before bending process is the panel thickness and the properties of composite panel filling material. If the bending process apply more than specified value, it causes material accumulation at the bending area. Therefore, the process should be applied carefully. The bending value should be two and half times of the thickness of the composite panel.



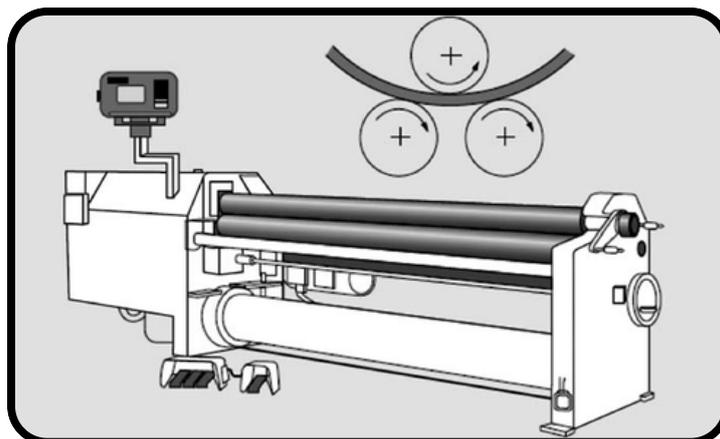
Minimum bending radius according to SHIPRADEBOND series.

SHIPRADEBOND 100-200-300-400	$r=10 \times d$
SHIPRADEBOND 100-200 FR B1	$r= 10 \times d$
SHIPRADEBOND 100 A2	$r= 25 \times d$
SHIPRADEBOND100-300 (Anodized and Mirror surfaces)	$r > 200 \text{ mm}$
SHIPRADEBOND 100-300 (Brushed surfaces)	$r > 60 \text{ mm}$

The spring back effect of aluminium composite panel which have LDPE core is more than other core type. Dimensions should be clarified and tested before serial application on sample. There will be sparkling on bending line after bending process on both anodized and brushed surfaces.

### 5.5.1 Bending with roll bending machine

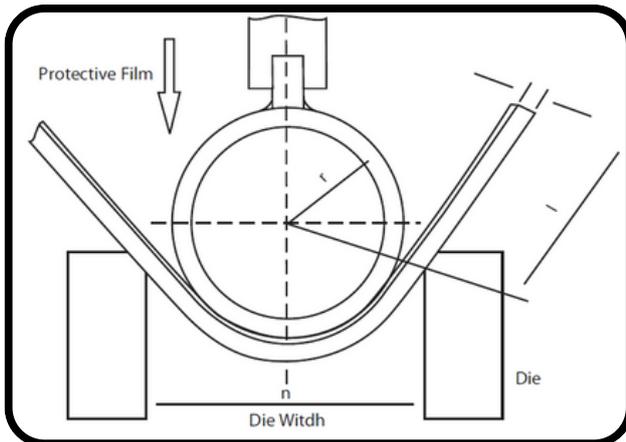
Shipradebond composite panels are suitable for bending process with cylinder bending machine. Make sure that feeder cylinders shouldn't be exerted too much pressure on panel during bending process. The cylinders of bending machines which are used with other materials except aluminium composite panels must be cleaned before bending aluminium composite panels in order to prevent surface from sawdust and burr etc...



Roll Bending Machine

### 5.5.1 Bending with brake press

Shipradebond composite panels can be easily bended with brake press like metal sheets. The edge side of die which is contacted with composite must be rounded and smooth. The minimum side length of bent part should be 5 times of ShipradeBond thickness. Bending radius is related with die gap and punch diameter. Ideal die width is calculated according to below given formula.

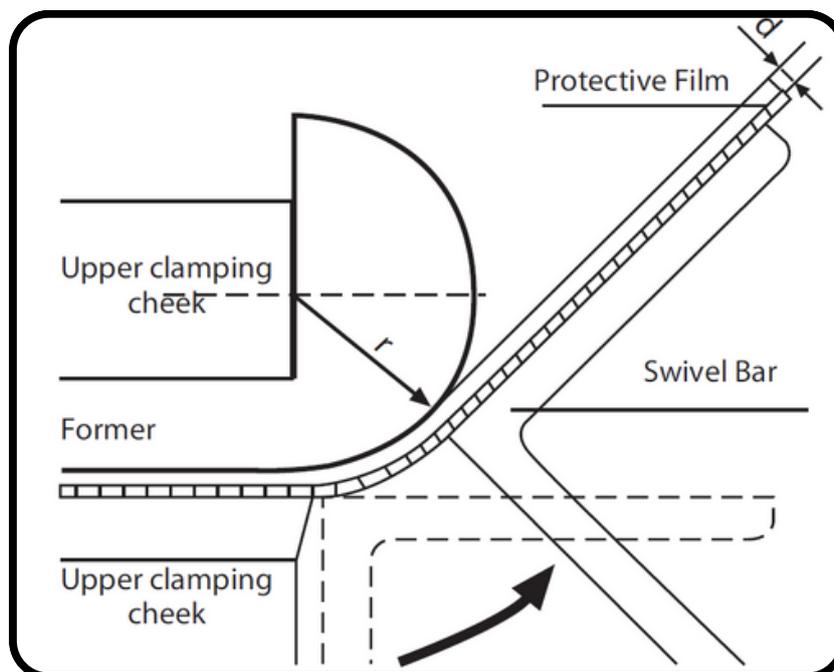


Bending with a brake press

$l \text{ min} : d \times 5$   
 $r \text{ min} : t \times 15$   
**t:** Thickness of ACP (mm)  
**n:** Ideal die width:  
 $(2 \times d) + (2 \times \text{Thickness of protective film}) + \text{Diameter of punch} + 15 \text{ mm}$

### 5.5.3 Bending with folding machine

The method of bending operation with folding machine is based on former which is stable between two cheeks and ACP is fold on the former. Bending with different radius is possible with changing the formers. The temperature of area is important with bending process and it shouldn't be under 10°C otherwise there will be a risk for paint cracking.



Bending with a folding machine

## 6. JOINTING AND FIXING METHODS

### 6.1 Thermal Expansion and Contraction

In order to avoid any tension occurring in the rivet and screw connections, the rivets and screws must be set tension free. The bore holes in the panels must be large enough to allow expansion. The linear thermal expansion of Shipradebond is 2,4 mm at a panel length of 1 meter and temperature difference of 100°.

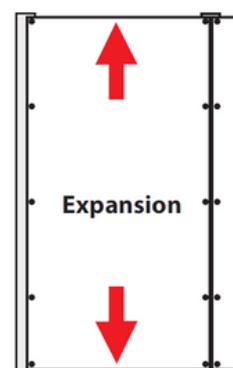
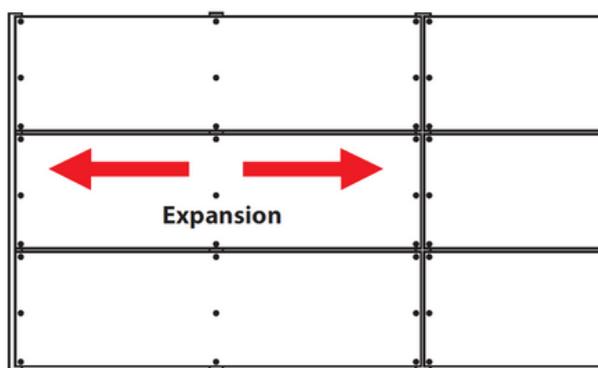
Thermal expansion and contraction

Material	Linear Thermal Expansion Coefficient / °C	Elongation or shrinkage
Shipradebond 100 A2	19x10 <sup>-6</sup>	1 mm
Shipradebond 100 B1	24x10 <sup>-6</sup>	1,2 mm
Aluminium	24x10 <sup>-6</sup>	1,2 mm
Steel	12x10 <sup>-6</sup>	0,6 mm
(304) Stainless Steel	17x10 <sup>-6</sup>	0,9 mm
Concrete	12x10 <sup>-6</sup>	0,6 mm
Glass	9x10 <sup>-6</sup>	0,5 mm
Wood	5x10 <sup>-6</sup>	0,25 mm
Acrylic Sheet	70x10 <sup>-6</sup>	3,5 mm

Calculation of expansion can be made with below given formula.

a : Linear Thermal Expansion Coefficient 24\*10<sup>-6</sup>/°C  
 Δ T : Temperature Difference  
 L : Length or Height of Panel

$$\Delta L = a \times \Delta T \times L$$



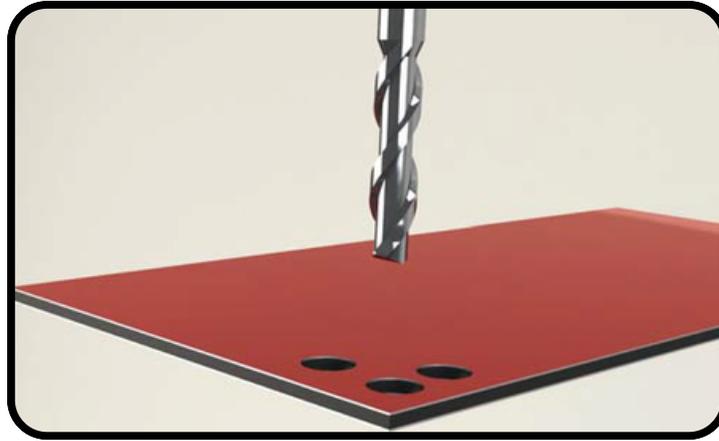
In order to clarify the situation on simple example; 1 x 3 meter black colored panels can reach approximately 70°C surface temperature under 40°C air temperature. The night temperature is accepted 20°C. Expansion on panel in mm is calculated below given formula.

$$\Delta L = 24 \times 10^{-6} / ^\circ\text{C} \times 50^\circ\text{C} \times 3000 \text{ mm} = 3,6 \text{ mm}$$

Half of the panel expansion must be expected on the opposite panel edges.

### 6.2 Drilling and Countersinking

It is possible to make a hole by using a drill bit or punching machine. The important point is the distance of the location of the hole or punching area to the edge must be at least twice distance of the diameter of the hole.



Shipradebond composite panels can be drilled with twist drills which is given in the picture. Countersinks are used for countersinking the hole and for widening larger holes.



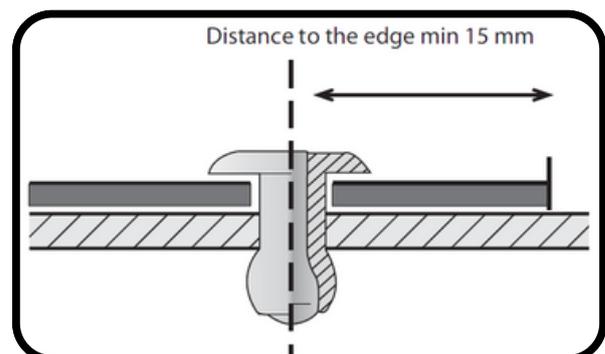
Countersink

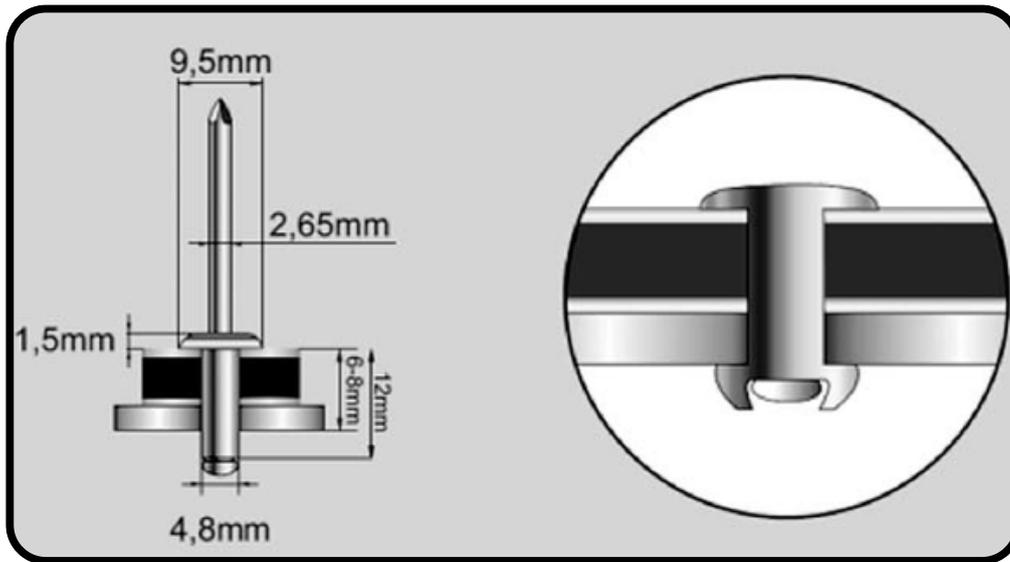
### 6.3 Riveting

It is possible to rivet the composite panels to attach with other materials. The rivet might be aluminium. The resistance of the connection points depends on the area where the hole is located. The connection holes' distance to the edge should be at least twice of the diameter. If it's necessary to use screws, it must be aluminium or stainless steel.

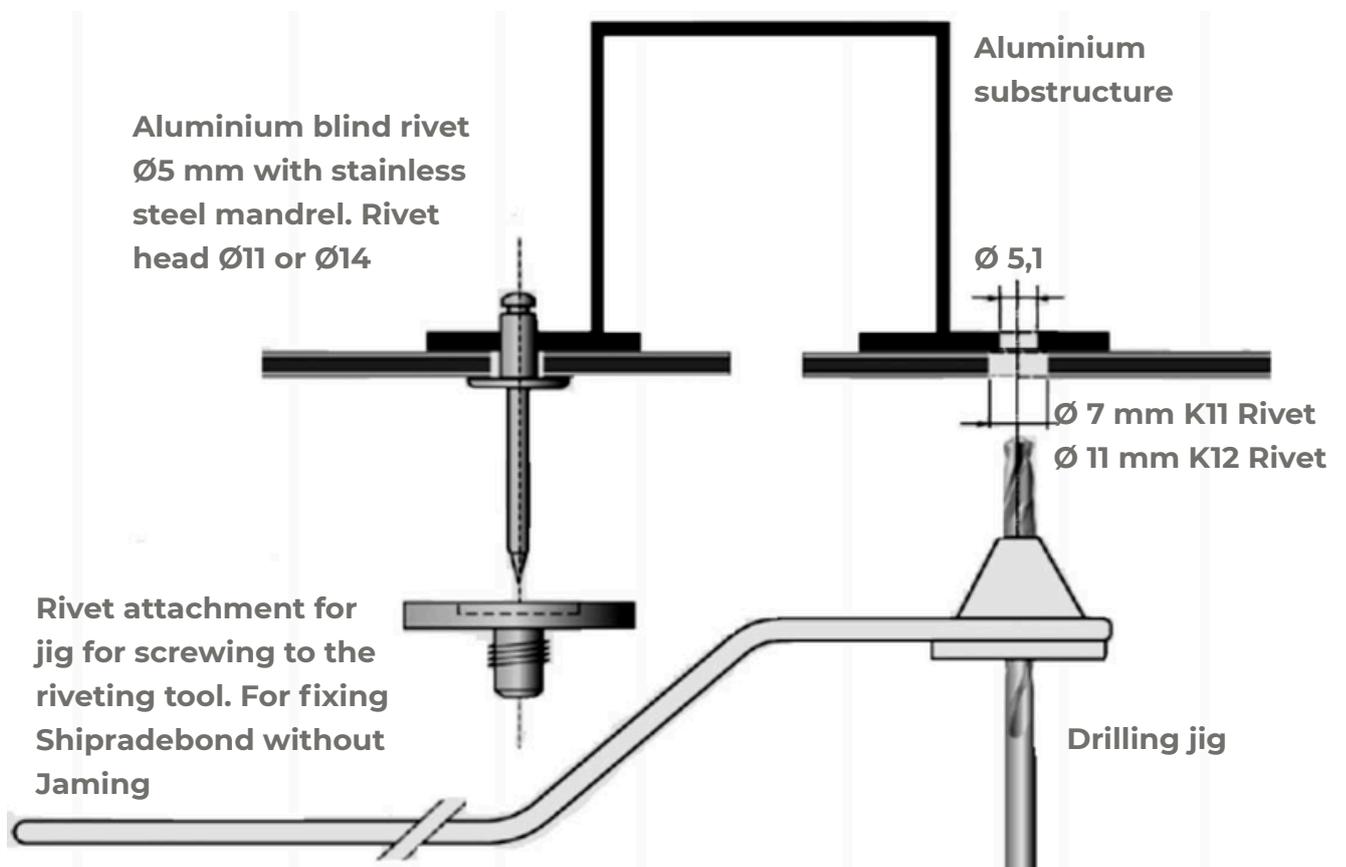


Riveting





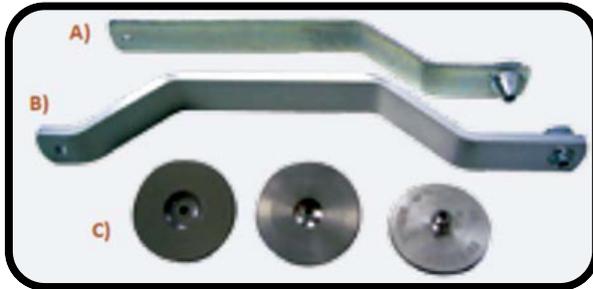
EN ISO 15977 Standard Blind Rivet



Ideal Riveting

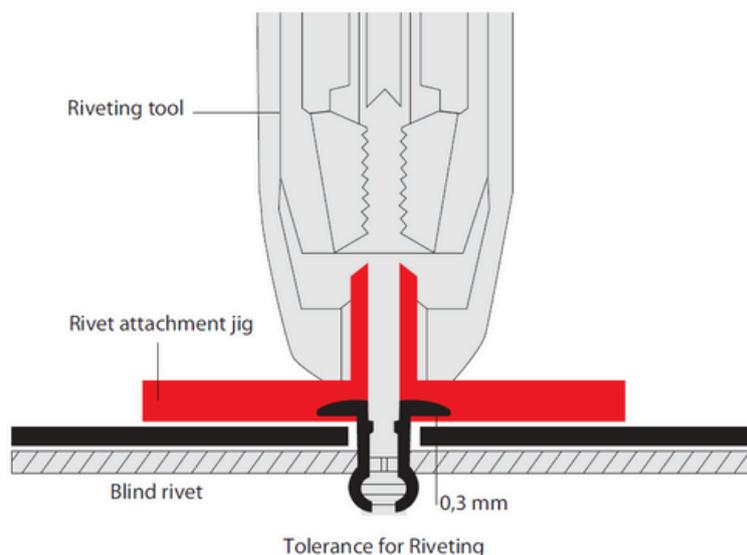
## For outdoor use please pay attention below given situations

- For outdoor use, aluminium blind rivets should be used that have been approved for constructions, and have a 5 mm shaft diameter and rivet head diameter of 11 or 14 mm

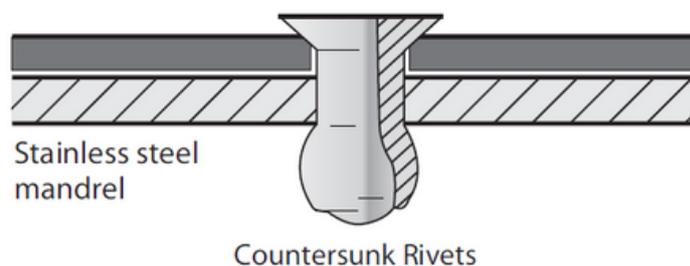


**A) Conical Drilling Jig**  
**B) Drilling Jig for hole Ø8,5 mm**  
**C) Rivet Attachment Jigs**

- Please take the thermal expansion of ShipradeBond (2,4 mm/m/100°C) into account. In order to avoid jamming, the hole in the panel must be large enough to allow for the expected expansion.
- Drillings jigs are used for centrally drilling holes into the panel and substructure and for centrally setting the rivet.
- Rivet attachment jigs are used for setting blind rivets without jamming allowing for a tolerance 0,3 mm. During riveting many factors may have an influence on the exact tolerance of rivets. Therefore, we recommend that you make a test on a façade panel. Please always remove a protective film in the riveting area prior to riveting.



Countersunk rivets are suitable indoor use only.

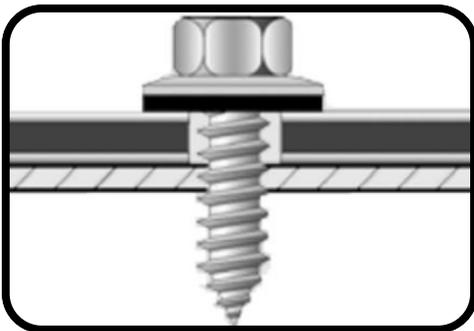


### 6.4 Screwing

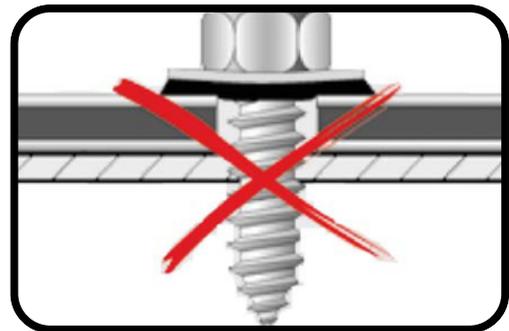
The screws during the installation of aluminium composite panels has to be aluminium or stainless. Connection holes' distance to the edge should be at least twice of the diameter. Otherwise tears can be seen on the hole parts.



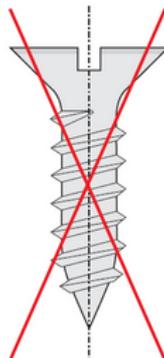
The screws should be tightened with a torque wrench or screwdriver such that sealing washer is placed on the panel for sealing the bore hole without exerting any pressure to the panel. If the sealing washer is visibly deformed or if the rubber seal laterally protrudes beneath the washer, an expansion of the panel is no longer possible which may result in a slight deflection of the cover sheet around the sealing washer.



Correct setting of screws



Incorrect setting of screws



Do not use countersunk screws for outdoor application

## 6.5 Sticking

There are lots of materials available to paste the composite panels. The suitable glue has to be chosen. The Glues which are not suitable for the surface may cause the oxidation and corruption on the surface in the future. It is necessary to follow the manufacturer's advice during glue selection. The surface has to be cleaned, dirt, dust and waste must be removed from the environment. The pasting quality depends on the surface conditions compatibility. During the composite panels connection, the insulation should be done where necessary. The isolation elements used in such cases are expected to keep up with the necessary atmospheric conditions. Recommended sealant is neutral silicone.



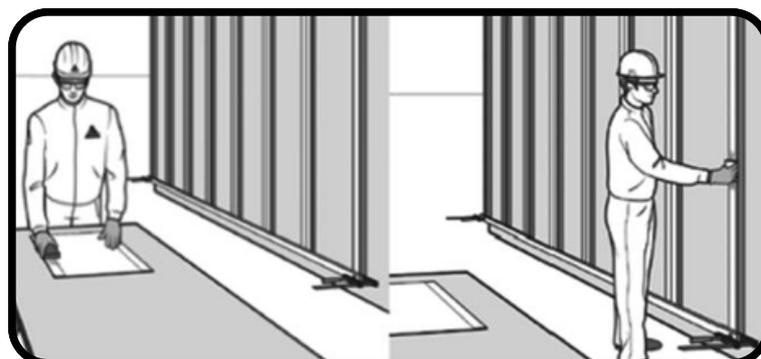
Sticking

**In order to make ideal sticking below given instructions must be followed.**

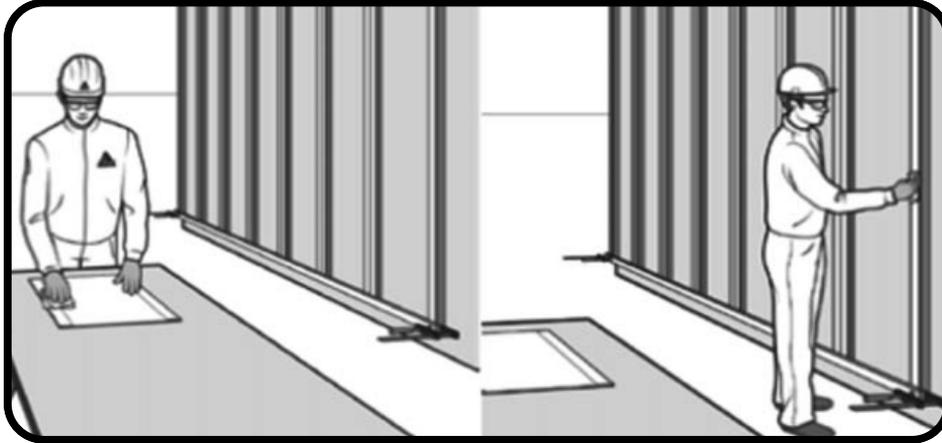
- The temperature of the building components to be bonded (cladding panels, sub-frame profiles, etc.) must be at least 3 °C higher than the dew point temperature. Ambient temperature: +5 °C min. / +35 °C max. Mark precisely where the first panel must be bonded on the substructure or use a reference which is fixed on the substructure.



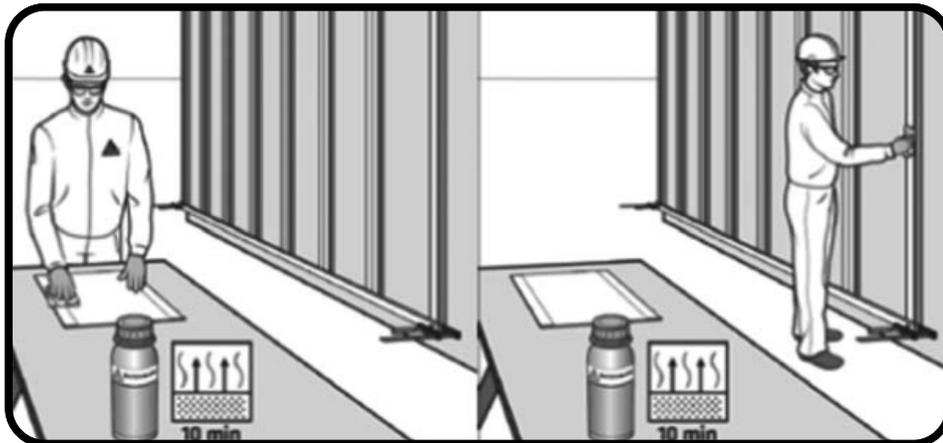
- The surface to be bonded must be clean, dry and free from grease. Abrading with an abrasive pad (e.g. Scotch Brite very fine) or mechanical grinding of the surfaces to be bonded with a very fine grinder, (grain 80).



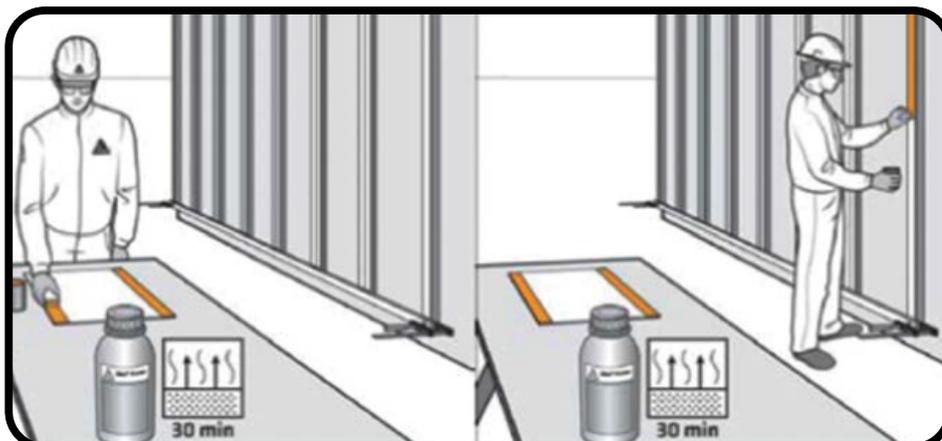
- Remove dust with a lint-free paper towel or cleaning paper.



- Activate the bond face with Sika® Aktivator-205 (or other if required). Use a clean lint-free paper towel or cleaning paper and wipe in one direction only (dirty cloths must be replaced). Allow a flash off time of 10 minutes.



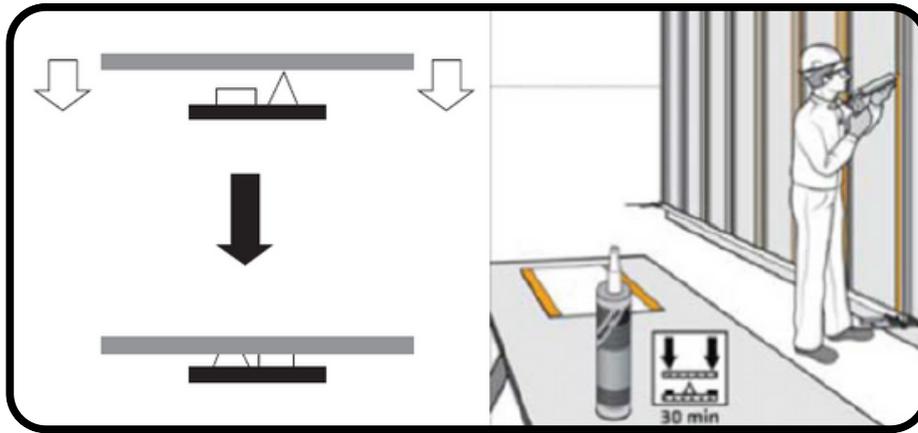
- Shake SikaTack® Panel Primer or Sika® Primer-210 thoroughly (the movement of the steel balls in the container must be clearly audible). Apply one thin coat of SikaTack® Panel Primer or Sika® Primer-210 uniformly over the whole surface with a felt pad. Allow a flash off time of at least 30 minutes



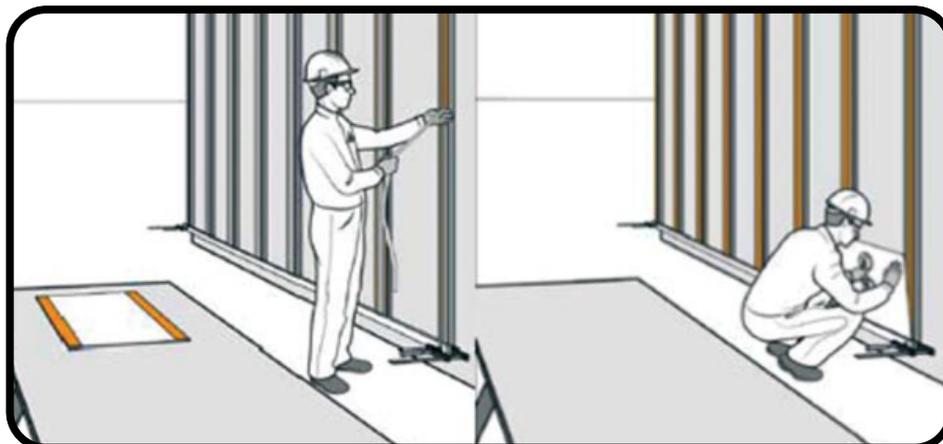
- Apply SikaTack Panel Fixing Tape over the whole length of the vertical sections and parallel to the edges. Do not pull off the protective foil at this time.



- Apply the chosen SikaTack® Panel adhesive in a triangular bead by using the triangular nozzle supplied with at least 5 mm gap to the fixing tape and to the side of the sub-frame profile.



- Apply the chosen SikaTack® Panel adhesive in a triangular bead by using the triangular nozzle supplied with at least 5 mm gap to the fixing tape and to the side of the sub-frame profile.

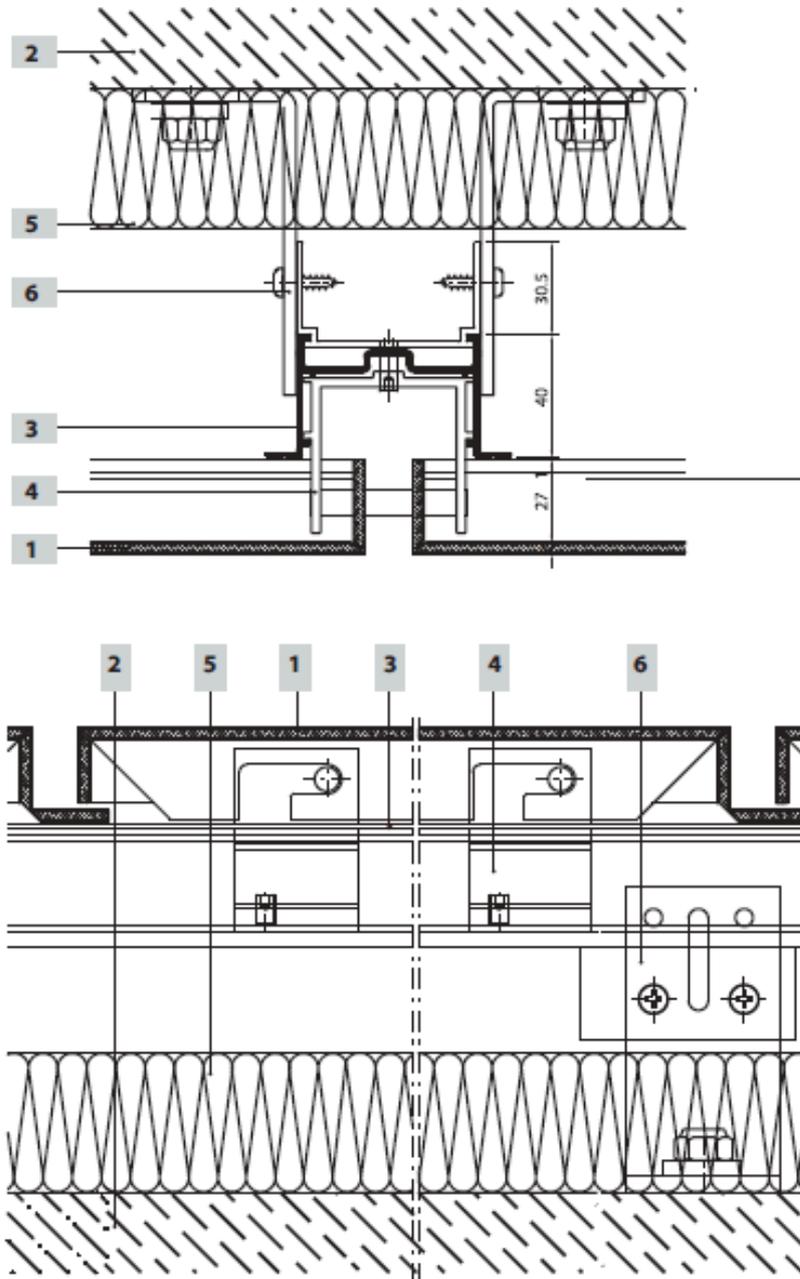


## 7. ASSEMBLING METHODS

Shipradebond Aluminium Composite Panels are used on the facades of the buildings. There are many advantages. ShipradeBond Aluminium Composite Panels provides sound and thermal isolation, easy and fast installation, flexible designs, light weight, and economical costs, which makes it highly preferred. It is lighter and provides better insulation than the solid sheets with same thickness. ShipradeBond can be installed as cassettes. According to Application sizes, wind load and static calculations must be made. If necessary panels must be supported by profiles. If there is no bulwark on the facade where ShipradeBond Composite Panel is going to be installed, it's better to insulate that area for the heat isolation of the building. Frame formed special Spandrel Panels should be used (produced from galvanized sheet and rockwool)



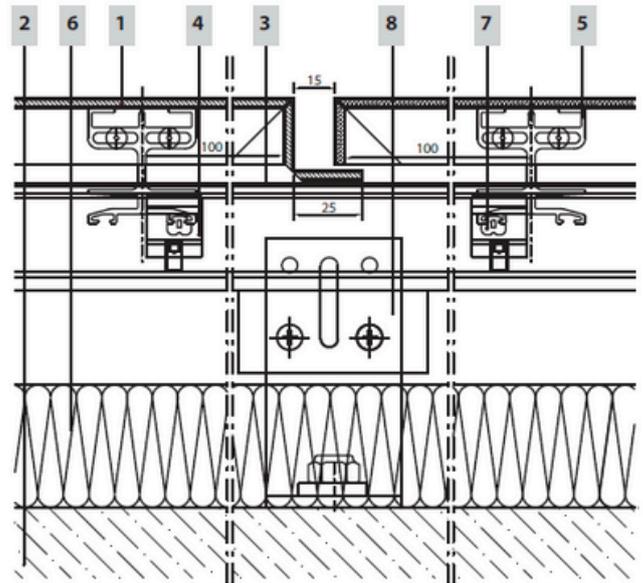
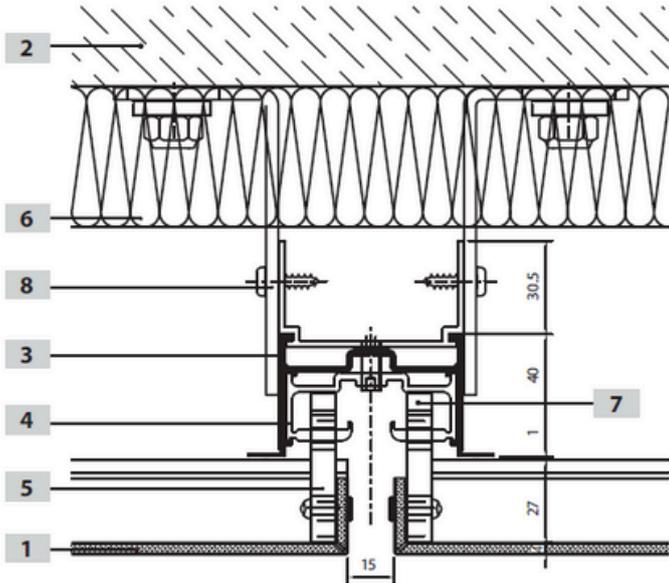
## 7.1 Application with Notchnig



SHIPRADE CARRIER SYSTEM MATERIALS	
NO	DESCRIPTION
1	SHIPRADEBOND COMPOSITE PANEL
2	CONCRETE WALL
3	VERTICAL CARRIER PROFILE
4	FIXING PROFILE
5	ROCKWOOL
6	GALVANIZED ANCHOR

## 7.1 Application with Notchnig

## 7.2 Clipping Application

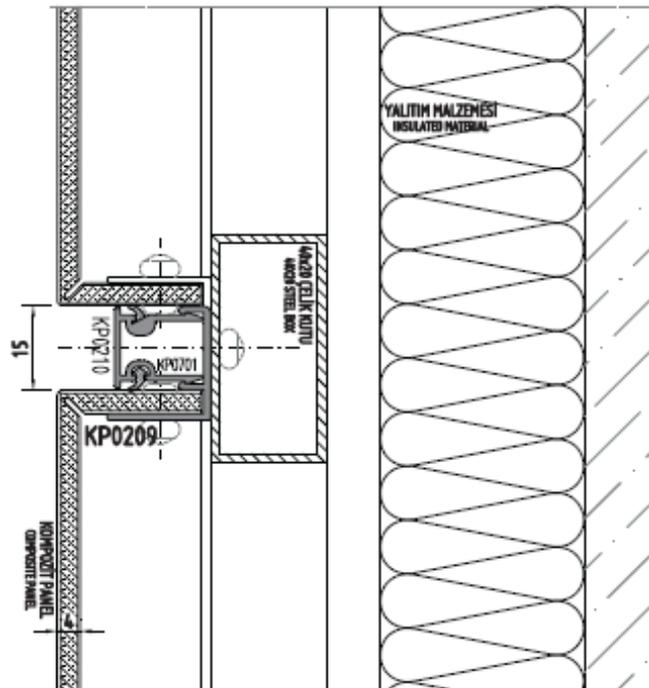
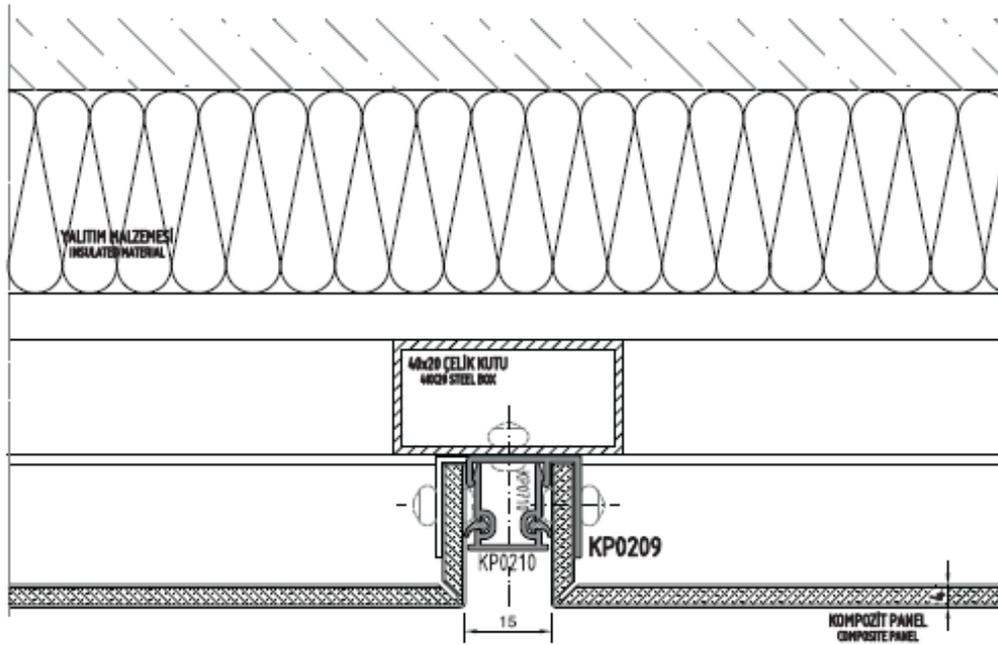


### SHIPRADE CARRIER SYSTEM MATERIALS

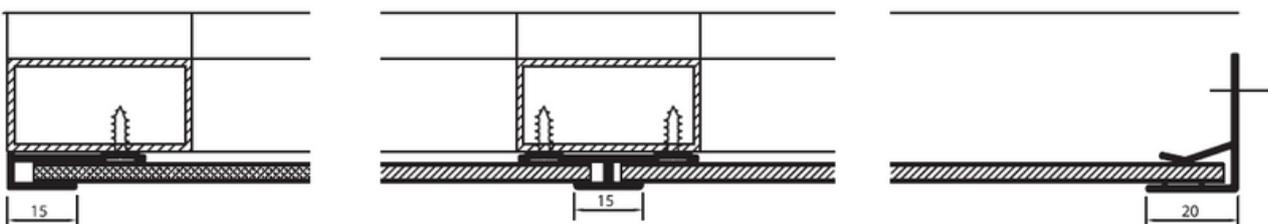
NO	DESCRIPTION	NO	DESCRIPTION
1	SHIPRADEBOND COMPOSITE PANEL	5	CONNECTION PROFILE
2	CONCRETE WALL	6	ROCKWOOL
3	VERTICAL CARRIER PROFILE	7	EPDM GASKET
4	FIXING PROFILE	8	GALVANIZED ANCHOR



### 7.3 Application with Joint Strip



### 7.4 Application with H Profile

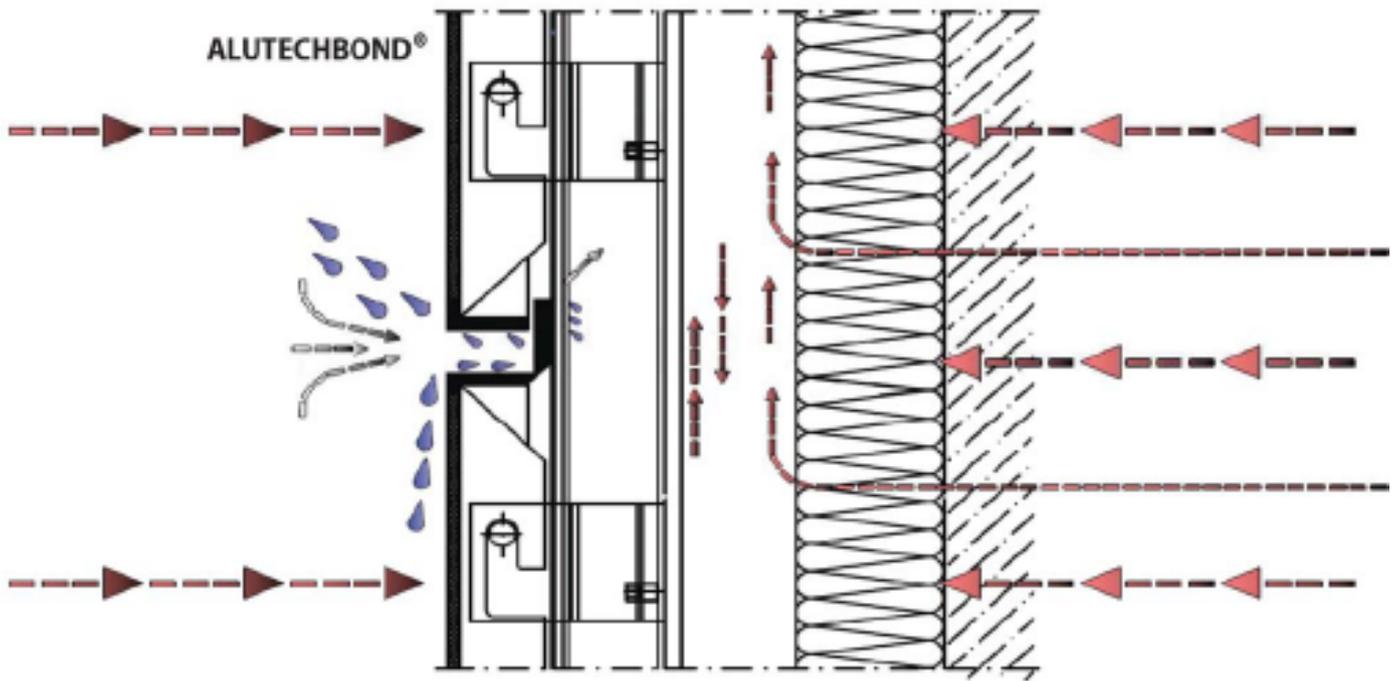


**8. WATER PROOFING**

There are two types of application methods. You can find details below; Application methods will be chosen accordingly to where the visual and functional requirements.

**8. WATER PROOFING**

On the Composite Panel applications water transfer and stratification made by the composite panel bending form and the profiles used on the connection points. This system provides air circulation inside. The drops are dried with this circulation.



**8. WATER PROOFING**

Water insulation is performed by filling all the gaps with silicone which is visible from outside. The silicon must be suitable for environmental conditions.

