



Elastic Adhesives for Wood Floors

Principles for Elastic Bonding

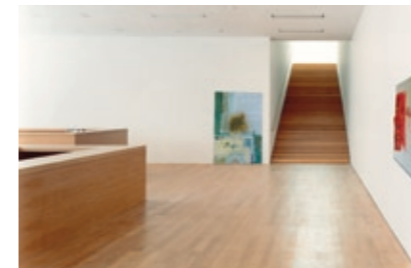


The Proven Elastic Bonding Technology to help Wood Floors look good Permanently



The installation of wood floors started with mechanical fixings (boards nailed or stapled down) or by bedding in and bonding with bituminous compounds. Later came rigid wood adhesives and additionally many wood floors and laminates are also installed with no fixings to the subfloor, as so-called 'floating systems'. All of these installation methods have significant disadvantages, for example the creaking of mechanically fixed floors, the 'trampoline effect' with high noise reflection from floating floors, plus the damage caused by stress transfer to the sub floors bonded with rigid adhesives.

The optimum method and the most professional way of installing wood floors, is now accepted to be with elastic adhesives. Sika created this concept of elastic wood floor bonding in the early 1990's and it had its origins in the marine ship building industry. Teak boarded decks are used and preferred on many types of yachts, leisure cruisers and ocean liners, these are bonded and caulked with Sika Marine elastic adhesive systems, which has now been done successfully for more than fifteen years.



Elastic Bonding:

Advantages of Sika Elastic Wood Floor Bonding Adhesives

- **Sound Dampening**
 - Dampening of impact and airborne sound
 - Improved walking comfort
- **Even Stress Distribution**
 - Minimized perimeter joints
 - Larger surface areas without joints
 - Installation is possible in difficult areas (e. g. wet rooms)
 - Secure and durable adhesive bonding
- **Additional Advantage of Sika Elastic Wood Floor Bonding Adhesives**
 - Adhesives bond to a very wide range of woods and substrates
 - Also suitable for difficult wood species as teak, maple, beech and bamboo
 - Primer-less application system
 - Fast curing
 - EC-1-classified products



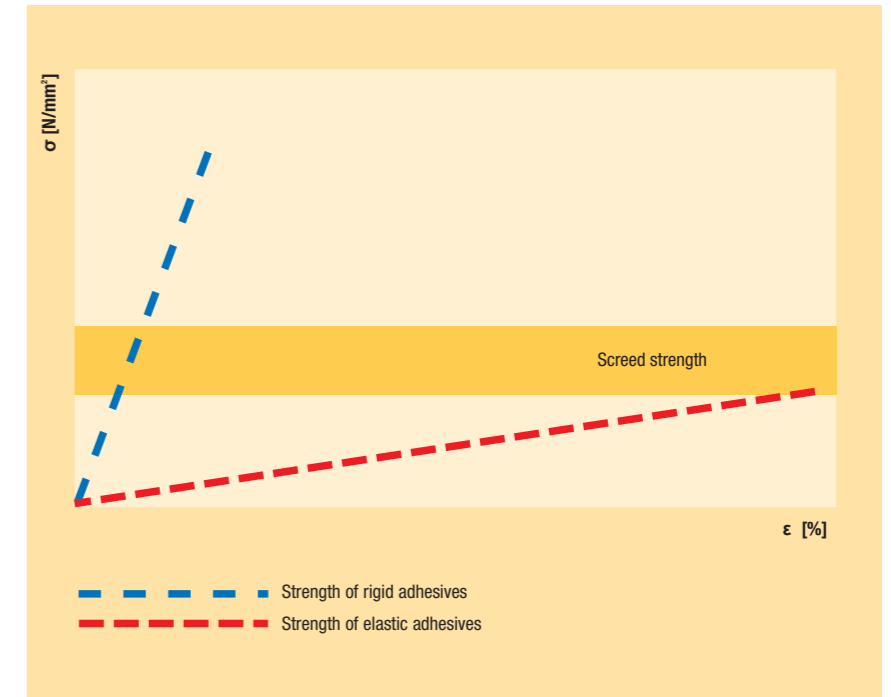
The Technical Advantages of Elastic Bonding



Comparative Strengths of the Wood, the Adhesive and of the Subfloor

When the wood floor is fixed or rigidly bonded to the subfloor, any shear forces are transmitted directly into the subfloor. Before 2006 the relevant standards for wood floor bonding adhesives required high shear strength. The adhesive was therefore the strongest part of the system with the wood floor and the subfloor. Where the wood floor expanded it transferred these expansive forces directly into the subfloor and as the weakest part of the system, the subfloor suffered damage.

Sika was the first manufacturer to introduce elastic wood floor bonding adhesives with a lower shear strength than the subfloor. Then in 2006 EN 14293 came into effect – which first recognised the advantages and use of elastic adhesives. So Sika actually changed the whole industry thinking about wood flooring.



Distribution of Stress Forces

An important difference between rigid and elastic adhesives is how the stress or force from the shrinking and swelling of the wood floor boards are transferred into the subfloor. The forces generated are transmitted from the wood floor via the adhesive into the subfloor. The transfer of these forces between bonded wood pieces can be seen as an example and then represented graphically as follows:

As you can see, with a rigid adhesive the forces are transmitted unevenly and concentrated at the edges. There is a clear stress peak in this area. However with the elastic adhesive, the forces are evenly distributed without stress concentrations, over the entire surface.

When the stress peaks exceed the strength of the subfloor (remember the rigid adhesive

is of higher shear strength), the subfloor will fail or fracture cohesively at the edges of the boards. Since the forces can only be transmitted over a limited and concentrated area at the edges, the forces will then move towards the middle and cause cohesive fracture in the substrate again. This will repeat until the board is totally loose and no longer able to transmit any forces into the subfloor. The wood floor will be debonded. It also makes no difference if the surface area is larger the only effect is that the two stress peaks are moved further apart but the result is the same.

With elastic bonded wood floors the way the forces are transmitted is different. Because the adhesive is elastic, the forces want to shift the board. But before the board can move the forces are transmitted over a much larger surface area and the larger this area becomes, the more force that can safely be transferred. Therefore there will never be stress peaks – as the forces are transmitted more evenly over the entire surface. As a result, by utilising the whole surface area, elastic adhesives do not damage the subfloor.

Sound Dampening Properties

As the cured adhesive remains a highly elastic and resilient material which does not become hard and stiff as rigid adhesives do – it is therefore able to absorb a substantial amount of the vibrations caused by walking and foot fall impact on the floor. As a result the impact noise and the ambient reflected noise are both improved.

An additional positive advantage from the resilient and dampening properties of elastic bonded wood floors, is the improved 'comfort' that is reported, especially from people who have to stand or walk around for long periods of time in the same area.

Stress Distribution with Wood Floors

As wood is a natural organic material, it changes its dimensions in accordance with changes in the relative humidity levels of moisture in the air. With increasing humidity wood starts to swell and with decreasing humidity it starts to shrink. Historically wooden wedges were used to split rocks due to this particular characteristic. The dry wedges were set into a drilled hole and then watered. The expansion of the wood is so strong, that it is able to split large areas of rock into two pieces. So you can easily understand the high forces that can be produced in this way.

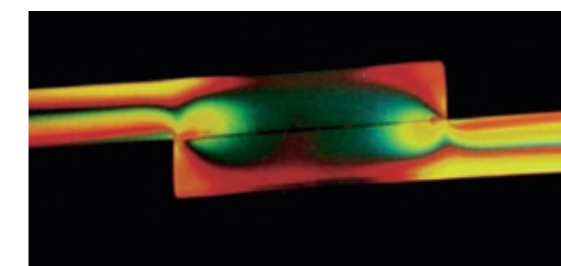


Photo-elastic model analysis of a rigid bond

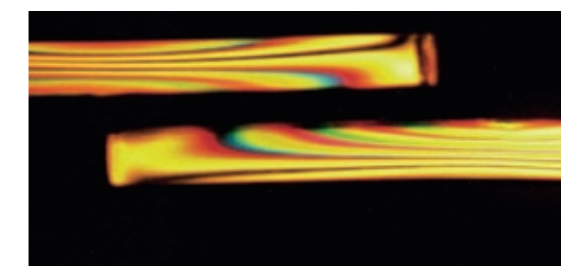
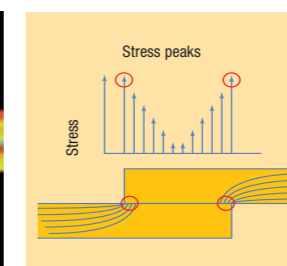
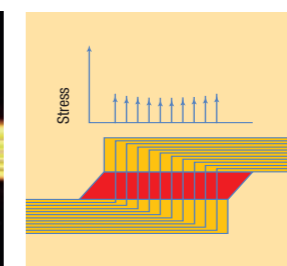


Photo-elastic model analysis of an elastic bond

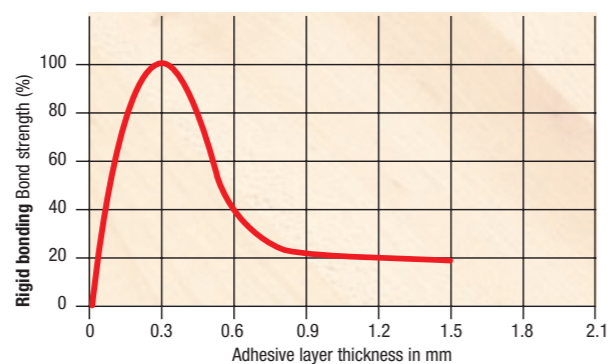
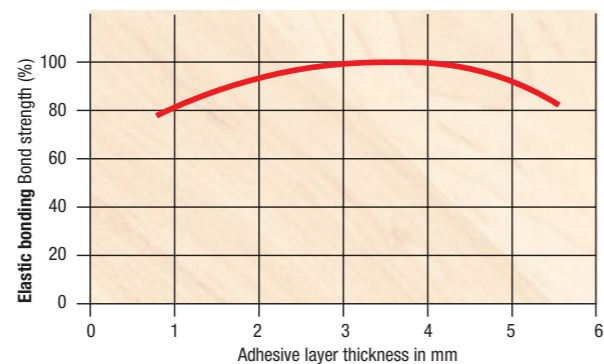


Practical Examples



Influence of the Adhesive Layer Thickness

SikaBond® elastic adhesives have almost the same adhesive strength when used for layer thicknesses between 1 mm and 5 mm (see below) and the degree of substrate tolerance is therefore somewhat irrelevant with these systems (regarding the adhesive strength). The bond strength of a rigid adhesive however is strongly dependent on its layer thickness, even small variations within less than 1 mm, can lead to a significant loss of strength.



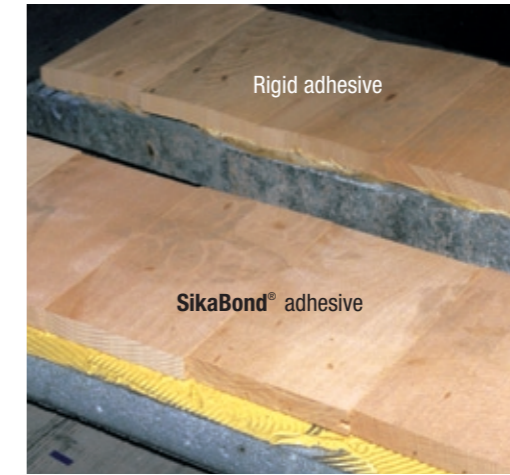
Influence of adhesive layer thickness on bond strength



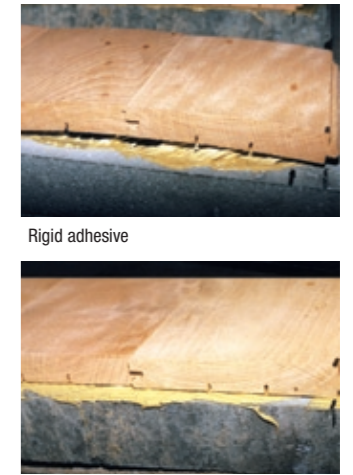
Expansion of Wood Floors with Increasing Humidity/Moisture Content:

The pictures on your right show results from real floor testing, supporting and emphasizing the theoretical findings above. Solid beech* wood boards have been bonded with a rigid adhesive and with an elastic **SikaBond®** adhesive onto a 2 m long concrete slab. The wood was restrained at one end; therefore any swelling behaviour was only possible in one direction. After adequate curing time the systems were exposed to increasing moisture levels in order to observe the swelling behaviour.

* Solid beech is very active wood regarding expansion and contraction.



Testing under extreme conditions: 21 mm thick massive beech board, 22 % wood moisture content



SikaBond elastic adhesive

Test results: The boards bonded with rigid adhesive expanded by a total of 25 mm, bowed considerably and showed signs of debonding. A cement screed of normal strength would therefore have already suffered damage. However, the elastic bonded wood floor only experienced a total of 1.5 mm expansion and remained totally intact! (If the same test was to be carried out with a floating wood floor, then the total expansion would have been approx. 80 mm.)

Gap Formation and Recovery of the Adhesive:

A second test also demonstrated the advantages of evenly distributed stress. Beech wood was bonded onto a concrete slab with a rigid adhesive and with an elastic **SikaBond®** adhesive. After adequate curing, the test specimens were exposed to cycles of changing conditions, simulating dry and wet seasons (summer and winter).



SikaBond adhesive after alternating climate cycle

Test result: After 6 change cycles equivalent to 6 years, the elastic bonded wood, only had small gaps of approx. 1 mm between the boards. However the rigid adhesive bonded boards had gaps of up to 4 mm. This clearly demonstrates the performance advantages of the elastic adhesive, due to the uniform stress distribution and the very high elastic recovery rate, only very limited deformation could take place and the adhesives elastic re-recovery or 'memory', was able to allow the wood to return to its original size and position. This is also why the teak deck on ships are successfully bonded with elastic **SikaBond®** adhesives.



Resin-based adhesive after alternating climate cycle

Summary of the Advantages of Elastic Bonding with SikaBond® Adhesives



Primer-less Bonding:

(no primer is necessary)

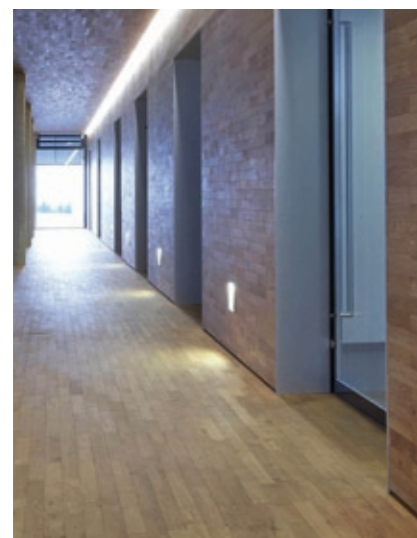
Excellent adhesion range (bonds to many different wood species and floor substrates). Good adhesion even on difficult wood species, such as teak.

In renovation projects: new wood floors can be bonded onto old, existing tiles and other surfaces.



Excellent Workability of the Products:

Easy to apply and spread / distribute with stable holding rigdes, stable for beaded application with the Sika® AcouBond System.



Elastic Bonding has the Following Inherent Advantages:

Sound and Acoustics:

Reduced impact and ambient reflected sound: The permanently elastic adhesive can absorb vibration and provide more comfortable acoustics.

Walking and Standing Comfort:

Through the elastic resilience and dampening effects the walking and standing 'comfort' is enhanced.

Uniform Stress Distribution:

Less movement joints are required and less perimeter gaps occur. Solid wood boards, even high moving wood species such as beech can all be bonded successfully.

Less gap formation between boards due to the elasticity, even stress distribution and high elastic recovery (memory) of the adhesive.



Secure and Durable Bonding:

Can also be used in difficult areas such as saunas and health spas, around pool decks and other extreme moisture exposed environments - remember Sika elastic wood floor bonding has its origin in marine industry with deck bonding and caulking.



Sika Wood Floor Bonding Systems at a Glance



The Sika® Full Surface Bonding System

Wood floors installed with Sika full surface bonding adhesives are guaranteed a secure solution. The origin of these elastic adhesives comes from the marine industry where exterior teak decks on ships have been successfully bonded for many years. The adhesives can withstand water immersion and bond to a wide range of substrates. Many tropical wood species can be bonded without pretreatment and bonding new wood floors directly over old existing tiles is possible. Sika wood floor adhesives can be applied by hand or with the fast, efficient and ergonomic **SikaBond® Dispensers**.



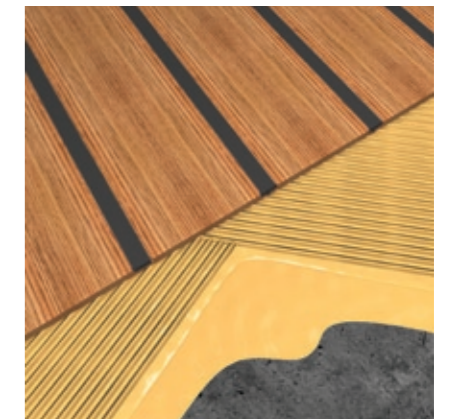
The Sika® Cordon System

The beaded Sika Cordon system is a particularly economic system using beads of the elastic adhesives applied in a 'cordon' arrangement, to bond selected wood floor types and where ambient and impact sound reduction or under floor heating efficiency are not important.



The Sika® AcouBond System

The **Sika® AcouBond System** is used when improved acoustic behaviour is demanded. The system consists of a special mat, combined with a highly elastic adhesive. The system is a hybrid between full surface bonding and a floating installation – utilising the best acoustic characteristics of both. The wood floor boards are bonded to the subfloor which prevents the "trampoline-effect" of floating installations and the mat is an excellent sound absorber, that reduces impact and airborne sound.

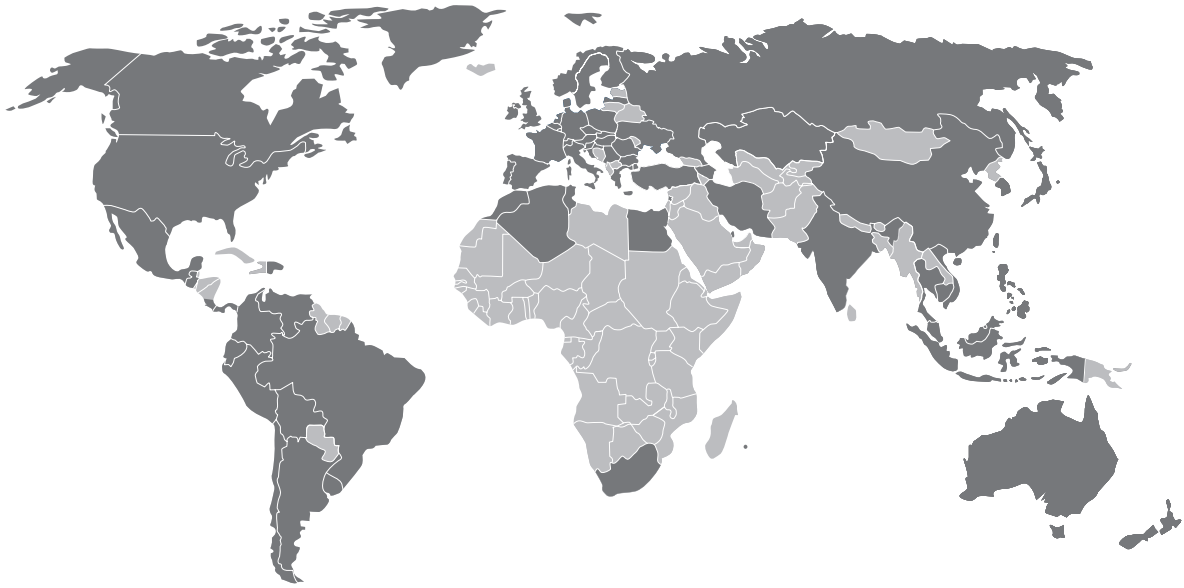


The Sika® Caulking System

The Sika Caulking system also has its origin in the marine industry where it has also been used successfully for many years to seal the gaps or 'joints' between the wooden deck planks. This system gives the floor a very exclusive and unique look. The Sika Caulking system is therefore an excellent design choice for wet rooms and facilities in health clubs and spas etc.

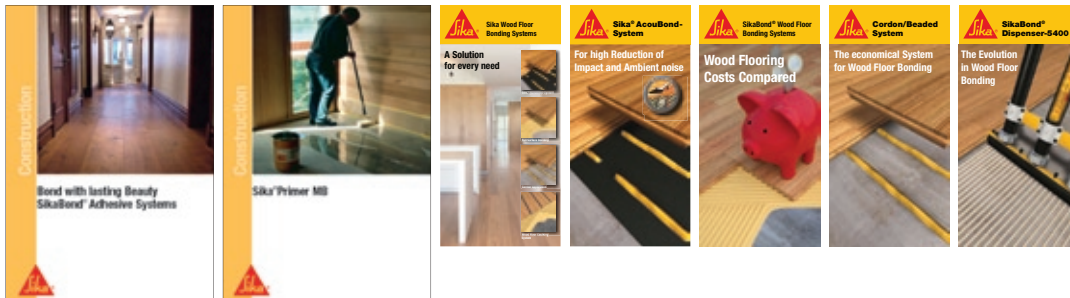
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Sika is a globally active company in the speciality and construction chemicals business. It has subsidiary manufacturing, sales and technical support facilities in over 70 countries around the world. Sika is the global market and technology leader in waterproofing, sealing, bonding, dampening, strengthening and the protection of buildings and civil engineering structures. Sika has approx. 12'000 employees worldwide and is therefore ideally positioned to support the success of its customers.

Also available from Sika



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