Bostik
smart adhesives

Guide for bonding wall cladding panels

BOSTIK, SMART ADHESIVES

The new logo and the new house style with the characteristic green gecko is more than just a visual appearance. “Smart Adhesives” is a reflection of our positioning with regard to the development of smart and innovative sealing and bonding solutions that are safe, flexible and efficient.

We develop innovative sealing and bonding solutions that, whatever is constructed, connected or built, are smarter and can adjust better to the forces and challenges in our daily life.

THE GECKO – INSPIRING ADHESION

For centuries, scientists have been inspired by geckos because of their unique bonding mechanism. They can stick to almost any surface, can climb super-fast against smooth polished glass and can easily carry their entire body weight with just one toe.

The Bostik gecko is flexible, easy to adapt to environments, is open to new situations and is courageous. It symbolizes Bostik’s smart and innovative sealing and bondig solutions for the challenges which today’s market faces.

Professional products and systems for cladding panels

BOSTIK IS A GLOBAL LEADING PRODUCER AND SPECIALIST IN ADHESIVES, SEALANTS, MORTARS AND SEALING SYSTEMS FOR CONSTRUCTION, INDUSTRY AND CONSUMERS. FOR OVER 125 YEARS, BOSTIK DEVELOPS SMART AND INNOVATIVE SEALING AND BONDING SOLUTIONS, WHICH ARE FUNCTIONAL AND EFFICIENT, TO MAKE EVERYDAY LIFE EASIER AND LIGHTER. ITS SOLUTIONS OFFER MORE THAN JUST CONNECTING MATERIALS.

INNOVATIVE SOLUTIONS

Innovative thinking and acting is one of the most important pillars of Bostik. In our own laboratories we develop and test new techniques and applications. Since 2015 Bostik even has a Smart House where new raw materials and products can be tested in a domestic laboratory. The house itself is the first building in Europe to meet the four most important environmental and sustainability certificates: BREEAM, LEED, Bepos and Passivhaus.

SUSTAINABLE BUILDING SYSTEMS

Professionals around the world rely on the high quality of our products, our customer-oriented organization and extensive technical support. Safety and sustainable developments are important components within our business operations. It motivates us to continuously work on new product developments in which economic performance and protection of the environment are joined .

ABOUT BOSTIK

A few years ago, with the introduction of the new Bostik logo and the corresponding house style, we have taken the road to become a global player in sealing and bonding solutions.

- 125 years of experience in the development of smart adhesives
- Annual turnover of approximately 2 billion euros
- More than 6,000 employees worldwide
- Active in more than 50 countries
- 14 Research and R & D centers worldwide
- Part of Arkema

BOSTIK BONDING SYSTEMS

For over 25 years, Bostik has been an active and innovative player in the field of bonding exterior wall cladding panels and has a leading role in terms of knowledge, experience and quality.

Trespa – Golden House, Houten (NL)

CONTENT

Preface

Bonding is an interesting technique.
Obviously the properties and quality of the adhesive itself and that of the bonding materials need to be considered. But the construction also plays an important role. Moreover in order to achieve the optimal result, the adhesive system must be applied correctly under the right conditions. This is quite a challenge, especially when bonding on the construction site! Nevertheless, Bostik has been successful for over 25 years with the bonding of flat cladding panels in a ventilated construction. Every time it is a great pleasure to see how the bonded panels give a building a beautiful appearance.
This guide deals with this application extensively. The information is not intended as a replacement for our advice and processing instructions, but functions as background information and addition to these. This guide is not complete, as building techniques, laws, regulations and building materials are constantly subject to change.

Ing. Rob Nooten – Product Manager Bostik B.V.

Petrach - Centraal Station, Harderwijk (NL)

1. Introduction

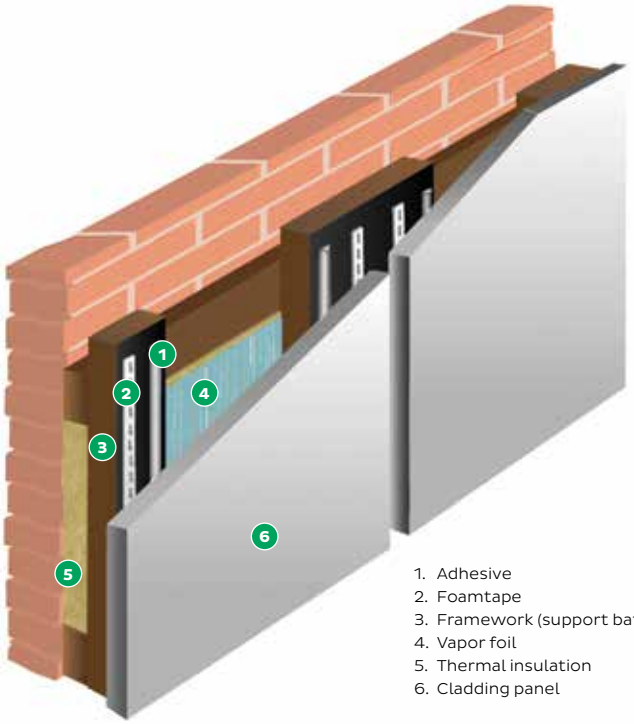
HISTORY

Curtain walls

In the Netherlands, buildings are traditionally still built out of brick. "Curtain walls" are relatively new. In this building method the outside (façade) is like a "shell" around the building and has no supporting function. In the USA, after 1930, the first aluminum curtain walls arose, but only became popular after World War II when aluminum became available for non-military purposes. Although all kinds of materials can be used for curtain walls, the first thing that comes to mind are glass façades of skyscrapers. In that case it concerns structural glazing where (double) glass is bonded to a load-bearing construction by means of silicones. This application is beyond the scope of this guide.

Rainscreens

A ventilated façade can be seen as a special type of curtain wall. In Norway, barns have been built for a long time with a ventilation space behind the wooden cladding with openings at the top and bottom to drain and evaporate (rain)water. The joints in the façade could be both closed and open. Only in the 1960s the term "open rain screen" (or "ventilated rain screen") emerged after scientific research, after which this system became really common in the 1980s.



1. Adhesive
2. Foamtape
3. Framework (support batten)
4. Vapor foil
5. Thermal insulation
6. Cladding panel

BONDING OF FLAT CLADDING PANELS

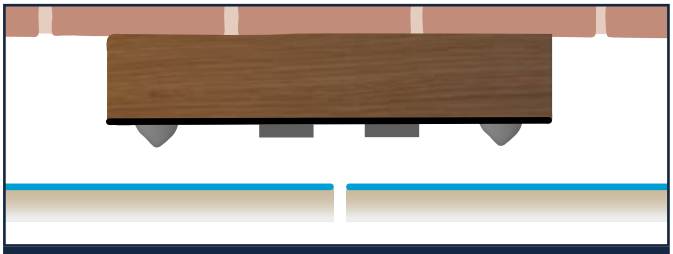
With respect to façade bonding, it mainly involves flat exterior wall cladding panels. Movement of the panels as a result of temperature and moisture should be taken into account. In the beginning, these panels were mainly screwed. Slowly their market share increased as the quality of the panels (especially weather resistance) improved.Nowadays, the panels discolor less and no longer delaminate (the release of the layers of which some façade panels are made up). Bonding of panels was desired, but the adhesives did not function well. The adhesives were rigid and could not absorb the movement of the panels, which led to breakage and / or panels coming off. The idea arose to use adhesive systems that could absorb some movement. The first development came from Bostik, the so-called Bostik PAD system. 2 mm thick strip was being used to which a contact adhesive was applied on both sides.

SCHEMATIC CROSS SECTION (TOP VIEW) BOSTIK PAD-SYSTEM:
Grey: strips. Cream: cladding panels red: contact adhesive.
Between the strips and panels a rubber joint profile is installed.

This system, which was used before 1985, turned out to be not ideal for outdoor applications. Around 1987 the idea arose to use elastic PU adhesives for fixing exterior cladding panels (from Sika), like used in the automotive industry. It Plastica, the Dutch distributor of HPL-panels from Fundermax was the first to introduce this system (with Sika adhesive) in the Netherlands.

The adhesive bead was applied in a triangular shape, next to a 3 mm thick double-sided adhesive foam tape (already used in the automotive sector when bonding car window shields).

Around 1989 Simson (now Bostik) introduced a similar system, but with a totally different, new adhesive based on a Japanese raw material; MS-Polymer from Kaneka. By applying this new technology, a number of advantages could be offered compared to PU technology. The adhesive was supplied in thick-walled HDPE cartridges, specially developed for Simson, resulting in a very long shelf life. In addition, the adhesive was solvent and isocyanate-free and had a very good adhesion, which made the pretreatment easier and faster.



SCHEMATIC CROSS SECTION
TOP VIEW
Black: Pretreatment wood.
Grey (triangular bead): adhesive
Grey (rectangle): foamtape
Blue: pretreatment cladding panel
Cream/white: cladding panel

Specific adhesive systems were developed in close collaboration with panel producers Trespa, Eternit and Rockpanel, which were successfully introduced on the market after necessary testing. In addition, required market support was provided by Simson (Bostik). Other panels were also bonded and various developments followed; quality improvements, different panels, other pretreatments, certification, etc. In the meantime, millions of m^2 exterior wall cladding panels have been bonded with Bostik systems; in Benelux alone, some 8 million m^2.

But why bonding? What are the advantages?

ADVANTAGES OF BONDING

Bonding offers aesthetic, economic and sustainable benefits.

1. An invisible (blind) fixing method

The advantage over mechanical fixing, like screwing, is that the front side of the panel is not visually disturbed by screw heads in the panel surface. Moreover, dirt can accumulate around the screw. This dirt can be collected by rain water resulting in dirt stripes running downwards with the rain water.

2. Favorable tension distribution

On the panels, forces are exerted that are caused by the movement (contraction and expansion) of the panel, the weight of the panel and the wind load. See chapter "Loads on bonding".

Because the adhesive is applied on a relatively large surface, there is no point load such as with mechanical fastening (like screwing, nailing and riveting). The forces acting on the panel are distributed over the entire length of the adhesive beads and favorably transferred to the support construction. There will be no breakage in the elastic (adhesive) connection and a high fatigue strength will be achieved. A second advantage of the elasticity of the adhesive is that deformations of the panel due to the movement of the adhesive with the panel will not occur. When applying a rigid connection (like screws), contraction and expansion of the panel cannot be properly absorbed, as a result of which the panel can "bulge". The panel may weaken at and around static nail or screw connections, because of movements due to contraction and expansion and deformation caused by wind load. As a result, the panel can tear, and in the worst case the panel (or part of it) can break loose from the façade. Therefore, one must take this into account when screwing (for example by pre-drilling a relatively large hole allowing the panels to move).

3. Application of thinner panels

Because the panels are bonded over a large surface, thinner panels can be used. This in contrary to mechanical fixing where the fastening takes place through screw holes in the panel. As a result, the panel is locally weakened. In order to compensate, thicker panels often have to be used. Relatively heavy materials, such as natural stone, where a certain material thickness is required due to their breakout strength with mechanical fixing, can be applied thinner when bonding. The use of thinner panels has as advantages that a lighter support construction can be used and that it simplifies the assembly by the lighter weight of the panels. In addition, thinner panels are cheaper than thicker ones.

4. Other constructional advantages

Another advantage is that the elastic bond has the ability to absorb vibrations as a result of, for example, heavy traffic or seismic movements. Also, through the use of an adhesive connection in this application, no thermal or cold bridges occur.

DISADVANTAGES OF BONDING

In addition to the advantages of bonding panels, there are also disadvantages.

1. Expertise required

The applicator must have sufficient knowledge of the adhesive system, the conditions under which it can be applied, the amount of adhesive to be applied, the open time of the adhesive, etc. If this knowledge is insufficient, this may result in poor bonding due to errors during the application.

2. Bonded panels cannot be adjusted

As soon as the panel is bonded and the adhesive has cured, adjustment of the panel is no longer possible. If turns out that the panel is not positioned correctly, the panel must be removed entirely and bonded again.

3. Quality of the bonding is difficult to control afterwards

It is difficult to see if a panel is properly bonded, because fixing is at the rear side of the panel and therefore invisible at the front.

4. Weather conditions

Installation of panels by bonding cannot take place under all weather conditions. Under certain conditions application cannot take place without taking precautionairy measures. For example in case of rain, heavy fog or mist, temperatures below 5°C or strong wind.

These disadvantages can be overcome by applying the adhesive system correctly in a controlled manner. For this, the applicator must set up a quality control system in which is clearly registered how and under which conditions the bonding has taken place. In addition, it is necessary for the applicator to have sufficient knowledge enabling him to assess the various aspects that influence the quality of the bonding.

ConcreAte concrete (with supporting profile) – Celon Pharma Office, Kazuń (PL)

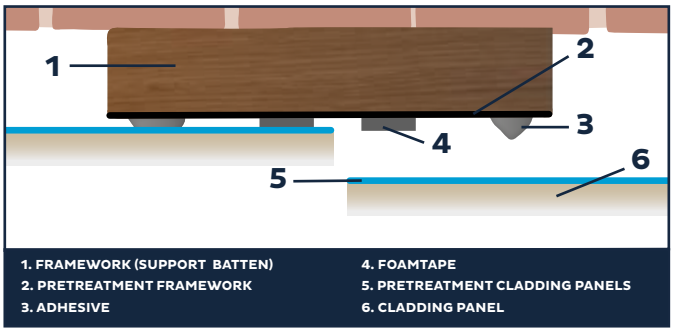
2. The bonding system

When bonding cladding panels, a complete adhesive system is being used. An adhesive system consists of various treatments and materials needed for correct bonding of the panels. The composition of such a system depends on the materials used (the cladding panel, the support construction and the brand or type of adhesive). The Bostik Paneltack adhesive system consists of the following components:

1. **Adhesive**
   The adhesive provides the final attachment of the panel to the supporting structure.

2. **Primer** (and / or cleaner) to pretreat the panel or supporting profile
- Primer; serves as a adhesion promoter on the supporting structure and the panel. Usually a primer is applied with the aid of a brush or roller (especially on planed wood, where a black colored primer is usually used).
- Cleaner; the panel and / or the support profile can be cleaned with this before the actual bonding.
- Washprimer; one speaks of a wash primer if both the surface is cleaned and a thin adhesion promoting layer is left behind in one single operation (with a cloth or tissue soaked in the wash primer).

3. **Foamtape**; the double-sided adhesive foam tape serves as both initial fixation until the adhesive has cured and as spacer for the adhesive bead.



The components of one adhesive system arealigned with each other. The components of different adhesive systems (from different manufacturers) can therefore not be exchanged with each other.

THE ADHESIVE

The adhesive is highly elastic. Typically the adhesive is strong enough to transfer the load of the weight of the panel and the wind load to the support construction, and is flexible enough to accommodate deformations of the panels. The latter is important because exterior cladding panels can contract or expand under the influence of temperature and / or moisture. The adhesive must be able to absorb these distortions. The thicker the adhesive bead, the more movement the adhesive can absorb. However, the thickness of the adhesive bead cannot be increased indefinitely. If the adhesive thickness is too large, the bonded panel can “slide down” due to the continuous weight of the panel. Therefore, the usual adhesive bead thickness is 3 mm (and is achieved by using the double-sided adhesive tape). The adhesive is applied in a triangular bead with the aid of a special V-shaped nozzle. The adhesive cures under the influence of moisture. This means that moisture from the air, from the panel to be bonded or from the framework is needed to allow the adhesive to cure. In a dry environment or when bonding closed, non-porous materials with little or no moisture (like aluminum), the curing of the adhesive will proceed very slowly.

PRIMERS

A primer is somewhat similar to a solvent-based paint. A primer is fluid and will therefore "wet" a surface better than a pasty adhesive. It is mainly used on the wooden battens of the supporting structure and often on the panel as well. The primer serves as an adhesion promoter. The primer can be regarded as an intermediate layer which ensures a better adhesion of the adhesive to the bonding area. The primer penetrates into the surface (pores) of the (wooden) substrate and can therefore anchor easily. Subsequently, the adhesive can chemically bind and physically anchor to the surface of the primer. By using a primer, a less suited surface can still be bonded.
The omission of one of the components of an adhesive system can lead to damage.

Black wood primer; Primer SX Black
This primer serves to improve the durable adhesion on untreated or impregnated wood. Wood is porous (and can absorb moisture). Due to the low viscosity, the primer penetrates into the wood, adheres and forms a firm, closed substrate for the adhesive after curing.

The adhesive is pasty and penetrates less easily into the wood surface than the thin primer. Thus by applying the primer, the durable adhesion is improved.
In addition, the primer has an aesthetic function: the black primer layer is visible between the vertical joints of the panels. This means that the primer layer must be resistant to sun (i.e. UV light) and precipitation. In this way the primer additionally provides some extra protection of the wooden battens, but this protective effect is limited unless this primer is applied on all sides of the wood. Primer SX Black should not be applied to painted (closed) wooden surfaces. The primer can be applied on the construction site (under dry conditions at temperatures between + 5°C and + 30°C). The wood moisture content should not exceed 18%. The minimum drying time of Primer SX Black, applied with a special roller, is 1 hour. At low temperature and / or a low relative humidity the primer dries less quick. However maintaining a drying time of at least 1 hour (under West-European conditions) should do.

Primer SX Black contains various health-hazardous ingredients including solvents. Therefore the necessary precautions must be taken during application. Proper ventilation is an absolute necessity here (which is of course not much of a problem in an outdoor application).

Cleaners
Cleaners such as Liquid 1, Cleaner I and Cleaner 14 are solvents used to clean the surface. In case of cladding panels it is possible that a residue ("substance") from the production is left behind on the surface on the backside (the side to be bonded). A residue can also come from glue residues of a transport foil, which is used to protect the panel from damage during transportation. These residues should be removed with a suitable cleaner.

Washprimer
Besides primers to be applied with a roller, other types of primers can be applied with a cloth or tissue paper directly from the can to rub the surface firmly, leaving a thin adhesion promoting layer on the surface. These are the washprimers such as Primer Paneltack or Prep M. These are also used to pretreat aluminum profiles. For specific materials (such as Trespa Meteon) ready-to-use wipes Easy Prep Wipes are available.

Before applying the adhesive, the cleaner or wash primer must have dried or evaporated completely.

Cleaning front side of the panel
Sometimes people use cleaners to clean the front of the panel. A suitable cleaning agent (such as Liquid 1) should be used and not the wash primer (or cleaner) that is intended to pre-treat the backside of the panel. An unsuitable cleaner could affect the coating layer on the front side of the panel and a wash primer leaves a visible layer behind.

FOAMTAPE
The tape consists of a light-compressible foam with a layer of adhesive on both sides. The tape is supplied on a roll with a protective film applied on one side. The tape is necessary because the freshly applied adhesive has not cured yet when installing the panel and therefore cannot yet hold the panel. After curing, the adhesive is strong enough and the tape loses its function.
The thickness of the tape is slightly more than 3 mm. When installing the façade panel, a minimum thickness of 3 mm adhesive layer is created between the façade panel and the underlying framework. This adhesive layer thickness is necessary to guarantee the elasticity of the adhesive enabling the adhesive to absorb movement of the façade panel in relation to the framework. The tape is compressible to absorb any small inequalities on the surface. When installing the panel, the tape may not be pressed too much, otherwise the adhesive does not reach its minimum required thickness because the tape moves back to it's original shape, causing the fresh adhesive to be pulled apart again.
After applying the tape and the adhesive to the support profiles, the protective film can be removed from the tape. Next, the panel can be carefully and gently pressed against the tape.

3. The construction

Just as in case of mechanical fixing, the construction and quality of the (support) construction are vital when bonding façade panels, determanating the durability of the total façade cladding. Not in all cases the applicator who takes care of bonding of the cladding panels will also take care of the construction. Therefore, it is important that the applicator is able to evaluate this support construction on its soundness prior to bonding the cladding panels. Only when this construction meets the requirements, one can start installing the façade panels. In any other case, the possible consequences of the observed deviations must first be discussed with the person responsible for the support construction and Bostik. Due to the large variation in application and materials, this manual does not provide a conclusive recommendation with regard to the construction.
It is therefore recommended to consult a constructor with regard to exact dimensions of the support profiles, the anchors, centre distances between the anchors, etc.

THE SUPPORT CONSTRUCTION

The support construction is the framework, attached to the building structure, on to which the façade panels are to be bonded. The structure of the support construction can vary and depends on the following factors:
- The application; the structure of the support construction can vary in applications such as façade cladding, fascias, soffits, canopies, etc.
- The materials used; the structure depends on the use of wood or aluminum. The type of cladding panel can also influence the structure (due to, for example, the weight of the panel).

Generally, a support construction (especially wood) is composed of the following components:
- Horizontal battens; only used if insulating material is applied. They are attached directly to the building with anchors.

Etalbond – Sanoforum, Brunssum (NL)

- Insulation; is not directly part of the load-bearing construction but is generally applied between the horizontal battens.
- Moisture-resistant, vapor-permeable sheet foil; is applied to prevent moisture from entering the structure and prevent the insulation material from getting wet. The foil is attached to the horizontal framework.
- Vertical support profiles; on which the cladding panels are bonded. Wooden vertical support battens are attached to the horizontal battens.

The most important requirements for the support construction are to support the façade cladding panels and to withstand the occurring wind loads. The loads on the façade panels are transferred to the building via the support construction. No matter the quality of bonding the cladding panels, if the fixation of the support construction is insufficient, there are huge risks of damage. It is of great importance that fastening of the construction is well executed.
Another important aspect is the flatness of a façade. The walls of building, which are made up of concrete or stone elements, are generally not completely flat. By absorbing irregularities during the assembly of the support construction, a flat façade can still be obtained.

Horizontal (wooden) battens

If insulation is to be applied when the support construction is being construed, horizontal battens will be used. The insulating material can be placed between the horizontal battens. The fastening generally takes place with corner pieces are mechanically fixed in the construction of concrete, brick or masonry by means of structural anchors. The fixation of anchors should be done carefully. It is important that, when drilling the holes in the walls of the building, to use the correct drill and check the diameter of the holes regularly. As soon as the anchor can be placed in the holes, these holes should be checked on boron, water and / or ice first.

The centre distances between the anchors depends on the weight of the wooden battens and should be determined by the constructor (and / or panel producer).

The thickness of the support profiles (battens) depends on the thickness of the insulation. The width is usually 45 mm. The centre distance depends on the weight of the wooden battens and distances between be determined by the constructor.

Insulation and vapor foil

The insulation and the moisture-resistant / vapor-permeable foil do not directly relate to the strength of the structure. However, without such a foil, durability of the construction can be negatively influenced. This is caused by the fact that the insulation material behind the façade cladding can get wet and long-term moisture accumulation can take place (various insulation materials absorb and retain water).

This water retention can lead to the following:

1. When wood is used in the support construction, damage (wood rot) can occur.
2. Different vapor pressures between front and backside of the cladding, because the cladding panel dries on the front on hot days while the back of the panel remains wet. These differences in moisture can cause, stresses occur within the panel, which can warp the sheet and cause tensions in the bonding.
3. The insulation material loses large part of its insulation value when it is wet.

The use of a foil is not necessary if an insulating material is used that does not immediately absorb water. Prior to the application, it should be checked whether fixing the horizontal support profiles and application of the insulation and the vapor foil has been carried out correctly (i.e. draining).

Vertical support profiles

Bonding cladding panels is done on vertical support profiles. Various requirements are imposed on this system. These requirements depend on the materials involved.

WOOD

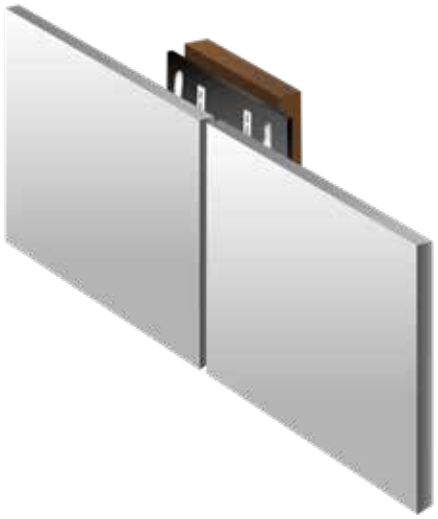
Direct bonding on wood

In order to obtain a properly bondable and even surface, the wooden battens should be planed four-sided. The wood has to be suitable for this application. First of all, it should be sufficiently strong (at least strength class C18 according to EN 338). It also has to be sufficiently durable, i.e. resistant to rotting, mold formation and insects. In general, preserved spruce is used. The wood may contain preservatives based on salts, zinc and copper like Wolman salts. Resinous wood such as pine and Oregon pine are not recommended as vertical support battens. The resins from these types of wood create a "greasy"surface, preventing primer and / or adhesive to adhere well. Materials such as plywood, OSB and MDF are not allowed as vertical support battens. These materials are made up of different thin layers of wood or fibers that are bonded together. These bonded parts can detach realeased from each other due to moisture (delamination).
Preserved wood treated with a wood preservative should dry first. When using wooden support battens, it is not allowed to process wood with a wood moisture content above 18%. A higher wood moisture content may lead to a poorer adhesion of the primer to the wood. Prior to application, the wood moisture content should be measured randomly to check whether this requirement is met.

Indirect bonding on wood

with Rockpanel Tack-S on (Rockpanel) strips.

Rockpanel Tack-S has CE certification and included in the European approval of Rockpanel. The requirements are as such that they cannot be met with direct bonding to wood. Therefore Rockpanel strips are screwed onto the timber battens, on which the panel is bonded. The Rockpanel strips provide a controlled substrate of constant quality for bonding.



This has a number of advantages:

1. The wood moisture content of the wooden supporting battens is less important. After all, when bonding directly, wood moisture content should not exceed 18% before bonding can take place.

2. The wood quality (for example bad pieces and knots) hardly plays a role in the quality of bonding.

3. The wood is protected against direct weather influences (especially between 2 panels).

4. In the event of fire, the wood is protected against direct fire load from the bottom side.

5. The color of the strips can match the panels (if residual strips are used), which is and remains aesthetically pleasing.

6. Residual strips from the cladding panels can be used.

7. Simpler, faster and more environmentally-friendly pre-treatment of the substrate on which is bonded. Although it is necessary to apply the strips as an additional operation, these strips only need to be cleaned with Liquid 1 prior to bonding with a drying time of 10 minutes. Cleaning is done by rubbing the surface with a soaked cloth (when bonding directly to wood, this wood must be primed with a brush or roller first, after which a drying time of at least 1 hour should be taken into account).

METAL ALUMINUM

In addition to wooden vertical support profiles (battens), it is possible to use aluminum or bare steel support profiles. However, these types of metal should be treated against rust. In essence, coated metals are also suitable, but a special pretreatment might be necessary. For the application of (powder) coated metal framework, first consult Bostik.
The metal framework is usually a profile especially made for this application. It can be constructed from a profile which is attached to the supporting structure, to which a T or L profile is attached (with blind rivets). A metal profile (with anchor bolts) is attached directly to the concrete or limestone wall of the building. This makes the application of a horizontal framework redundant.

Aluminum profiles are used most commonly. The aluminum used is not pure aluminum but an alloy with magnesium and silicium AW-6060 (AlMgSi 0.5) or AW-6063 (AlMgSi 0.7) according to EN 755-2. The aluminum can be anodised, meaning it has been given an extra protective oxide layer by a special surface treatment.

The profile has a minimum thickness of 1½ or 2 mm. The insulation material will be placed between the aluminum profiles, taking sufficient distance into account between insulation and cladding panel to ensure a ventilation gap. When mounting aluminum profiles, the thermal expansion of aluminum must be accounted for by using so-called slotted holes enabling the profiles to work freely. The length of the aluminum profiles is limited to 6 m in order to avoid large expansions. The maximum expandable part of the profile is 3.5 m from fixed attachment point to profile end.

A joint between the aluminum profiles should always coincide with a joint between the panels. Preferably the joint is continued at the same height. The aluminum framework (whether or not anodised) should be cleaned and degreased with the (transparent) wash primer **Prep M** or **Primer** dikgedrukt. A drying time of at least 10 minutes is recommended.

Optionally, the black primer **Prep G-Plus** can be applied (as an alternative) after cleaning (for example with Cleaner I). This primer can be applied with a brush or foam block. A drying time of at least 30 minutes is recommended.

Eternit – The Genesis, Braine l'Alleud (BE)

FRAMEWORK

Dimensions

The framework requires a certain thickness in order to obtain sufficient ventilation behind the wall cladding. In addition, a minimum width is required to obtain sufficient surface for the adhesive and tape. Therefore, the following minimum dimensions of the wooden (or aluminum) vertical framework are recommended:

Centre distances

Thickness	≥ 19 mm
Width of end- and intermediate supports	45 mm
Width of supports for joints	95 mm

The centre distances between the vertical support profiles depend on a number of factors:

- Height and location of the building; the higher the application area, the smaller the distances of the framework. Therefore, it is possible that different centre distances are used on one building. In addition, the location of the building plays a role; for example stricter requirements are made on the coast with regard to wind load.

- Thickness of the panel; The thinner the panel the smaller the centre distances in order to prevent too much deformation of thin façade panels which could lead to breakage, for example in the case of natural stone. This relates to the stiffness of the panel.

- The location on the façade; Because the wind load at the corners and edges is higher than elsewhere on the building, a smaller centre distance is often applied along the corners and edges of a high building (see chapter 4).

- One or multiple field span; In case of smaller panels there are only 2 support profiles or battens at the ends, which is referred to as a one-field span. For broader panels, intermediate support profiles or battens are applied with a slightly shorter centre distance than with a single-field span.

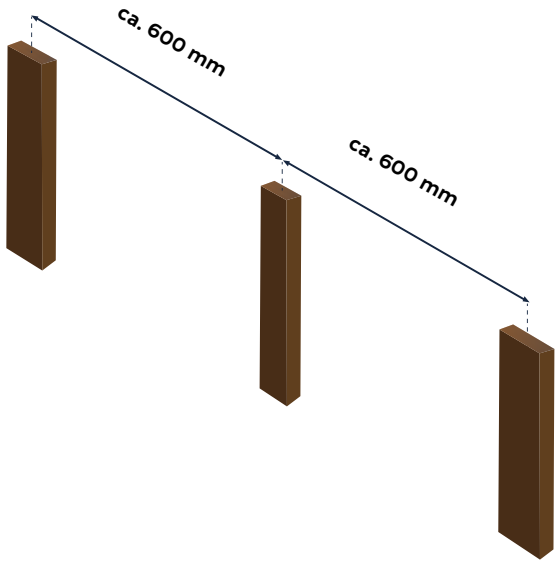
Factors influence the centre distances between the vertical support profiles, making it impossible to draw up a general guideline. However, 600 mm is generally used as the maximum centre distance. The table solely gives an indication of the centre distances. For the exact size, it is advised to consult the relevant technical data sheet and / or contact the panel manufacturer.

For wind load see the Eurocode 1 part 1-4, i.e. EN 1991-1-4.

Panel type	Thick-ness in mm	2 supports per panel in mm	>2 supports per panel in mm
HPL	6	450	550
	8	600	750
	10	750	900
(FCB)	8	500-600	400-500
Natural stone	15	600	600
Rockpanel	8	600	600

Flatness

The assembly of the framework must be carried out in such a way that the support profiles are aligned for aesthetic reasons, but also because an unevenness of the vertical profiles can lead to large differences in adhesive thickness or stresses in the panels. These stresses are caused when the façade panel is set hollow or convex against the tape on uneven battens. Therefore, flatness of the framework should be checked before application. A maximum deviation of 2 mm is permitted in relation to the façade line.

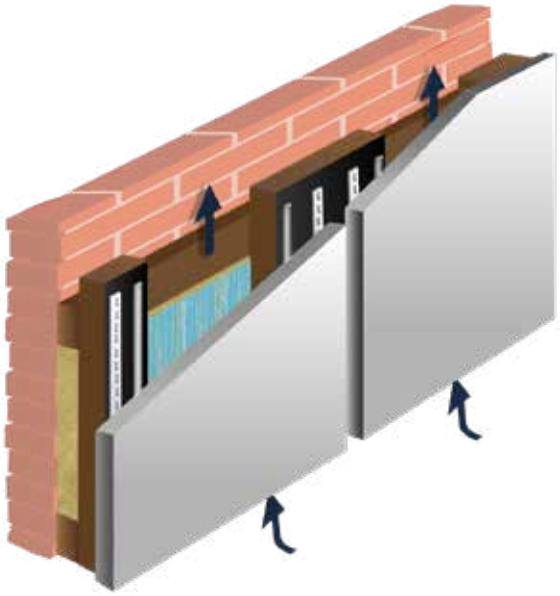


VENTILATION

A durable construction needs to have sufficient ventilation behind the panels. This ventilation ensures:

- The support construction can dry, avoiding damage (wood rot) of the wood or corrosion of the metal; in case of insufficient ventilation, moisture behind the panels cannot escape.

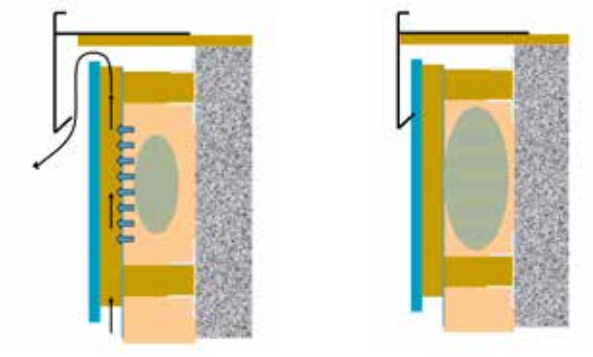
In normal applications, based on the recommended quantity of adhesive, the requirements are amply met.



- Large temperature differences between front and rear of the panel are avoided; sufficient ventilation ensures that temperature on hot summer days, especially of the backside of the panel, does not become extremely high. Ventilation ensures that heat from the panel at the rear side can disappear.

Fiber-cement panels are carbonated. Carbonation is a chemical reaction in which slaked lime in the cement is converted with carbon dioxide into calcium carbonate and water. If there is insufficient ventilation, the differences in conditions (in particular the concentration of carbon dioxide) may cause the carbonation between the front and back of the panel to vary. This will happen more quickly on the front side of the panel, resulting in more contraction at the front, causing the panels to warp (cavity).

To ensure good ventilation, the following requirements should at least be met*:
- Air cavity of at least 20 mm at the back side of the panel. This air cavity must have a direct opening at the top and at the bottom of the façade and should not be interrupted
- Sufficient in- and outflow openings at the bottom and top of the façade.



Good Wrong

These openings should have a size of:
- At least 20 cm2 / m1 at façade heights up to 1 meter
- At least 50 cm2 / m1 at façade heights above 1 meter.

A roof trim it must be ensured that should not be installed too tight the façade panel prohibiting any ventilation (see illustration).
Also at the bottom of the façade, ensure that the ventilation openings remain free. Special ventilation profiles are often used to prevent pests (such as mice) from entering.

The ventilation will be enhanced if no horizontal joint profiles are used.

JOINTS

Fixing cladding panels should be carried out in such a way that a joint is kept clear at the location of the mutual connections of the panels, in order to be able to absorb the movement of the panels due to temperature and / or moisture. As a result, it is prevented that when the panels are expanding, they "butt" against each other. This “butting” may cause deformation of the panels. For instructions, consult the panel manufacturer. In practice, for aesthetic and practical reasons, a joint width of 10 mm is often used.

The joints can be finished in different ways:
- An open joint, pretreated wooden support profile (batten), finished with black primer Primer SX Black. Or in case of an aluminum profile with Prep G-Plus.

- A joint profile of anodised aluminum. This profile covers the joint and only has an aesthetic function. The profile should not obstruct the expansion and contraction of the panels due to temperature and moisture changes. The profile should neither obstruct ventilation nor lead to local moisture accumulation.

Other solutions are also possible if they do not negatively affect aspects such as ventilation. An open joint is technically preferred. By leaving the joints open, there is less chance of contamination of the panels because the joint remains clean. In addition, the open joints provide additional ventilation openings. Even with open joints, only little rain can get behind behind the panels a vapor-permeable foil can be used in order to prevent the insulation value from decreasing due to possible rain or moisture penetration.

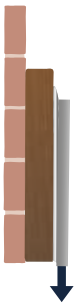
* A larger air cavity is required for higher buildings. The requirements can be different for certain types of panels. Consult the instructions of the panel manufacturer.

4. Loads on the bond

Cladding panels do not have a constructive (load bearing) function. Façade cladding can be seen as the shell of a building, which serves to embellish and protect the underlying construction against direct weather influences. Bonding must keep the façade cladding in place and absorb the loads that act on it.

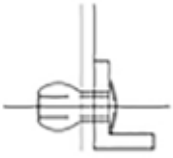
OWN WEIGHT OF THE CLADDING PANELS

The own weight of the panel is a permanent shear load. This load is always present. Therefore the bond has to be strong enough for a longer period of time. The bonded façade panel should not slowly and continuously slide down. In other words: the face panel should not 'creep'.



Cladding panels should be carried by the support construction. Loads are transferred by the adhesive.

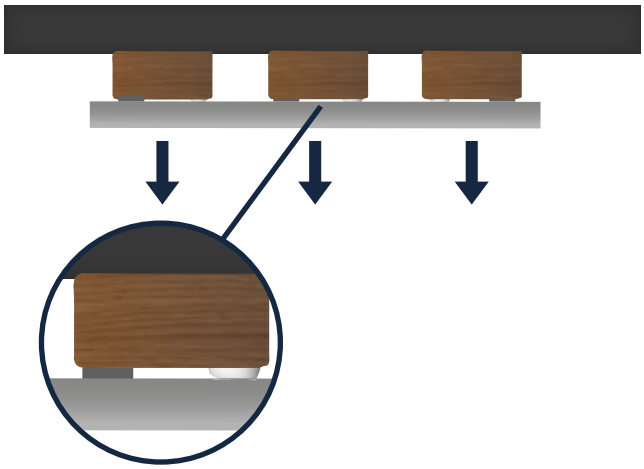
Heavier panels (>20 kg/m²) like natural stone are best supported by small aluminum "consoles" on the aluminum support profiles. In this way, the panels can be positioned easier before they are pressed against the adhesive. Moreover, because the consoles permanently support the plates, the adhesive is not or hardly subjected to creep. However, the consoles block the movement of the panels downwards, as a result of which the panels can only work upwards. Generally, this is not a problem for the elastic bond.



Example of aluminum console (l-shaped profile). 2mm thick. Width and height 20 mm, extends 8mm. Fixed with a suitable blind rivet. Such a profile is hardly visible.

Horizontal bonding; ceilings

In fact, the load of the own weigth of the panels applies to horizontal bonding too, only it involves a tensile load instead of a shear load.



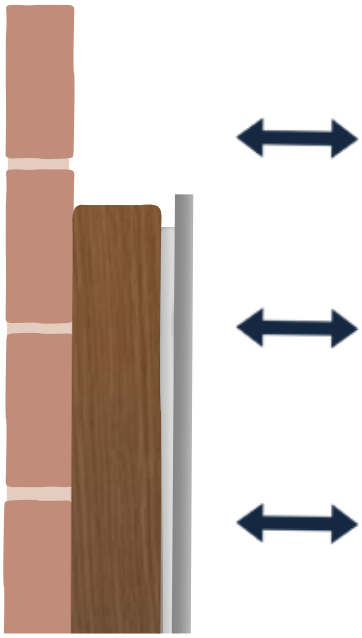
In general, smaller centre distances between the supporting profiles are used for ceiling panels, usually 70% of the distances used in vertical façade bondingin order to prevent the panels from sagging. Heavier panels (> 20 kg / m2) should not be bonded horizontally.

Note: Initially the foam tape should hold the panel in position. In the case of long, non-rigid, somewhat flexible cladding panels (such as Rockpanel and thin metal sheets), there may be a **peeling load**, particularly at the end of the panel. As a result, the foam tape may not be able to hold the panel.
In that case, the panel should be additionally supported for a while, taking into account that the foam tape is not being pressed too thight.

WINDLOAD

Wind is just air movement. When a building is blocking wind, the moving air will reach a standstill, causing a pressure force. However, wind movement is a dynamic process: there are gusts - of strong wind -, interchanged with softer winds. Swirls of air are created at the edges and corners of buildings, creating varying forces: especially pressure, but also traction through so-called 'wind suction'.

The bond has to be able to absorb pressures and tensile forces on cladding panels.



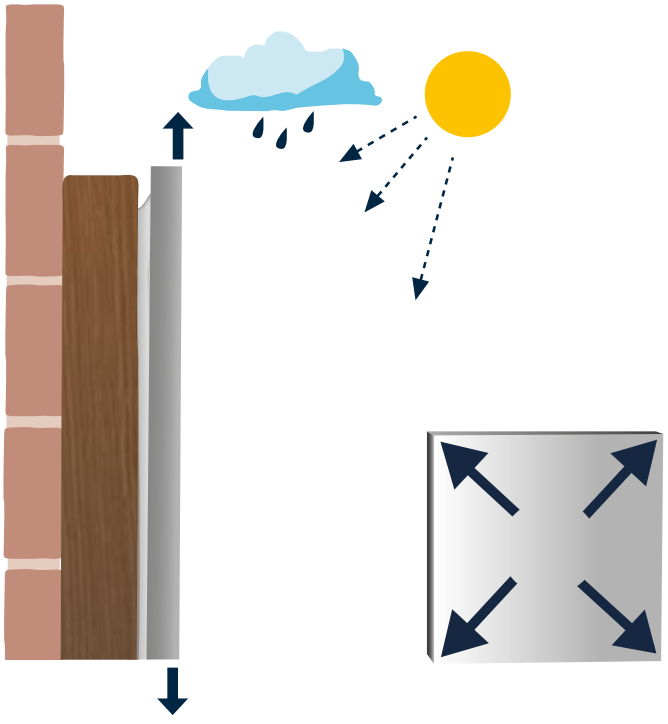
Wind load is a fluctuating load. This load, changing over time: sometimes there is no wind at all; if there is wind, the load is alternately a pressure or a pulling force. Wind load causes a tensile stress or a compressive stress in the bond. Regarding the construction, it has to be taken into account that wind load is higher at the edges and corners of a building than at the center of a façade. Therefore, the distances between the support profiles at corners or edges of the façade are often reduced.

The wind load is calculated on the basis of Eurocode 1 part 1-4, i.e. EN 1991-1-4 . The pressure values depend on the height of the building, the geographic location of the building and the environment of the building (whether or not the building is surrounded by other buildings).

EXPANSION AND CONTRACTION OF THE PANELS

If the façade is exposed to full sun, it will heat up, panels will be much warmer than the support construction which is not in direct contact with the sun. In addition, the panels provide partial thermal insulation.
Panels that warm up will expand while the support construction hardly changes in size. The bond should be able to absorb these differences in dimensions and remain attached to both the façade panel and the support construction.
Often moisture plays an even more important (but similar) role than temperature (sun).
Because the panel increases during heating (and the support construction remains the same in size), the bond will start to slide. The same effect, but opposite, occurs when the panels become colder than the support construction and thus contract. The adhesive layer should be sufficiently elastic and thick to be able to follow this movement.

The shear deformations in the adhesive layer increase from the center of the panel towards the edge of the panel. This also means: the larger the dimensions of the panel, the greater the shearing effects that can occur in the adhesive layer if the panel contracts or expands.



In case of **HPL panels**, contraction and expansion of the panels under the influence of temperature and humidity is an important aspect, which has to be taken into account. HPL panels contain thermosetting resins and wood fibers which are influenced temperature (thermal expansion), but by moisture (hygric expansion). Other panels, such as fiber cement boards, are less affected by these influences. This underlines why Bostik advises a different adhesive (with a higher elasticity) for HPL-panels than for other panels. Therefore the calculation of maximum panel dimensions of HPL panels is discussed here.

Calculation of maximum panel dimensions of HPL panels
Wooden support battens are mounted rigidly. Therefore the adhesive should be able to fully absorb the movements due to contraction and expansion of the panel. In test reports based on BRL 4101 part 7, information is given about the elasticity of the tested adhesive system. As a result of the test, a maximum elastic elongation of the adhesive system is given in millimeters. For the calculation value, a safety factor of 2½ is taken into account.
Paneltack is highly elastic, which allows the adhesive to absorb possible distortions of the panels. When mounting panels such as Trespa Meteon, a maximum occurring (diagonal) deformation of 2.5 mm / m1 must be taken into account. In accordance with BRL 4101 part 7, the maximum elastic deformation the Paneltack system can still absorb in practice should not exceed 4.3 mm, which means that the diagonal length of the panels may not exceed 3440 mm. Panels of 3050 x 1530 mm standard dimensions may therefore be bonded, since the diameter of these panels is 3410 mm.

Remark
Panels should be flat before bonding. Larger panels are more critical than smaller panels and therefore require even greater care in terms of handling and storage. In case of doubt, the applicator should contact the constructor and / or Bostik.

The following is stated in the KOMO ATTESTATION-WITH-PRODUCT CERTIFICATE:

Explanation: The maximum movement of the panel is equal to 40% of the maximum elastic elongation of the adhesive with a thickness of 3 mm.

Taking into account the maximum permissible movement of the façade panel, the diagonal of the cladding panel should comply with:

$$d_{max} \leq 2 \frac{x_{max}}{f_{max}}$$

With:

d_{max}	Maximum diagonal of the wall panel	m
x_{max}	maximum displacement of the wall panel	mm
f_{max}	maximum deformation of the wall panel in the chosen climate range (see wall panel product information)	mm/m[1]

Example of calculation:

Bonding Trespa Meteon with Bostik Paneltack

x_{max} = 4,3 mm Value of adhesive (max deformation of the wall panel in table 1) in KOMO-certificate

f_{max} = 2,5 mm/m
Max. movement of Trespa Meteon which should be taken into account. (Source: KOMO certificate Trespa)

d_{max} this means 2 x (4,3/2,5) = 3,44 m.

Rockpanel – Rijnlands Rehabilitation Centre, Leiden (NL)

5. Certification

EUROPE

General
In the European Construction Products Regulation (CPR), requirements are set for construction products. Requirements with regard to mechanical strength, fire safety, hygiene, health, the environment, safety of use and sustainability. These requirements can be incorporated into so-called harmonized European standards valid in all countries of the EU. CE marking is then mandatory for the relevant construction products.
If there is no harmonized European standard for a construction product, a technical guideline can be drawn up in the form of an EAD (European Assessment Document) that forms the basis for CE marking. This is a voluntary CE marking.

Bonding cladding panels
There are European standards for specific cladding panels such as EN 438 for HPL panels and EN 12467 for fiber cement boards (FCB). However, there is no harmonized European standard for bonding cladding panels, as a result of which CE marking on the basis of such a standard is not possible.

Rockpanel
There is no European standard for exterior cladding panels based on compressed mineral wool (such as Rockpanel). There is, however, an EAD (European Assessment Document) on the basis of which Rockpanel has obtained an European Approval. The Rockpanel panels are therefore CE certified. The relevant EAD (090001-00-040) also includes the fastening methods, including elastic bonding. This means Rockpanel has obtained an European Approval for their panels bonded with Rockpanel Tack-S.
For the time being Rockpanel Tack-S is the only CE marked adhesive system with an European Approval, but only specifically for Rockpanel.

THE NETHERLANDS

KOMO certification

KOMO is a collective quality mark that is used in Dutch construction. The KOMO Foundation manages the quality marks. KOMO certificates are issued by Certification Bodies whom are accredited by the Accreditation Council and have a license agreement with KOMO.

KOMO certificate holders may only apply the KOMO quality mark if their product, process or service meets the quality requirements as laid down in relevant assessment guidelines. These assessment guidelines are drawn up under the supervision of a certifying body by a Board of Experts, whose independence and proportionate stakeholder representation is reviewed by KOMO and the Dutch Accreditation Council.

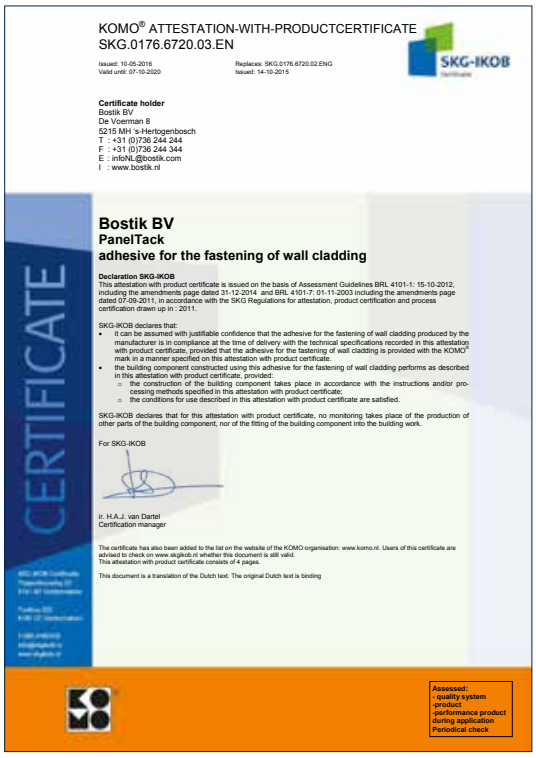
For exterior panel bonding, there is BRL 4101 part 7 on which an attestation-with-product certificate can be obtained.

It concerns a quality declaration from a certifying body regarding:

- Values of product characteristics
- Performance of a product in its application (including the performance of a construction component in which the product is used)
- Application conditions
- Processing instructions

BRL 4101 part 7 is not a solitary guideline but is part of a series of façade cladding guidelines with panels. Part 4, for example, deals with HPL panels and part 9 with fiber cement boards. There is also BRL 4104 for installing by use of adhesive systems on the basis of which application companies can obtain a process certificate.

Bostik has obtained two attestations-with-product certificates, one for Paneltack and one for Paneltack HM. The certifying body is the accredited test institute SKG-IKOB, which ensures an independent assessment of the quality.



KOMO® ATTESTATION-WITH-PRODUCTCERTIFICATE
SKG.0176.6720.03.EN

SKG-IKOB

Issued: 10-05-2016
Valid until: 07-10-2020

Replaces: SKG.0176.6720.02.ENG
Issued: 14-10-2015

Certificate holder
Bostik BV
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5215 MH 's-Hertogenbosch
T : +31 (0)736 244 244
F : +31 (0)736 244 344
E : infoNL@bostik.com
I : www.bostik.nl

CERTIFICATE

Bostik BV
PanelTack
adhesive for the fastening of wall cladding

Declaration SKG-IKOB
This attestation with product certificate is issued on the basis of Assessment Guidelines BRL 4101-1: 15-10-2012, including the amendments page dated 31-12-2014 and BRL 4101-7: 01-11-2003 including the amendments page dated 07-09-2011, in accordance with the SKG Regulations for attestation, product certification and process certification drawn up in : 2011.

SKG-IKOB declares that:

- it can be assumed with justifiable confidence that the adhesive for the fastening of wall cladding produced by the manufacturer is in compliance at the time of delivery with the technical specifications recorded in this attestation with product certificate, provided that the adhesive for the fastening of wall cladding is provided with the KOMO® mark in a manner specified on this attestation with product certificate.
- the building component constructed using this adhesive for the fastening of wall cladding performs as described in this attestation with product certificate, provided:
  - the construction of the building component takes place in accordance with the instructions and/or processing methods specified in this attestation with product certificate;
  - the conditions for use described in this attestation with product certificate are satisfied.

SKG-IKOB declares that for this attestation with product certificate, no monitoring takes place of the production of other parts of the building component, nor of the fitting of the building component into the building work.

For SKG-IKOB

ir. H.A.J. van Dartel
Certification manager

The certificate has also been added to the list on the website of the KOMO organisation: www.komo.nl. Users of this certificate are advised to check on www.skgikob.nl whether this document is still valid.
This attestation with product certificate consists of 4 pages.

This document is a translation of the Dutch text. The original Dutch text is binding

Assessed:
- quality system
-product
-performance product during application
Periodical check

KOMO® ATTESTATION-WITH-PRODUCTCERTIFICATE
SKG.0176.7094.04.EN

SKG-IKOB

Issued: 10-05-2016
Valid until: 14-10-2019

Replaces: SKG.0176.7094.03.ENG
Issued: 07-01-2016

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I : www.bostik.nl

CERTIFICATE

Bostik BV
PanelTack HM
adhesive for the fastening of wall cladding

Declaration SKG-IKOB
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For SKG-IKOB

ir. H.A.J. van Dartel
Certification manager

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This attestation with product certificate consists of 5 pages.

This document is a translation of the Dutch text. The original Dutch text is binding

Assessed:
- quality system
-product
-performance product during application
Periodical check

6. Fire safety

Passive fire safety involves fire reaction and fire resistance.

REACTION TO FIRE

Reaction to fire is the behavior of a constructive product with regard to its influence on the start and extension of a fire. The European classification according to EN 13501-1 distinguishes seven main classifications (A1, A2, B, C, D, E and F) with the following two additions:
- class s for smoke development (s1, s2 and s3 where s1 is the highest subclassification).
- class d for the formation of burning drops and particles (d0, d1 and d2 where d0 is the highest subclassification).

The Netherlands

The requirements in the Dutch Building Decree regarding fire behavior of the façade construction are as follows:
In the case of new construction, the façade must meet a certain fire class. If there is no protected (escape) route along an outer surface, class D applies in accordance with EN-13501-1.
A higher fire class is needed for the part of an outer surface along which an extra protected escape route is located. In addition, fire class B applies to the part of the façade, which is located:
- above 13 m height. Up to 13 m, the fire fighters can work with the usual equipment. Above that, special material is necessary and the material of the building should ensure that a façade fire does not spreads too quickly.
- below 2.5 m to the adjoining site near a building in which a floor intended for persons is situated 5 m or higher above the measurement level. This requirement is made to ensure that a façade does not immediately catch fire in case of arson near a building.

The requirement for material (reaction to fire) behavior does not apply to 5% of the total surface area of the construction components. This allows installation of mailboxes, light fittings and doorbells. For doors, windows, frames and similar construction components, only fire class D applies; not the highest class.

Belgium

In Belgium the requirements for façade cladding are D, s3, d1 for low buildings (below 10 m) and B, s3, d1 for medium and high buildings.

As an illustration, see table below for the European classification.
It is important to note that in order to determine fire classes D to A2 the so-called SBI test according to EN 13823 has to be carried out. The fire reaction is tested in "end use conditions", which means that a complete corner construction is tested, constructed in accordance with practice.
In case of bonding, the panels should be bonded in the right way on the support construction, applying an air cavity behind the panels. In the most critical case, the joints between the panels are left open. Therefore, the fire class obtained is not valid for a single item but for the total construction.
All components in the construction determine the result, such as the panels, the support construction, the installation method and any insulation material used.

European classification 'material behavior in case of fire'	*Contribution to fire*	
	Safety	**Practice**
A1	No contribution	Incombustible
A2	Hardly any contribution	Practically incombustible
B	Very limited contribution	Very hard combustible
C	Big contribution	Combustible
D	High contribution	Well combustible
E	Very high contribution	Very combustible
F	Dangerous contribution	Extremely combustible

However, the most determining factor is the panel. Regarding the support construction; aluminum is non-flammable and is superior to wood in terms of fire safety. Though, aluminum melts at about 650°C. Concerning the insulation material, the choice is usually made for non-flammable material (class A1 or A2), in particular mineral wool (usually Rockwool). Bostik has conducted various fire tests showing that regarding fire safety (fire classification according to EN 13501-1) it hardly matters whether panels are mechanically fixed or bonded with Bostik. With the Bostik adhesive systems, legal requirements can be met.
Trespa Meteon, for example, bonded with Paneltack falls into fire class D or C and Trespa Meteon FR, bonded with Paneltack, even in class B. The same classes as with mechanical fastening. A reassuring thought!

FIRE RESISTANCE

The fire resistance is the ability of a building element to meet the requirements relating to fire stability, flame resistance and thermal insulation for a certain period of time. As far as bonding is concerned, generally no specific requirements are set.

Trespa – Heers (BE)

Project: Ceramic tiles – Jurmala (LVA)

7. The application

Actual processing instructions can be found in the technical data sheets on www.bostik.com. In this chapter assembly of the support construction will not be treated. For this, the architect and / or constructor should be consulted.

STORAGE OF MATERIALS

To ensure the quality of the materials, good storage conditions are necessary. Storage often takes place on the construction site. Special arrangements should be taken in order to obtain the correct storage conditions. The minimum conditions for the various materials that require storage are as follows:

Support battens or profiles and panels; should be stored dry in a well-ventilated area.

Distortions due to large climatic differences and transport damage should be prevented. **Consult the instructions of the panel manufacturer regarding storage and transportation.**
With various types of cladding panels, large fluctuations in the climate (temperature and relative humidity) can lead to warping. Warped cladding panels, which cannot be fixed to the façade without great tension (because they have to be pressed against the tape to get them straight again), are no longer suitable.

Adhesive system; should be stored dry and preferably frost-free.

The adhesive should have a minimum temperature of +5°C prior to application. This prevents the adhesive from being hard to gun due to "thickening" of the adhesive.
Before use, all components of the adhesive system have to be checked on shelf life. Every packaging mentiones a batch number and best before date.

Record batch numbers and shelf-life. Products that have passed the expiry date should not be applied. To avoid exceeding the expiry date, it is best to work according to the "first in, first out" principle. Products longest in stock should be used first.

CLIMATE

On the day you want to start the application, first check the weather forecasts for that day. In the cases mentioned below, bonding cannot take place or measures have to be taken to allow dry application of the adhesive system and bonding of the panels:
- On rainy days or if rain is predicted. If there are provisions for working dry, the application does not have to be interrupted.
- On days with heavy fog or mist.
- On days of temperatures below +5°C, bonding is not allowed.
- On days with heavy wind or storm, bonding is not allowed.

Without Bostik's permission, durable bonding under the above conditions is not guaranteed and is therefore not recommended. If there is no question of rain, frost or strong wind, you must check and record temperature and relative humidity (RH) prior to application. Using the temperature and RH it is possible to calculate the dew point. If the relationship between temperature and RH is such that the temperature of the surface drops below the dew point (see the table on the next page), you have to wait with the application of the adhesive system. When reaching the dew point a water film may be present (dew) on the framework and on the panel, which may adversely affect the adhesion of the primer and / or the adhesive.
The dew point is reached because cold air absorbs less moisture than warm air. Hot, humid air may condensate on cold materials (for example at night) such as the façade panel or an aluminum framework. This dew point changes again as soon as it gets warmer during the day. As a result, it is often possible to bond later in the morning.

Table: Determine dew point

TEMP °C	RELATIVE HUMIDITY %										
	50	55	60	65	70	75	80	85	90	95	100
35	23	25	26	27	29	30	31	32	33	34	35
30	19	20	21	23	24	25	26	27	28	29	30
36	15	16	17	19	20	21	22	23	24	25	26
25	14	15	16	18	19	20	21	22	23	24	25
24	13	14	15	17	18	19	20	21	22	23	24
22	11	12	13	15	16	17	18	19	20	21	22
20	9	11	12	13	14	15	16	17	18	19	20
18	7	9	10	11	12	13	14	15	16	17	18
16	6	7	8	9	10	11	12	13	14	15	16
15	5	6	7	8	9	10	11	12	13	14	15
14	4	5	6	7	8	9	10	11	12	13	14
12	2	3	4	6	7	8	9	10	10	11	12
10	0	1	3	4	5	6	7	7	8	9	10
8	-2	0	1	2	3	4	5	6	6	7	8
6	-3	-2	-1	0	1	2	3	4	4	5	6
4	-5	-3	-2	-2	-1	0	1	1	0	3	4
2	-7	-5	-4	-3	-2	-1	0	0	1	1	2
0	-8	-7	-6	-5	-4	-3	-2	-1	-1	0	0

No dew point, safe to apply
Possible dew point on materials. Please take care
High risk of dew, application not recommended

CONTROL CONSTRUCTION

It the responsibility of the applicator to check whether the construction has been installed in accordance with the minimum requirements regarding ventilation, dimensions, etc. This check has to be performed on the following aspects:

- Composition and structure of the support construction; the construction should be strong enough to support the cladding (see chapter 3).

- Ventilation; the ventilation should be able to prevent moisture accumulation at the back of the cladding panels (see chapter 3).

- Position of the vertical supports; correct positioning the vertical supports, on which the cladding panels have to be bonded. The check should evaluate the centre distance and correct position of the final support profiles. In particular, presence of a joint with correct dimensions between two panels or at an end panel should be checked.

- Flatness of the framework; the area in which the support profiles are mounted should meet the requirement of a maximum deviation of 2 mm with respect to a wire tensioned randomly within the panel dimension. This requirement can be measured by stretching a wire between the two end profiles. If one of the profiles is more than 2 mm outside the line of the wire (including the two final lines), this deviation should be resolved prior to bonding the façade panel.

- Moisture content of wooden support battens; every day application is taking place, the wood moisture content should be determined and recorded prior to application, by means of random sampling from different battens (at least 5). If the wood moisture content of one of these battens exceeds 18%, the following measures have to be taken:

1. The random sampling should be extended to measuring 25 different battens.
2. If only a single batten with a wood moisture content above 18% is involved, it has to be removed and a new batten should be placed or this part of the façade should not be bonded. As soon as the batten(s) have dried back to below 18%, the primer can still be applied on the battens after which bonding can proceed.
3. If the vast majority of the battens have a wood moisture content above 18%, the application will have to wait until the wood moisture content has fallen below 18%.

In addition to checking the construction, a daily check of the panels to be bonded is needed. Curved or warped panels should not be bonded. There is no definition for the degree of warping that is allowed. In general it can be stated that if a panel is pressed against the foam tape of various vertical support profiles during application and the panel, releases itself from the support profiles due to the tension, the warping is in any case too much. In such a case, the panel must be immediately removed from the façade. Furthermore, the deviation of this panel directly serves as a reference for the permitted deviation of all other façade panels to be bonded. Prior to bonding a new panel, the adhesive and tape residues must first be removed (see later in this chapter).
In addition to curved panels, damage to panels is obviously also not allowed. This can be both an aesthetic damage to the front of the panel or damage affecting the durability of the panel, such as large scratches in the back coating.

PREPARATION OF WOODEN BATTENS WITH PRIMER SX BLACK

Wooden support battens should first be pretreated with a primer. The application of this primer should be done according to the following steps:

- If necessary, clean the battens, by removing dust and grease.
- Shake the Primer SX Black tin firmly to ensure that it is well mixed.
- Pour part of the primer into a paint tray suitable for use with a roller.
- Apply the primer using the prescribed roller. Apply sufficiently. However, it is not allowed to apply too much (if there are so-called "drips" in the primed surface, too much has been applied which has to be spread out).
- Allow the primer to dry for at least 1 hour.
- Prevent contamination of the primed surface.
- Never apply a second layer of Primer SX Black to an existing layer of (dried) Primer SX Black. The dried layer has a closed surface on which a new layer does not adhere well.

The minimum drying time of Primer SX Black is 60 minutes. If this drying time is not taken into account, the quality of bonding is endangered because solvents evaporating from the primer can affect the adhesion of the adhesive. Therefore always respect the prescribed minimum drying time.

The drying time mostly depends on temperature and relative humidity of the surroundings. Low temperature and / or low relative humidity results in a longer drying time.
A single primer layer will do.

Primer SX Black is intended for porous wooden surfaces and should not be used on lacquered wood. For lacquered or painted wood, Bostik must be consulted. When bonding on metal supports, the washprimer Prep M or Primer Paneltack has to be applied.

PRE-TREATMENT PANEL

In addition to timber battens, the panels should also be pretreated. Usually this means the panel has to be pretreated with a primer to improve the adhesion. If prescribed by the instructions of the adhesive system, the application of the primer on the panel should be done after sanding and cleaning. The primer can then be applied. These treatments only need to be done at the areas of the panel where the adhesive is to be applied. The exact pretreatment of the panels depends on the type of panel.
For HPL panels, it is usually sufficient to apply Primer Paneltack and sometimes (for example for Trespa Meteon) the ready-to-use Easy Prep Wipes. Primer MSP is prescribed for Rockpanel. For fiber cement boards (EQUITONE Natura, Pictura and Tectura) and natural stone, Primer MSP is usually recommended, but sometimes Primer Q (EQUITONE Tectiva) or only cleaning with, for example, Cleaner 14 (SVK Ornimat).

CONSULT BOSTIK PROCESSING INSTRUCTIONS FOR CORRECT PRETREATMENT OF THE PANELS.

SANDING

Sanding the panel is generally not necessary unless explicitly indicated! After sanding, a dust-free surface must be left behind.

CLEANING

It is necessary to clean and / or prime the back side of the panel before bonding. Cleaning is necessary to remove possible residues (substances) from the surface. Such a residue often originates from the production of the panel or from a foil applied to protect the surface. This substance can negatively affect the bond. By cleaning such a residue is removed from the panel.

The method is as follows:

- If the surface is very dirty, first clean with a dry brush.
- Take a dry lint-free cloth and soak partly in the cleaner to be used.
- Now rub the cloth firmly over the bonding part at the back of the panel. Only the parts where the bonding takes place have to be cleaned, making sure that cleaning is done over the entire height of the panel and in a sufficiently wide spread. When cleaning with a cloth, make sure that the movement of cleaning is such that any dirt is wiped off the surface and is not spread over the surface to be bonded.
- Do not try to clean more surface than can be bonded in one day. This prevents contamination of the cleaned surfaces.
- Let the cleaner dry completely.

The drying time usually is approximately 10 minutes. It is important to let the cleaner dry completely. Contrary to the application of a primer, a surface can be cleaned with a cleaner twice.

WASHPRIMER

For clean panels like HPL and aluminum, it is sufficient to use Primer Paneltack as washprimer. Just wipe off the to be bonded area of the panel with the washprimer. In fact the same operation as the method described above for the cleaner. The drying time usually is around 10 minutes. It is important to let the primer dry completely.

PRETREATMENT OF THE ALUMINUM SUPPORT PROFILES

The same treatment applies to the aluminum support profiles as to the pretreatment of the cladding panels. Pretreatment with Prep M or Primer Paneltack.

PRETREATMENT OF THE PANEL WITH ROLLER OR BRUSH

Sometimes it is necessary to treat the back of the panel with a primer (Primer MSP or Primer Q), which must be applied with a brush or roller. Then the drying time is much longer (usually 1 hour, for Primer Q at least 2 hours) compared to pre-treatment with a wash primer (10 minutes).

APPLICATION OF THE FOAM TAPE

After complete drying of the primer or cleaner, the foam tape can be applied. When applying the foam tape, the following should be taken into account:

- The foam tape should be applied vertically, uninterrupted and over the full length of the panel. The tape has to be cut with a sharp knife.
- After application of the tape, it should be pressed firmly onto the frame. The protective film should not be removed until just before the installation of the panel (i.e. after applying the adhesive to the support construction).

The tape should be placed in such a way that there is sufficient space for the adhesive to be applied later (next to it). In addition, the position and the size of the panel have to be taken into account. Depending on the type of support profile and the use of a joint profile, the foam tape is placed as follows:

- End and intermediate supports:
  A single strip of foam tape along one of the edges. 20 mm must be left over for the adhesive.
- Intermediate (mid-support) at the location of the vertical joint between two panels:
  Two strips of foam tape are placed on the support profiles just slightly behind the panel edge. The tape should be applied on the edge of the panel. This avoids the risk of the adhesive being pushed away from underneath the panel onto the visible side (the joint between the two panels). 20 mm should be kept free for the adhesive to be applied next to the foam tape.

APPLICATION OF THE ADHESIVE

A hand gun is usually used to apply the adhesive. If a lot of panels need to be bonded, an air pressure caulking gun or an electric gun could be preferred. This eases laying a straight and even adhesive bead. The adhesive is always applied to the framework (not on the panel). First, check if the primer on the framework has dried sufficiently. If it is sufficiently dry and the foam tape has been applied, the adhesive can be applied.

Use the provided nozzle with the V-shaped incision. This V-shaped cut prevents air entrapment when installing and pressing the panel.

When applying the adhesive bead, proceed as follows:

- Apply from top to bottom. The adhesive should not be interrupted, otherwise the bonded surface area will become too small and possibly too little adhesive is applied for a good and durable fixation of the cladding panel. Application of the adhesive in dots is of course not permitted.
- The adhesive bead should be applied at approx. 10 mm distance from the foam tape, creating sufficient space for the adhesive to "flow" to all sides when pressing the panel. If the adhesive bead is applied too close to the foam tape, there is a risk that adhesive will run over the tape when the panel is pressed, resulting in unsufficient adhesion of the foam tape. Naturally, the adhesive should not be applied too close to the edge, because the adhesive bead might then partly end up next to the frame.
- After application of the adhesive, the panel should be installed within approx. 10 minutes (open time). If you wait longer, the adhesive bead may already have cured slightly on the outside, resulting in a skin on the adhesive (skin formation). Too much skin formation will cause insufficient final adhesion.

Do not work longer than 10 minutes ahead when applying adhesive. In practice this appears to be the time required to install one cladding panel. Only for small panels it is possible to apply the adhesive for several panels at once.

APPLICATION OF THE CLADDING PANEL

Prior to installing the cladding panel, the panel must be checked on the following:

- Damage.
- Intolerable curving (warping).
- Correct pretreatment of the bonding surface as discussed earlier in this chapter.
- Correspondence of the applied primer layer to the position of the support profile.
- If the surface to be bonded is sufficiently dry.

If these conditions are met, the panel can be applied against the façade. Preferably work from top to bottom.

This is done as follows:

As an installation aid, use a supporting adjustment batten at the bottom side of the panel to be fixed. Attaching this batten is easiest before applying the adhesive. If cladding panels have already been installed under the panel to be installed, use chocks of the correct thickness (= the joint thickness).

- Remove the protective foil from the foam tape.
- Place the panel in the correct position on the adjustment batten or chocks and tilt the panel gently against the adhesive.
- Position the panel exactly in the right place by carefully adjusting the panel. This adjustment is only possible for a few millimeters. Too much adjustment leads to insufficient bonding of the façade panel.
- Now press the panel gently against the foam tape. After this, it is no longer possible to further position the panel. Once the panel has been pressed against the adhesive, the panel cannot be removed from the façade without consequences if the position was incorrect. If the panel has to be removed now, even if the adhesive has not yet cured and the open time of the adhesive has not passed, the adhesive will have to be fully removed and re-applied.

To remove a panel and re-apply, proceed as follows:

- If the adhesive has not yet fully cured, the panel can be pulled loose from the façade. By using a spatula, the adhesive from the frame and the panel can be removed. As soon as the vast majority of the adhesive has been removed, the remains should be removed with a suitable cleaner (like Liquid 1). As soon as the cleaner has completely dried and, if necessary, new foam tape has been applied, it can be bonded again according to the above mentioned procedure.

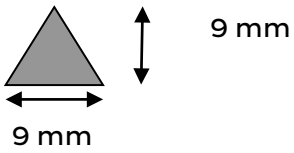
- If the adhesive has fully cured, the façade panel can be removed by cutting the adhesive bead at the back of the panel with a long string of iron wire (piano string). As soon as the panel is removed, the adhesive residues on the back of the panel and on the support battens or profiles should be carefully removed using, for example, a chisel. The final residues can then be carefully removed by light sanding. If a wooden frame has been applied, provided with a primer, the primed surface must be well sanded. The lightly sanded panel surface can be cleaned with a suitable cleaner. After a new layer of primer has been applied to the wooden battens and the primer and cleaner have dried sufficiently, one can bond again according to the described procedure.

CONSUMPTION OF THE ADHESIVE

The exact amount of adhesive used depends on the way in which the adhesive is applied. Moving the sealant gun faster or slower or applying more or less pressure results in a lower or higher consumption of the adhesive. If an adhesive bead is applied as prescribed, the consumption can be calculated as follows:

Consumption in milliliters per linear meter (ml/m):
Consumption = width x ½height
Consumption = 9 mm x (½ x 9 mm) = 40½ ml/m

Triangular adhesive bead:



This means 40½ ml of adhesive is required per linear meter. Based on the cartridge or sausage contents, it can be calculated how many cartridges or sausages are needed theoretically for the total project:

Content of cartridge = 290 ml
Consumption of one cartridge = 290 ml : 40.5 ml/m = 7.1 linear meter

Content of sausage = 600 ml
Consumption of one sausage = 600 ml: 40.5 ml / m = 14.8 linear meter

With one single cartridge, theoretically, approximately 7 meters of bead can be applied to the supporting profiles. With one sausage about 14½ meters.
In practice, consumption is often slightly higher, i.e. 1 cartridge for approximately 6½ m and 1 sausage for approximately 13 meters. Depending on the centre distances between the support profiles (or battens), it is possible to calculate exactly how much adhesive is needed.

SAFETY AND ENVIRONMENT

Before processing always consult the relevant safety data sheets. Up-to-date safety data sheets can be found on the website bostiksds.thewercs.com

If a product is, for example, harmful, light-flammable or environmentally harmful, this will be clearly indicated on the packaging with the hazard symbols and the so-called hazard statements (H-phrases, with the -H of hazard) and precautionary measures (P-phrases, with the P of precaution). This has to be taken into account in the processing. Particularly with respect to primers and cleaners. Bostik Paneltack, Paneltack HM and Rockpanel Tack-S adhesives are solvent and isocyanate free.

Rockpanel – Van den B[illegible]aard, Geldermalsen (NL)

SHORT WORKING PROCEDURE

Below a brief description of the application method to be followed.

1. CHECKING THE MATERIALS:

- Shelf life and storage conditions of the adhesive
- Storage and condition of the panels
- Record data

2. CHECKING THE CLIMATE:

- Weather forecast
- Determination of temperature, relative humidity and dew point
- Record data

3. CHECKING OF THE CONSTRUCTION:

- Solidity construction
- Sufficient ventilation present
- Position of support construction
- Flatness of support battens or profiles
- Wood moisture content
- Record data

4. APPLYING THE (WOOD) PRIMER:

- Clean and degrease surface
- Shake the canister well
- Apply primer with paint roller (or brush)
- Pretreat material for only one day
- Allow the primer to dry for at least 1 hour

5. CLEANING WITH CLEANER OF WASHPRIMER:

- Clean the bonding area with a lint-free cloth or tissue
- Cleaning material for a maximum of one day
- Allow the cleaner or wash primer to dry completely (at least 10 min.)

6. APPLY A TEMPORARILY SUPPORTING BATTEN

7. APPLYING THE FOAMTAPE:

- Check if the primer is dry
- Vertically continuously apply foam tape
- Do not remove the protective foil
- Position the foam tape on support batten or profile depending on details

8. APPLYING THE ADHESIVE:

- Apply adhesive from top to bottom, uninterrupted
- Adhesive bead approx. 10 mm next to the foam tape
- Open time of the adhesive maximum 10 minutes

9. INSTALLING THE CLADDING PANEL:

- Check panels again for defects
- Check whether cleaner / wash primer is dry
- Remove protective foil from foam tape
- Place the panel carefully on a temporarily supporting batten
- "Tilt" and position panel carefully
- Press the panel by gently rubbing on the foam tape

8. Panel materials

There is a variety of materials available on the market for façade cladding. The properties of these panels may vary considerably, which have to be taken into consideration when bonding. In this chapter different types of panel materials will be briefly discussed.

HPL-PANELS

Structure

HPL is the abbreviation for High Pressure Laminate. It is a panel based on thermosetting resins reinforced in the core with wood fibers or cellulose layers. The top layer is provided with a decorative layer included in the thermosetting resin layer. This top layer consists of a colored cellulose layer or color provided (pigmented) resin. Possibly an extra protective coating is provided on the panels during production (for example, a coating against discoloration by UV light).

Production

The impregnated fibers and / or cellulose layers are compressed with the top layers under high pressure at high temperature. In order to protect the front side of the panels during transportation and processing, the sheets are often covered with a foil. In a single case, the back of the panel is also provided with a foil. This foil serves to protect the panel surface and prevents warping.

Properties

HPL plates are durable panels with good chemical resistance. The panels can swell under the influence of moisture. This should be taken into account when using these panels. The maximum contraction and swell is type-dependent and is mainly determined by the build-up of the panels. Usually 2½ mm per meter is taken into account as the maximum expansion. Tooling HPL panels can be done with ordinary woodworking machines with tungsten carbide or diamond cutting tools. When cutting the panels, the front side should face upwards. The edges of the panels do not have to be treated with an additional protective coating.

Storage

The panels should be stored dry, frost-free and protected from direct sunlight (for example by using a cover plate). The panels should preferably be stacked horizontally in a straight line, supported under the entire surface. If the sheets cannot be stored horizontally, vertical storage at an angle of 60° to 70° is also possible. Again, full support of the panels is necessary. The panels should be clear of the ground, for example placed on battens in such a way that the bottom side is ventilated.

Bonding

There might be a residue on the sheet surface (agent to release the sheets from each other or from the press). Residues of a protective film may be present too. To prevent such a residue from having a negative influence on the adhesion, it is advised to clean all HPL panels with a cleaner or wash primer. Some HPL panels are provided with a special UV protection top layer on which good adhesion cannot be obtained without the use of the wash primer. Once the HPL panels are applied to the façade, the foil should be removed as soon as possible to prevent uneven stresses in the panel, due to moisture and temperature.

Trade names

Sometimes people use popular names like "compact panels", “compact boards” or "Volkern" sheets. In the Benelux the most important brands are Trespa Meteon, Max Exterior, Plastica Massief, Resoplan and Abet.

HPL – Station, Gliwice (PL)

FIBRE CEMENT BOARDS

Structure

FCB is the abbreviation for Fiber Cement Board. A flat panel made of a homogeneous mixture of cement and fibers that provide reinforcement. The top layers on the visible side are often treated with a 2-component layer that can be applied in various colors.

Production

The fiber cement products were invented at the end of the 19th century by the Austrian Ludwig Hatschek, who mixed 90% cement with 10% asbestos fibers with water in a special machine. Since approximately 1970, asbestos fibers are no longer used. From a homogeneous mixture of cement, water and fibers, thin films are spread on a roller by means of a sieve until the desired sheet thickness is achieved. Then the mixture is pressed under the roller into a compact panel. After the panel has dried in different chambers, the non-visible side of the sheet can be provided with a soaking layer (coating) and the visible side of 2 soil layers. After the primer layers have dried (and the panel has been cut to size), the panel is provided with a colored 2-component layer (and sometimes the edges are finished in the same color).

Properties

Fiber cement bonded panels are durable, which are only slightly affected by moisture. Usually the minimum thickness of the panel is 8mm. Sawing should preferably be done with diamond cutting tools with the direction of rotation of the saw from the visible side to the rear. If necessary, sawing edges can be sanded with emery paper No. 220.

Storage

The panels must be stored dry and well ventilated. The storage takes place horizontally on a pallet with the visible sides facing each other (panels alternating) with a protective foam in between. The maximum stack height is 1 meter. The transportation of individual sheets must be done vertically.

Bonding

The back of the panels (adhesive side) must be cleaned thoroughly. First of all, dust on the surface should be removed with a brush. The further pretreatment depends on the type of panel (brand name, see below), sometimes only cleaning is sufficient but usually it is necessary to apply a primer (primer MSP or Primer Q) with a roller. It is very important that the specified minimum drying time of the primer is taken into account! Occasionally it is advised to treat the edges of the panels (in particular the panels which are provided with a water-based coating on the back) to prevent water penetration, but in practice this is usually not done.

Trade names

Sometimes the name "Eternit" is used as a generic name for these boards, a name (derived from Eternity) conceived by Ludwig Hatschek. This name was widely used by various fiber cement board producers in their company name. This caused international confusion because various "Eternit" companies were started which had nothing to do with each other, other than that they produced according to the Hatscheck method.

The Eternit company in the Benelux is Eternit Kapelle-opden-Bos in Belgium, part of the ETEX (Equitone) group.

Cembrit
EQUITONE (Linea, Materia, Natura, Pictura, Tectura, Tectiva)
FibreCem Swisspearl
SVK (Ornimat, Decoboard, PuroPlus)

EQUITONE Tectiva – De Trip, Utrecht (NL)

PRESSED MINERAL WOOL

Structure

These panels consist of mineral wool flakes pressed under high pressure with a small amount of thermosetting synthetic resin and additives, cured under high pressure and temperature. The panels are provided with a colored coating on the front side.

Production

The backside of the boards are sanded to obtain the correct thickness, when the stone fiber package (glass fiber) is also sanded away as much as possible. Subsequently the back of the board is provided with a thin layer of fabric binder.

Properties

The panels are easy to saw, even on the construction site. They are lightweight and can easily be nailed or screwed. Movement of the boards due to the influence of temperature and humidity is low.

Storage

During transport and storage, maximum of 2 pallets may be stacked with a maximum of 25 panels per pallet for 8mm thick panels and 30 panels for 6mm thick panels. The pallets should be sufficiently solid to prevent deformation of the package. The panels have to be transported and stored dry. Store pallet on a flat surface.

Bonding

Rejection criteria are the mechanical and physical properties of the panels. This means that there is no guarantee that the 'carrier' (the glass fiber) has been completely removed. If the back is well sanded and the fabric binder is well applied, adhesive systems will generally adhere well. If these conditions are not met, then an adhesive system will badly attach; the dust layer will allow the ability to pull off the adhesive bead. This means that an adhesive system should be aligned to this product characteristic. Therefore, special primer Primer MSP is to be applied.

Trade names

Rockwool Rockpanel, producer Rockwool Rockpanel BV in the Netherlands.

Rockpanel – Woondrôme, Wijchen (NL)

ACM: ALUMINUM COMPOSITE

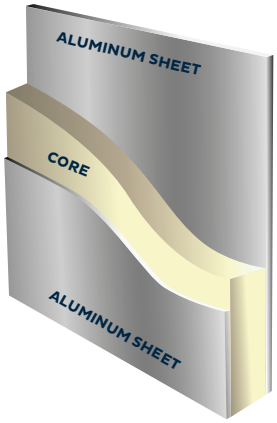
Structure

The internationally used abbreviation ACM reflects aluminum composite material. ACP is also commonly used for aluminum composite panel.

Aluminum sandwich panels are constructed from two thin single aluminum cladding plates (0.5 mm thick) and a core (thickness 2 to 5 mm). Available in blanc, enamelled or anodised versions. The sandwich panels are produced in thicknesses of 3-4 and 6 mm.

Different core materials can be used, in particular:

- Polyethylene (PE); fire class D
- Aluminum hydroxide with polymer; fire class B
- Aluminum-magnesium hydroxide with polymer binder, fire class A2



Production

The single panels are formed into sandwich panels on a continuous installation. The core is extruded. The panels are also delivered double-sided mill finished or natural anodized. The cladding panels are coated on one side with PVDF coating in many colors and often have a sheet thickness of 4 mm, w x h 1.250 x 3.200 mm. The aluminum backside sheet can be untreated.

Properties

The panels are very lightweight. The panels are resistant to weather influences, industrial air pollution and atmospheric influences on the coast, depending on the chosen surface treatment. Aluminum can expand or contract under the influence of temperature. This must be taken into account when using the panel. At a temperature change of 100 °C the change in size is 2.4 mm per meter. The panels can be processed by cutting, sawing, punching, rolling, setting, drilling and milling with the usual tools.

Storage

Protect pallets against precipitation, humidity and condensation. Store pallets in stacks. Do not store sandwich panels vertically. Do not store longer than 6 months.

Bonding

Aluminum in itself is not difficult to bond. However, it is necessary to clean as a pretreatment or to apply a wash primer. Some boards require only cleaning (Cleaner I), where others necessarily need to be treated with a wash primer (Prep M).

Trade names

Alucobond, producer 3a Composites Singen GmbH in Germany. Other trade names: Alubond, Alucobest, Etalbond, Reynobond.

Etalbond – Sanoforum, Brunssum (NL)

CERAMIC PANELS (TILES)

Structure

Ceramics are formed by sintering or fusing from powder to an extremely hard and smooth material. The word ceramics is derived from the Greek word keramos, which means drinking vessel or pottery vessel. Traditionally, ceramics are based on clay or silicates. However, there are many different types of ceramics made from other types of clay, additives or other processes. Ceramic tiles are often used as wall and floor tiles in various rooms including bathrooms.

Properties

For outdoor applications, the tiles have to be frost-resistant. The lower the water-absorbing capacity, the better the frost resistance. Tiles with limited water absorption are known under the names ultragres and porcellanato. Porcellanato tiles are unglazed and very compact tiles that are pressed under very high pressure using porcelain earth. Because of the very small grain size and low porosity, they are also insensitive to dirt without glazing. They are durable and require little maintenance. Regarding façade panels, two types can be distinguished;

1. Normal (thicker) ceramic wall panels

Available in various sizes but often 600x600mm or 1200x600mm. The thickness is usually approximately 13 mm. Often a sort of diamond shaped profile can be noticed on the back and sometimes a whitish powder. This is a so-called engobe layer, which is used during production to prevent the plates from sticking to each other.

Bonding

The surface should be well brushed in stripes of 10-15 cm wide, where the adhesive (Paneltack HM) is to be applied in order to remove the engobe. Then rinse with a soft brush or clean cloth. Primer MSP is usually used. Because of the weight we advise to bond on aluminum as support profiles and use small supporting L-shaped profiles.

2. Thin ceramic slabs of 3 x 1 m

A recent development is the very thin ceramic slabs with very large dimensions. They are only 3 or 5 mm thick which makes them very lightweight. This makes them somewhat fragile. Therefore they are often reinforced at the rear with a fiberglass mat (attached with a special adhesive). The maximum dimension is 1000x3000mm.

Bonding

Because the slabs are so light and do not work much, they are well applicable for bonding. Though it is important to check the bond of the fiberglass mat on the backside and whether the adhesive used is "embedded" in this fiberglass mat.

Trade names

Grespania Coverlam, Laminam, Mosa, Levantina Techlam, Porcelanosa, Thesize Neolith.

Neolith – Sopot (PL)

NATURAL STONE

Structure

Natural stone is extracted from quarries in various countries including Belgium, Germany, France, Brazil, Africa, China and India. A number of natural stone types are flagstone, marble, granite, limestone, travertine, slate and quartzite.

Properties

The properties of various types of natural stone differ. Think of hardness, porosity, split ability and weather resistance. Natural stone can be processed in various ways. Often the front side of the panels are polished, making it smooth and shiny, but the backside is not.

Natural stone composite

Composites are composed of various materials such as granite, marble or quartz which is pressed together with synthetic resin. Therefore it is also available in many different colors. Composite has a closed surface.

Bonding

Bonding with Paneltack HM after the right pretreatment.

Natural stone – Benetti, Maastricht (NL)

WOOD, MULTIPLEX AND MDF

Plywood is a sheet material, made up of more than three layers of wood veneer of large dimensions bonded together in opposite wood grain direction. This creates a stable board of wood with large dimensions. MDF, Medium-Density Fibreboard, is pressed board with medium density. The wood fibers are dried and connected by resins.

Properties

Untreated wood is sensitive to moisture and should therefore be well protected against it. That means that those boards around (front, back and edges) have to be finished. In principle, wood is combustible.

Medite Tricoya

Medite Tricoya is a different story; a very durable MDF board that is even suited for outdoor applications without treatment. The fibers used are acetylated. During this process, the structure of the wood changes, so that it hardly reacts to contact with water. The material does not crack or split and has very high dimensional stability in all directions.

Bonding

Bonding with Paneltack HM after the proper pre-treatment (which depends on the applied coating on the back).

Project: Medite Tricoya – KunstVeld, Lent (NL)

GLASS FIBRE REINFORCED CONCRETE (GFRC)

Structure

The concrete is reinforced with glass fibres before pouring into the mold. The fracture strength of the concrete is greatly increased by the fibers and large panels can be made that are still relatively thin (from 20 mm).

Properties

Durable. Non-combustible. Virtually maintenance-free.

Bonding

Bonded with Paneltack HM after pretreatment with Primer MSP, in the same way as with natural stone. Often it is advised to first sand and clean the back. Because of the weight it is recommended to bond on aluminum and apply a small support profile.

Trade names

FibreC, Dinamic CCC.

FibreC – Leenderbos, Hoofddorp (NL)

POLYESTER

Structure

Polymer composite with a core of crushed natural stone, reinforced by a layer of glass fiber.

Properties

Solid, flexible and lightweight cladding panel. The panel is easy to keep clean and has a long life span.

Bonding

Can be bonded with Paneltack after thorough cleaning.

Trade names

SteniColour.

Steni – Minervaplein, Rotterdam (NL)

ENAMELLED GLASS

Structure

Enamelled glass is float glass to which a layer of enamel (in fact also a glass layer but of a different composition) has been added. This enamel is burnt into the glass surface by a thermal treatment. By applying it at high temperature, the enamel achieves exceptional mechanical hardness and high resistance to extreme weather conditions and air pollution. Is often used for parapets in façades.

Properties

Durable, colorfast, chemical resistant and require little maintenance. Glass is fragile.

Bonding

Can be bonded with Paneltack HM. In addition, any UV load on the adhesive layer must be prevented. When bonding, make sure that the adhesive does not shine through. Optionally, Prep G can be used for pre-treatment. In places where people and animals can be injured by glass breakage, the heat-soak test must be applied in accordance with EN-14179. It is usually advised to apply aluminum as support structure and use and a small L-shaped support profile.

Trade names

Delogcolor van Pilkington, SGG Emalit Evolution van Saint-Gobain Glass, Kristalcolor van Steinfort.

Enamelled glass – Brabant Water, Eindhoven (NL)

ACRYL (SOLID SURFACE)

Structure

Solid Surface is a collective name for a group of sustainable surface materials that consist of acrylic bonded and polyester bound natural minerals and pigments. Solid surface was first introduced by DuPont in 1967 under the brand name Corian. Since the expiration of their patent there are also other producers with a similar product on the market. It is often used for countertops, baths, etc.

Properties

These panels tend to expand and contract due to temperature differences so that an movement of approx. 2 mm / m has to be taken into account.

Bonding

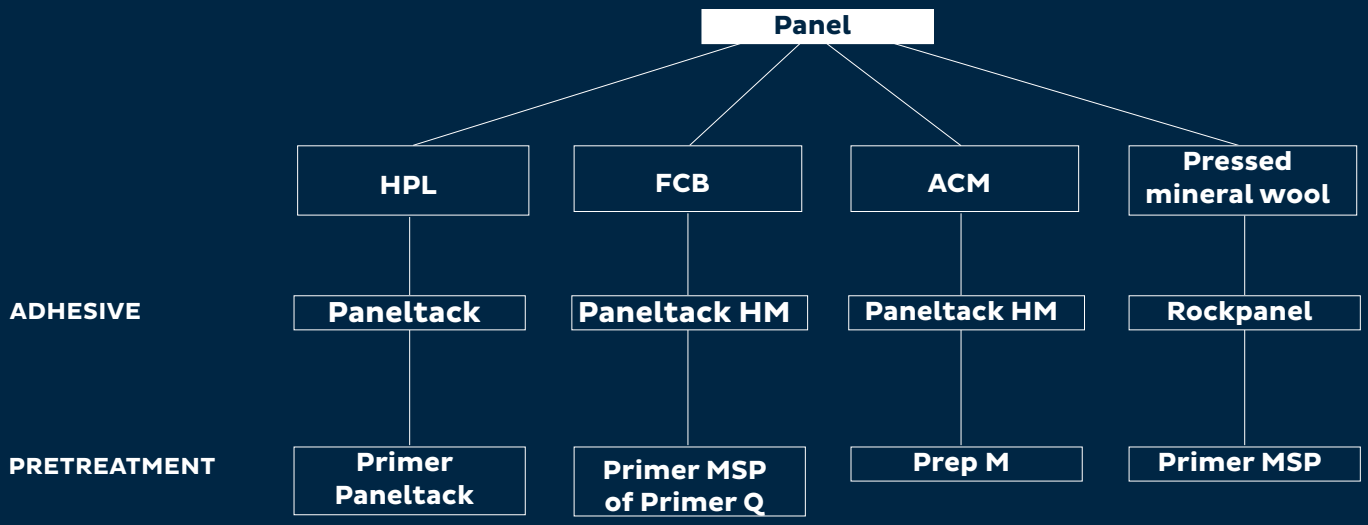
Can be bonded with Paneltack after cleaning the panels with Cleaner 14. It is recommended to support the panels with a small support profile.

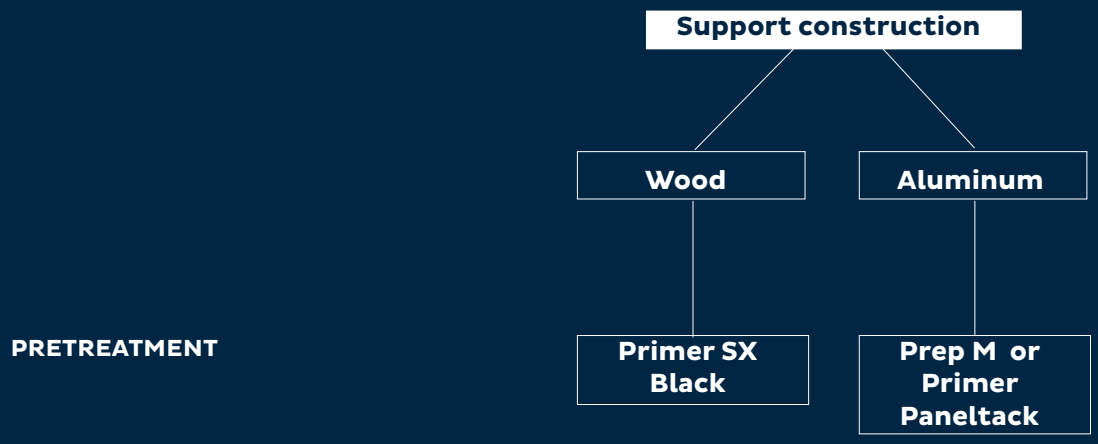
Trade names

Corian, Krion.

SURVEY WEIGHTS CLADDING PANELS

Cladding panel			Weight kg/m³	Thickness mm	Weight kg/m²
ACM	Aluminum, Composite, Material	Pe-core		3	4,5
		Pe-core		4	5,5
		class B of A2		6	7,3
		class B of A2		3	5,9
		class B of A2		4	7,6
Aluminum			2755	2	6
Acryl	Solid Surface	Corian	1700	12	21,5
FCB	Fibre Cement Board	Fiber Cement	1800	8	14
GFRC	Glass Fibre Reinforced	Cement fibreC	2300	13	30
Pressed mineral wool		Rockpanel	1050	8	8,4
Enamelled glass			2500	6	15
HPL	High Pressure Laminates		1400	8	11
				10	14
				12	17
Plywood		Okoume	500	12	6
		Mahonie	700	12	8
Ceramics	Standard		2300	13	30
Ceramics	Thin, reinforced with fibreglass			3	8,2
				5,6	14
Natural stone			2800	15	42
			3000	20	60
			2800	25	70
			2800	30	84
Polyester		Steni Colour	1940	6	12


Panel
HPL
FCB
ACM
Pressed mineral wool
ADHESIVE
Paneltack
Paneltack HM
Paneltack HM
Rockpanel
PRETREATMENT
Primer Paneltack
Primer MSP of Primer Q
Prep M
Primer MSP


Support construction
Wood
Aluminum
PRETREATMENT
Primer SX Black
Prep M or Primer Paneltack

9. Adhesive index

Cladding panel	Supplier/producer	Bonding systen			Pretreatment cladding panel								
		Paneltack	Paneltack HM	Rockpanel Tack-S	Sanding	Primer Paneltack	Easy prep wipes	Primer MSP	Primer Q	Prep M	Cleaner 14	Cleaner I	Prep G+
Abet MEG	Abet Laminati	X				X							
Alucobest	Shanghai Huayuan New Composite Materials		X							X			
Alucobond	3A Composites		X							X			
Alucopal	Plastica		X							X			
Arpa BG	Arpa Industriale	X				X							
Cembrit Patina	Cembrit		X		X				X			X	
Coverlam 5,6 mm	Grespania		X					X					
Corian	DuPont	X									X		
Equitone Natura	Eternit		X					X					
Equitone Pictura	Eternit		X					X					
Equitone Linea	Eternit		X						X				
Equitone Tectiva	Eternit		X						X				
Etalbond	Elval Colour		X							X			
Eternit Cedral Board	Eternit		X					X					
fibreC	CFS (Rieder)		X		X			X					
Flex-Color	Hillegersbergsche Gevelproducten		X									X	
Geëmailleerd glas algemeen			X										X
G-ext Exterior grade	Gentaş Laminat	X				X							
ISIcompact	RET Bouwproducten	X				X							
Kalesinterflex FIT	Kalebodur	X										X	
Krion	Butech Building Technology S.A.	X					X						
Kristalcolor	Steinfort Glas		X									X	
Kronoplan Color	Kronospan HPL	X				X							
Laminam 3+ en 5+	Laminam		X									X	
Max Exterior	Fundermax	X				X	(X)*						
Natural stone general			X					X					
SVK Ornimat	SVK		X				X				(X)*		
SVK Decomat	SVK		X				X				(X)*		
SVK PuroPlus	SVK		X					X					
Petrach	CFS (Omnis Exteriors)		X									X	
Planbond	MAAS Profile GmbH		X							X			
Plastica Massief NT	Plastica (Fundermax)	X				X	(X)*						
Reynobond	Alcoa		X							X			
Resoplan	Resopal	X				X							
Rockpanel	Rockpanel			X				X					
Staron Solid Sheet	Cheil Industries		X							X			
Supra-HPL	Hillegersbergsche Gevelproducten	X				X							
Techlam 3+ en 5+	Leventina		X									X	
Trespa Meteon	Trespa International	X				X	(X)*						
Steni Colour	Steni AS	X					(X)*				X		
UniKern	BuildingSuits B.V. B.V.	X					X						
Unipanel	Heering Kunststoffen	X					X						

* (x) as alternative

Pretreatment support construction	Bonding system				
	SX Black	Prep M	Liquid 1	Prep-G Plus	Primer Paneltack
Wood max. 18% moisture	X				
Aluminium		X		(X)*	(X)*
Stainless steel		X			
Rockpanelstrip			X		

* (x) as alternative

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