4

Sealing and Bonding

4.1 Deck Coverings

4.1.1 General description

Deck coverings are of functional and esthetical importance. Since maritime conditions are harsh, the ship has to be produced not only with the best products but also in accordance with a professional workmanship.

This manual will help to produce durable bonding and sealing solutions. For project related informations we recommend to consult the corresponding national Technical Service.

Teak deck history

Teak has been used for hundreds of years as a durable deck material.

The hard wood is very durable. Natural antimicrobial and insecticide substances cause an excellent natural anti-rot and weathering resistance.

Alternatives for teak such as iroko, padouk etc. are used in some cases but needs an intensive protection work to assure a long time function. Usually they are used in workboats as thick protective floors.

Regardless of the type of wood used, all require sealants to protect the deck from water penetration that can cause severe damage. This can take the form of unsightly marks along the hull, rotting the woodwork and corroding metal components. Watertight seals are therefore absolutely essential. Also, in addition to adding structural strength to the sub-deck, a wooden deck contributes to the insulation in hot and cool climates alike.

Teak, however, is not a uniform material. Oil, fat, talc and resin-content, as well as porosity and colouration, differ depending on the source and age of the wood.

The following pages detail the correct procedures for the planning, laying, preparing and caulking of teak decks with Sika's Totally Glued Teak Decking System.

Strict adherence to the guidelines will result in a watertight timber deck that can be enjoyed for years to come and that will resist the harsh conditions of the maritime environment.

4.1.2 Types of teak deck

The Teak planks vary in dimension. Thickness range from 4 to 50 mm. The later have been used for luxury vessel decking's with mechanical fixation. Up to now the 22 mm planks applied with the Sikaflex® bonding technology result in the same durability at a more economic price.

The joint for caulking is realised in two ways:

1. Symetric or asymetric joints

Advantages:

- Simple manufacturing process

Disadvantages:

- Limited joint depth for restoration or refurbishment grindings
- Higher risk of water penetration between planks and the deck (detachment due to wood swelling)

Important:

A bond breaker tape on the bottom of the joint to prevent 3-side adhesion is not necessary.

2. Deep joint method

Advantages:

- High grinding (removal) reserve
- Cost saving by using thinner wood planks
- Better adsorption of wood expansion

Disadvantages:

- More complicated working procedure for curved planks

Important:

We generally recommend to use the deep joint method whenever possible.

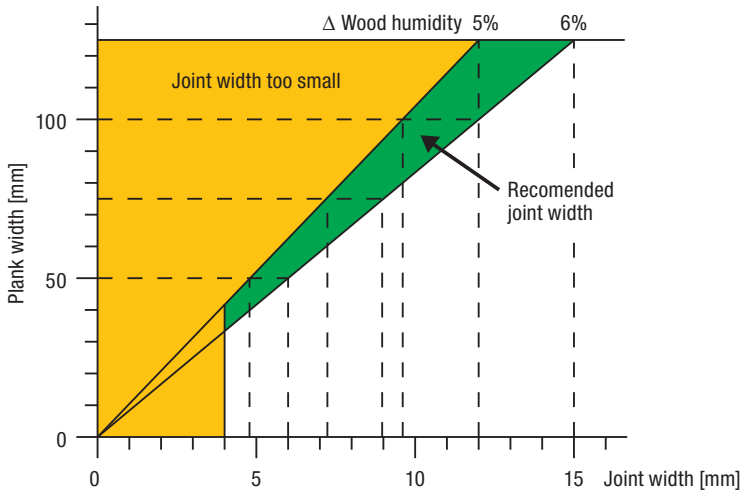
4.1.3 Joint dimensioning

The joint width depends on the width of the plank, the humidity of the wood when manufactured and the expected humidity in use of the ship.

Important:

The change of wood humidity is under normal conditions (wood humidity max. 12 %) in the range of 5 % to 6 %.

General recomandation for joint width (teak)



Parameter: wood shrinkage: 0.2% / % wood humidity (teak)

The humidity of the wood can be measured or estimated from the following graph:

air humidity	Wood humidity (% by weight)						
90 %	21.1	21.0	21.0	20.8	20.0	19.8	19.3
85 %	18.1	18.0	18.0	17.9	17.5	17.1	16.9
80 %	16.2	16.0	16.0	15.8	15.5	15.1	14.9
75 %	14.7	14.5	14.3	14.0	13.9	13.5	13.2
70 %	13.2	13.1	13.0	12.8	12.4	12.1	11.8
65 %	12.0	12.0	11.8	11.5	11.2	11.0	10.7
60 %	11.0	10.9	10.8	10.5	10.3	10.0	9.7
55 %	10.1	10.0	9.9	9.7	9.4	9.1	8.8
50 %	9.4	9.2	9.0	8.9	8.6	8.4	8.0
45 %	8.6	8.4	8.3	8.1	7.9	7.5	7.1
40 %	7.8	7.7	7.3	7.3	7.0	6.6	6.3
35 %	7.0	6.9	6.7	6.4	6.2	5.8	5.5
30 %	6.2	6.1	5.9	5.6	5.3	5.0	4.7
25 %	5.4	5.3	5.0	4.8	4.5	4.2	3.8
Tempera-ture	10 °	15 °	20 °	25 °	30 °	35 °	40 °
Quelle: R. Kaylwert und Angaben des U.S. Forest Products Laboratory, Madison 1951							

Calculation example:

Plank width: 50mm
Production condition: wood humidity measured: 7 %
Expected climatic conditions in use: 30 °C / 70 % r.h
Corresponding wood humidity (see table): 12.4 %
Maximal change in wood humidity: 12.4 % – 7 % = 5.4 %
Maximal plank movement (teak) 5.4 % x 0.2 % / % wood humidity change x 50 mm = 0.54 mm
Practical excepted joint movement: 10 % of the joint width
Calculated joint width: 0.54 mm x 10 = 5.4 mm (practical 6 mm)

Important:

The minimal joint width is in any case 4 mm. Adjacent joints to walls and profiles should be doubled in size.

Preconditions of teak bonding

The teak quality is essential for an optimal result in respect of functionality and optical aspect.

Standing year rings as well as the absence of alternating spiral growth are essential to assure a uniform plank deformation under the different climates. Laying year rings may in addition lead to a danger of foot injuries due to scale of wood formation.

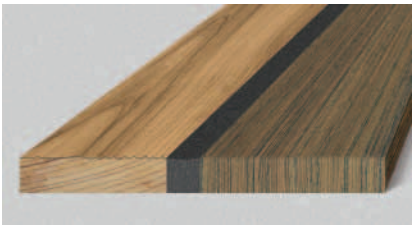


Fig. 1 Left side: laying year rings are not recommended. Right side: standing year rings are best.

4.1.4 Procedure of levelling, bonding and caulking of teak decks

General working conditions

The preferred working conditions for applying sealant to decking are as follows:

- Outside temperature 5 °C to 35 °C and maximal 75 % relative humidity
- Avoid increasing temperature during the first day
- Avoid exposure to direct sunlight and rain
- Prevent exposure to the elements for a minimum of 8 hours after the last step of the process
- Ensure adequate ventilation if necessary
- Avoid dirt, dust, oil, fat, grease, water during all processes as these can cause adhesion failure

Surface preparation and primer application

Timber decks are usually applied on top of a sub deck of steel, aluminium, polyester GRP or wood. Aluminium and steel decks may be deformed by the welding process and require a levelling process whereas wooden and polyester GRP decks are normally even by nature.

Fig. 2 Typical welds and weld splatter of a steel deck

Aluminium or steel decks

	Steel: *the surface must be grinded or sand-blasted to remove rust, loose particles, flaked paint, contaminants, etc. When complete, remove all dust with a vacuum cleaner* ***Aluminium:*** *This surface should be slightly sweep-blasted or sanded*
205	*Treat the surface with Sika® Aktivator-205 using a clean, lint free rag or a paper towel. Change the rag frequently*
	Flash off: 10 minutes (min) to 2 hours (max)
	Take care to avoid dust, dirt or other contaminates until the next step has been carried out
ZP	*■ Check the air humidity and temperature and apply the product only if the surface temperature is higher than indicated in table on page 6 (Minimal substrate temperature to avoid water condensation). Respect the lower temperature limit.* *■ Surface and air temperature has to be between 10 °C and 35 °C.* *■ Mix the two parts of SikaCor® ZP Primer for 3 minutes, using an electric paddle mixer. Scrape the sides and the bottom of the container and mix for another 30 seconds. Do not split pre-packed cans. Use full kits only.* *■ Always monitor the pot life (1 hour at 30 °C, 3 hours at 10 °C).* *■ Apply SikaCor® ZP Primer with a short hair roller. SikaCor® ZP Primer consumption, approx 200g/m².*
	Drying time before next application: *10 °C: 5 to 14 hours* *20 °C: 3 to 14 hours* *30 °C: 2 to 14 hours*

Protect the area until SikaCor® ZP Primer has hardened.

If the area is contaminated, vacuum clean again and then treat thoroughly using Sika® Aktivator-205.

If drying time exceeds the maximum 3 days flash of time, abrade the surface with a rotating sanding machine using P36 grit and vacuum clean thoroughly. Then reapply the SikaCor® ZP Primer.

Glass fibre reinforced plastic decks

208	*Heavily soiled surfaces should be cleaned off first with a pure solvent (Sika® Remover-208) to remove the worst of the soiling*
	Lightly abrade the contact area with a sanding pad
	Remove the dust with a vacuum cleaner
205	*Treat the substrate with Sika® Aktivator -205, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash off time: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin coat of Sika® MultiPrimer Marine using a clean brush, a foam pad or a felt applicator*
	Flash off time: 30 minutes (min) to 24 hours (max)

Fig. 3 Applying SikaCor® ZP Primer with a roller

Deck levelling

Steel and aluminium decks are usually deformed by the welding process. They need to be levelled before applications of the teak panels. Levelling is carried out using Sika Transfloor®-352 SL or SikaTransfloor®-352 ST. SikaTransfloor®-352 SL should be used on even decks SikaTransfloor®-352 ST is more thixotropic and can be used for decks with a sheer of 3 degrees.

SikaTransfloor®-352 SL and SikaTransfloor®-352 ST show excellent adhesion to the SikaCor® ZP Primer. It represents a lightweight two-component polyurethane based system that cures to a smooth and efficient sound damping layer.

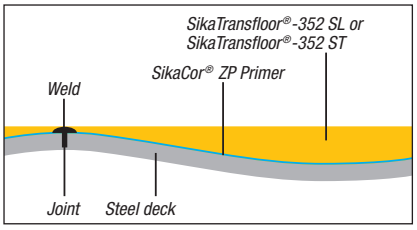


Fig. 4 Cross-sectional detail of deck showing levelling of high spots (weld) and uneven surface

Important:

Condensation or water droplets on the levelled deck will cause adhesion failure; always monitor the dew point.

Application temperature

The temperature (substrate / product / air) should be between 10 °C to 35 °C

In case of unfavourable climatic conditions, humidity in the air may condensate on a colder surface. Therefore the substrate temperature has to be controlled and should be equal or higher than indicated in the following graph (see page 7).

The deck levelling process

352 SL or ST

Stir component A and add component B of SikaTransfloor®-352 SL or SikaTransfloor ®-352 ST.

Mechanically mix for three minutes at a medium speed. Avoid air entrapment.

Fig. 5 Mixing SikaTransfloor®-352

Immediately transfer the entire contents of the SikaTransfloor®-352 mixture to another container, scraping the sides and bottom. Mix the new container for another minute before transferring the mixture onto the deck. Never scrape the remaining contents out of a pail onto the deck as this may not be completely mixed. Instead transfer any remnants to the next pail in the process and mix in with a new quantity. Repeat this as many times as required

Fig. 6 Transferring the SikaTransfloor®-352 to another container

Pour the SikaTransfloor®-352 mixture onto the area to be applied. Always observe the working time restrictions: 45 minutes at 10 °C, 35 minutes at 20 °C and 25 minutes at 30 °C

Fig. 7 Pouring the SikaTransfloor®-352 to the floor

Spread the mixed SikaTransfloor®-352 onto the deck using a bar or straight edge at a thickness just exceeding the highest elevation point of the steel or aluminium deck. Do not apply at a thickness over 30 mm. If this should be necessary, the operation must be carried out in several consecutive processes with intermediate sanding of the cured SikaTransfloor®-352 surface followed by vacuum cleaning. Working conditions: 10 °C to 35 °C and 80 % r.h. max.

Fig. 8 Spreading the SikaTransfloor®-352

Drying time: The SikaTransfloor®-352 coating can be walked over after 24 hours and is ready for the next stage in the process

Deck bonding and bedding

Application on levelled surface with Sika Transfloor®-352 SL or SikaTransfloor®-352 ST.

Proceed with sanding the surface of cured SikaTransfloor®-352 prior to application of the bonding/bedding compound Sikaflex®-298. In the time between the curing of the levelling compound and applying the bedding compound, the surface of the SikaTransfloor®-352 must be kept free of soiling from footprints, dirt, dust, grease, fat, oil and other contaminants. The sanding process should be carried out using appropriate belt-sanding equipment with an 80 grit paper and followed by a thorough vacuum cleaning.

Application on other substrates

If levelling with SikaTransfloor®-352 is not required, planks should be offered up and their positions should be marked. When all have been marked, the planks should be removed ready for the primer.

SMM	*For all woods: Apply a thin continuous coat of Sika® MultiPrimer Marine using a roller or spray equipment*
	Flash off times: 30 min to 24 hours

Ideally the surface as well as the joint is primed if the planks are embedded and the sealing of the joint is executed in a short time period.

Fig. 9 Applying Sika® MultiPrimer Marine to a teak deck with a roller (hidden side)

Application temperature	10 °C (50 °F)	20 °C (68 °F)	30 °C (86 °F)
Pot life SikaCore® ZP Primer	3 h	2 h	1 h
Waiting time before application of SikaTransfloor®-352 ST or SL	5 h – 14 h	3 h – 14 h	2 h – 14 h
Working time SikaTransfloor®-352 ST and -352 SL	45 min approx.	35 min approx.	25 min approx.
Waiting time before installation of timber decking with Sikaflex®-298	up to 14 days	up to 14 days	up to 14 days

Working/waiting/drying time for SikaCore® ZP Primer, SikaTransfloor®-352

Minimal substrate temperature to avoid water condensation on the surface[1]							
	Air humidity	< 50 %	50 %	60 %	70 %	80 %	90 %
air temperature	5 °C	0	0	0	3	5	7
	10 °C	3	3	6	8	10	11
	15 °C	8	8	10	13	15	16
	20 °C	12	12	15	17	19	21
	25 °C	17	17	20	22	24	26
	30 °C	21	21	24	27	29	31

[1] calculated by the dew point plus 3 °C security

☐ white = not allowed condition

■ yellow = allowed condition

Example air temperature 10 °C/relative humidity 60 % result: minimal surface temperature: 6 °C : conclusion: not allowed working conditions (minimal 10 °C).

Application of Sikaflex®-298 and embedding of the planks

Sikaflex®-298 is a low viscous, exceptionally strong flexible one-component adhesive which is applied with a 4 mm comb trowel. The consumption should be around 1.2 liters (2x 600 ml sausages) per m². The quantity has to be adjusted according to the surface texture. In any case the planks have to be embedded totally without any air pockets between substrate and planks.

Fig. 10 Carefully applying Sika ® MultiPrimer Marine

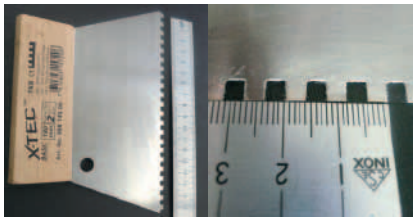


Fig. 11 Hand application picture comb trowel and comb trowel detail

Important:

Only cover an area that will allow adequate time for a manageable quantity of deck planking to be placed before a skin forms on the adhesive (see Product Datasheet).

Hold the planks in place by mechanical means such as weights/sandbags or by vacuum pressing.

The fixation may be released after 24 hours. If a shorter waiting time is needed or in case of low temperature / humidity we recommend spraying sparingly a mist of water over the surface just before placing the planks. The needed water quantity is only about 1 gram water per square meter of Sikaflex®-298.

In such a case the fixation time is reduced to some hours.

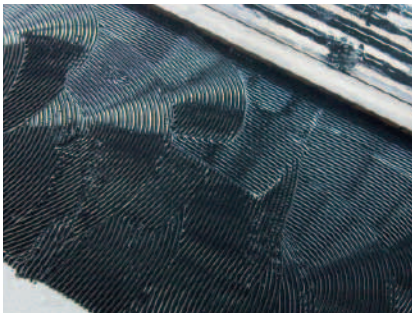


Fig. 12 Sikaflex®-298 applied with a comb spreader

Fig. 14 A teak floor being laid, showing the bedding compound and the weights to hold it in place

Fig. 13 Putting down the decking

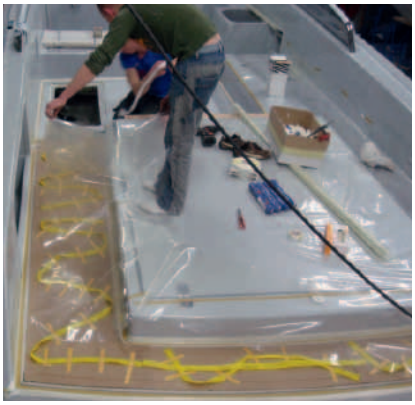


Fig. 15 Vacuum press

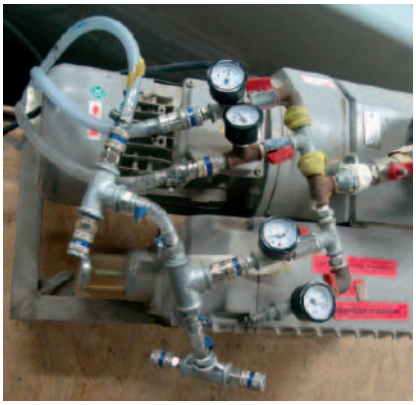


Fig. 16 Vacuum equipment

Deck caulking with Sikaflex®-290i DC

As soon as the teak planks are fixed, the caulking may be done.

Priming the substrate seams

Priming of the planks is an absolutely vital step in the process of caulking with Sikaflex®-290i DC.

If the planks are not already primed, this operation has to be done using a brush in a smaller size than the joint width

In order to achieve long-term adhesion of Sikaflex®-290i DC to the sides of the joints, meticulous preparation of the seams is required. Remove all dirt with a vacuum cleaner.

SMM

Apply a thin coat of Sika® MultiPrimer Marine to the edges of the joint seams. It can be applied by brush or spray in one coating operation. Application temperature: 10 °C to 35 °C

Drying time:
10 °C to 35 °C: 30 min to 24 hours

Important:

If the caulking process is followed not later than one day after the bedding, priming can be done simultaneous for both working steps (plank priming including seams). Take care to avoid soiling of the teak before caulking has be done

Application of Sikaflex®-290i DC deck caulking compound

Before any work commences, ensure that the temperature of the wood does not exceed 35 °C

In addition, the ambient temperature during application should be constant or falling and ideally within the range of 5 °C and 35 °C

290i DC

Apply Sikaflex®-290i DC ensuring that air is prevented from entering the seam by placing the tip of the nozzle against the bottom of the joint and keeping the gun at an angle of about 60°. If narrow joints need to be caulked a specially designed nozzle may be required Use a handgun, a piston- driven airgun or a battery operated gun. Continue to apply along the seam so that the joint appears to slightly overfill behind the nozzle, but maintain a constant motion

After applying Sikaflex®-290i DC but before skinning occurs, compress the excess material onto the surface of the deck using a slightly flexible spatula at an angle of 60 °. This produces a convex appearance of the joint and fills the seam completely (see Fig. 19)

Protect the joints from rain and direct sunlight prior, during and after caulking, for a period of at least eight hours. Do not use excess material from the spatula to prevent bubbles in the joint

Sikaflex®-290i DC is ready for sanding following the conditions outlined on the bar chart in Fig. 17

Relative air humidity	Air Temperature (°C)		
	10 °C	20 °C	30 °C
25 %	5.5 days	4.5 days	3.5 days
50 %	4 days	3.5 days	3 days
75 %	4 days	3 days	2 days

Fig. 17 Safe span time

Fig. 18 Applying Sikaflex®-290i DC

Fig. 19 Compressing Sikaflex®-290i DC with a spatula

Deck sanding

For efficient sanding results, use an industrial sander. It is recommended to begin with a medium paper at about 80 grit, progressing up to 120 grit. Suitable sanders are belt sanders, flat plate, or elastically suspended sanders. Sanding should be carried out in line with the seems. The waiting time between application of Sikaflex®-290i DC and sanding is indicated in Fig 17.

Finishing

It is **not** recommended that a finish such as a varnish be applied to the exterior teak deck as these can contain solvents or plasticizers which can adversely affect the cured Sikaflex®-290i DC or the drying of the lacquer. Varnishes do not often exhibit the flexible characteristics of a caulk, and so the finish may also show cracks, which could render the deck unsightly.

See also chapter 4.1.6: Maintenance of teak decks

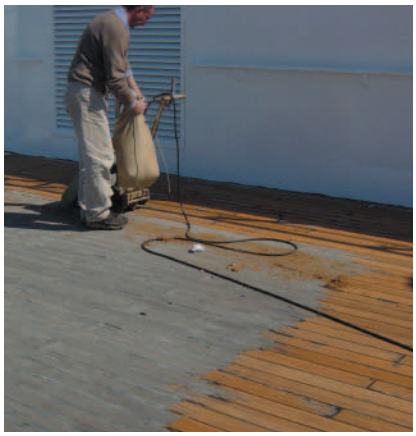


Fig. 20 Sanding the deck

4.1.5 Prefabricated teak decks

Many shipyards appreciate the use of prefabricated teak decks because they can be manufactured off-site, rather than on board where the process can block other activities. Prefabricated panels are efficient in their versatility to be produced in various shapes, quickly or on demand; as soon as the panel manufacturer has obtained the dimensions of the boat deck production can be started, thus saving substantially on labour costs. The prefabricated panels are also very easy to handle and to bond to the deck.

Types of prefabricated teak decks

In modern boat-building wooden decorative decks are often constructed in the form of prefabricated panels bonded or bedded onto the sub deck. This method is often favoured for time and cost savings.

These kinds of panels are either made to measure (custom made) from a template fitting the prescribed deck section, or are cut out of unidirectional panels. Prefabricated teak deck panelling comes either with or without a backing.

Backings may be

- Marine plywood in different thickness
- HPL (flat laminate)
- Fiberglass lamination with epoxy resins

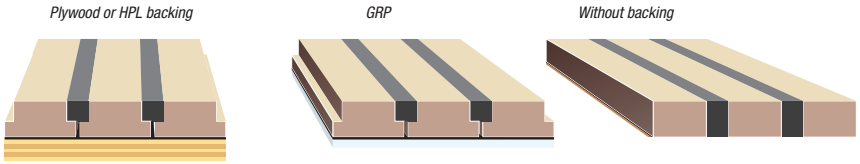


Fig. 21 Typical prefabricated teak deck profiles

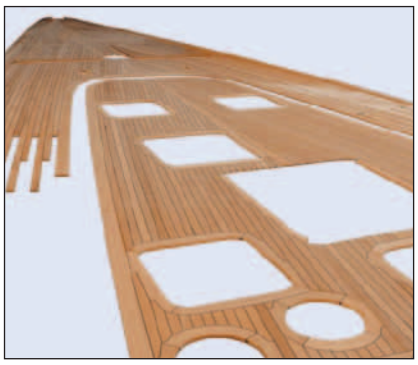


Fig. 22 Customised teak decking made to measure

Fig. 23 A prefabricated teak deck is laid out in preparation for fitting

Fig. 24 Deep joint prefabricated teak decking and the strength and flexibility inherent in the adhesive

Bonding of the prefabricated elements

To bond or bed the prefabricated panels, use one-component polyurethane adhesives such as Sikaflex®-298 or Sikaflex®-291i in case of intensive vacuum pressing.

The adhesive has to act as an additional layer in between the sub deck and the panel in order to waterproof the overall surface of the deck. As a prefabricated feature deck does not have to be drilled for screws and bolts there is no puncturing of the layer and therefore no risk of water leakage which could damage the sub-deck.

Substrate preparation

Fibreglass backings

208	*Heavily soiled surfaces should first be cleaned off with a pure solvent (Sika® Remover-208) to remove the worst of the soiling*
	Lightly abrade the contact area with an abrasive pad very fine
	Remove the dust with a vacuum cleaner
SMM	*Treat the substrate with Sika® MultiPrimer Marine, using a clean brush or roller*
	Waiting time until deck bonding: 30 minutes (min) to 24 hours (max)

Timber or plywood backings

	Abrade the contact area on the deck with a sanding pad (80/100 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a roller applicator*
	Drying times: Sika® MultiPrimer Marine 30 min to 24 hours

Timber deck with HPL-backing

	Abrade the contact area on the deck with a sanding pad (60-80 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a roller*
	Waiting time until deck bonding for Sika® MultiPrimer Marine 30 min to 24 hours

Timber deck without backing

	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a roller*
	Waiting time until deck bonding for Sika® MultiPrimer Marine 30 min to 24 hours

Two-component coating on metals

	Ensure that the treated metal deck is compatible with Sikaflex®-291i or Sikaflex®-298. Test the paint with a solvent like acetone or a commercial available silicon remover or paint thinner. If the paint can be removed, sandblast off the paint down to the metallic surface and use SikaCor® ZP Primer
Aktivator	*Treat the substrate with Sika® Aktivator, using a clean lint free rag or paper towel. Change the rag frequently!*
	Waiting time until deck bonding: 10 minutes (min) to 2 hours (max)

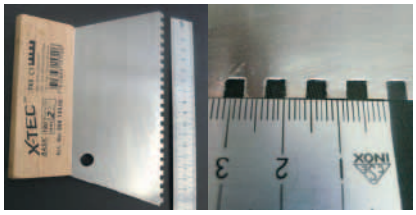
Aluminium or steel decks

	***Steel:** the surface must be ground or sand-blasted to remove rust, loose particles, flaked paint, contaminants, etc. When complete, remove all dust with a vacuum cleaner* ***Aluminium:** This surface should be slightly sweep-blasted*
	Thoroughly vacuum clean the surface
	Treat the surface with Sika® Aktivator-205 with a lint free paper towel
	Flash-off: 10 minutes (min) to 2 hours (max)
	Avoid dust or other contamination until the next step has been carried out
ZP	*Apply a continuous coating to the surface of SikaCor® ZP Primer within 2 hours of the Sika® Cleaner-205 treatment. Use a clean brush or a roller at a consumption of approx. 200 gm/m² or 80 µm thickness.*
	Waiting time until deck bonding: 10 °C minimal 5 to 14 hours 20 °C minimal 3 to 14 hours 30 °C minimal 1 to 14 hours

Application and positioning of the prefabricated deck elements

Sikaflex®-298 is a low viscosity, exceptionally strong flexible one-component adhesive which is applied with a 4-5 mm comb trowel. The consumption should be around 1.2 litres (2x 600 ml sausages) per m². The quantity has to be adjusted according to the surface texture. In any case the planks have to be embedded totally without any air pockets between substrate and planks.

Remove the air after the element was laid down with a steel roller. Start in the middle of the deck towards the edge of the element.



Bonding process

298	*Apply the adhesive to the previously prepared surface and spread it using a spreader with 4 mm triangular notches. The bed thickness may vary depending on the thickness of any gap that needs to be filled*
	If HPL or GRP-laminates have to be bonded, spray a light mist of water on the Sikaflex® prior to positioning the panels (about 1 g/m²). *If one of the bonded partners is wood, the application of a water mist is not necessary but sometimes useful to accelerate the cure at lower temperature* *The deck panel must be positioned accurately and pressed firmly into place* *Use a roller to eliminate air pockets*
208	*Uncured Sika adhesives or sealants should be removed with Sika® Remover-208 on non porous substrates. On porous substrates let harden the Sikaflex® soiled on teak and eliminate it mechanically*
	Clamps, weights or screws (removable once the adhesive has set) can be used to secure the panel. Alternatively, the vacuum press method can be used
	After 24 hours the panels can carry their full service load and the temporary fastenings can be removed

Fig. 25 Application of Sikaflex®-298

Fig. 26 Holding in place with weights

Finishing

Remaining joints should be caulked as soon as the fixation means are removed. For horizontal joints, Sikaflex®-290i DC can be used. Vertical joints should be caulked with Sikaflex®-295 UV.

Important:

If masking tapes are used, they have to be removed as soon as possible before skinning of the Sikaflex® occures.

Fig. 27 Sealing the edges after renovation with Sikaflex®-295 UV

4.1.6 Maintenance of teak decks

The teak deck changes its color during exposure to the sun and will weather in time to a silver patina. The resulting greyish brown is sometimes wished. In such case we recommend to clean the deck surface regularly with Sika® Teak Cleaner. Use a sponge or a brush and work always it the direction of the wood grain. In warm climates this procedure should be carried out every day. Bleach, strong acids and aggressive chemicals should not be used at any time.

To maintain the colour and appearance of a new teak deck, Sika offers a maintenance system: Sika's Teak Maintenance System is fully compatible with Sikaflex®-290i DC caulked teak decks.

Sika's Teak Maintenance System consists of the following:

1. Sika® Teak Cleaner

This product is used to clean the surface of the teak

Apply directly to either wet or dry teak using a brush. Work always it the direction of the wood grain. Leave for 15 minutes before rinsing off with fresh water.

2. Sika® Teak Brightener

Following the treatment of Sika® Teak Cleaner, apply Sika® Teak Brightener to the wet surface using a clean rag and allow to set for a maximum of 5 minutes before rinsing off thoroughly with fresh water.

3. Sika® Teak Oil

Apply this with a clean rag to dry, cleaned wood and allow the oil to penetrate before removing the excess. Reapplication is recommended at the first signs of weathering.

Fig. 28 10 year old teak deck

Fig. 29 New teak deck

Fig. 30 Keep decks looking like new by using the appropriate maintenance products

Fig. 31 The Sika range of teak deck maintenance products

4.1.7 Teak deck repair

Most quality timber decks are of teak. For this reason, most of the procedures outlined in this manual are focused on that material.

Deciding whether or not a wooden deck needs to be repaired is not always easy. First, it must be established that a joint has failed or that the wood has been damaged sufficiently to cause a problem.

Each and every joint should be closely inspected. Any points at which there is a small gap or crack in the caulk should be marked with distinctive chalk.

Similarly, the wood surface should also be closely examined for undue wear, gashes, splitting or splintering and should be marked with chalk in a similar way.

However, parts or all of damaged planks should be replaced, according to how badly they are damaged.

If joints are mostly in good condition, but are damaged in one or two places, these can be repaired by replacing the local caulk. More extensive damage, may suggest that all of the jointing would need to be replaced.

The following table shows the recommended responses to the outcome of a deck analysis.

Deck analysis responses

Please note that water intrusion between wood and deck may lead to fouling of the wood. It is recommended to control the deck periodically and repair non tight areas before the whole deck is affected or part of the wood detaches from the deck due to the wood expansion with permanent water contact.

How to detect untight areas?

Wood that has become damaged by water trapped in a failed joint becomes more porous than the wood surrounding it. This can result in the damaged wood changing colour. It also means that it will remain wet after the rest of the deck has dried. Wetting the deck and closely examining the areas that remain wet after the rest has dried, is an effective method for identifying problem areas.

Fig. 32 Discolouration of the wood is a tell-tale sign of a failed or damaged joint in this teak deck

	Serious wood damage	Slight wood damage	Wood undamaged
Serious joint damage	Replace deck with new prefabricated or built in-situ deck	Replace all joints, then sand and restore whole deck	Replace all joints
Slight joint damage	Replace damaged joint areas, replace damaged wood areas, then sand and restore whole deck	Replace damaged joint areas, then sand and restore whole deck	Replace damaged joints only
Joints undamaged	Replace damaged wood areas. Sand and restore whole deck	Sand and restore whole deck	Clean the deck. Restore the wood if necessary

Which repair solution will be chosen depends on the state of the deck and the expected result.

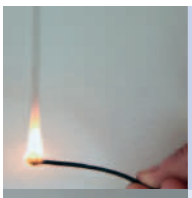
Determination of the type of adhesive which will be replaced

In the following part all possible repair solutions are described. However to achieve a perfect result, the chemical composition of the original deck caulking material as well as the elastic adhesive of the planks have to be determined if they are not known.

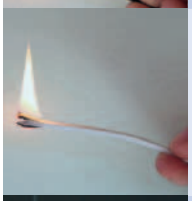
One simple test is to observe the burning behaviour of the sealant or adhesive.

For that a small test piece of the test product will be ignited with a pocket lighter.

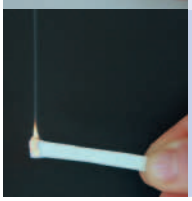
The type of flame, the flammability and the smoke gives a good indication of the product base.



Flammable. Yellow flame with an intense black fume and black ashes indicates a polyurethane



Flammable. Yellow flame without black fumes indicates a Product based on Hybrids or MS-polymers



Non propagating light yellow flame with a white to grey fume and white ashes indicates a Silicon based product

If in doubt, consult your local Industry Departement.

Important:

Never repair a joint simply by cutting the sealant out and replace it with a sealant unless the chemical base is identical.

Repair recommendation

If the old joint is soft and sticky we recommend to eliminate the old material completely using a router. Enlarge the joint to ensure a proper wooden surface After such a removal, **all sealant types** can be newly applied as described in the chapter 4.1.4 Procedure of levelling, bonding and caulking of teak decks.

	New joint		
Old joint	**PUR**	**MS / Hybrides**	**Silicones**
PUR	Just cut out the defective joint. Clean the surface to be resealed with Sika® Aktivator and leave it for at least one hour before the application of the new sealant	Not recommended	Not recommended
MS or Hybrid	Not recommended	Seek advice from the manufacturer	Not recommended
Silicone	Not recommended	Not recommended	Cut out the defective material, clean with Isopropylic alcohol and seal the joints after 1 hour flash off time

Removing of old caulking

There are five principal methods for removing old caulking. These are:

- Manual cutting with a sharp knife
- Using an oscillating cutter (Fein Tools) with a chisel-tip blade that is the same width as the joint
- Using an electrically heated rubber-cutting 'rubbercut' tool (Rema)
- Using a router. This method must be used if the old caulking material is not Sikaflex®-290i DC as the sides of the joint will be shaved by the router blade

The method used normally reflects the size and the nature of the job. For a small, one-off job, the manual method would be the cheapest and the simplest method. A large job or a professional repair workshop would likely need to use either the oscillating cutter or the Rubbercut tool for both the time-saving and the quality of the finish.

The router would be used where it is necessary to make sure that there is no residue of the old caulking remaining. This would be especially important when the old caulking material is of unknown chemical composition as it might both have an unwelcome reaction with the new caulking material and have an inferior adherence to the sides of the joint.

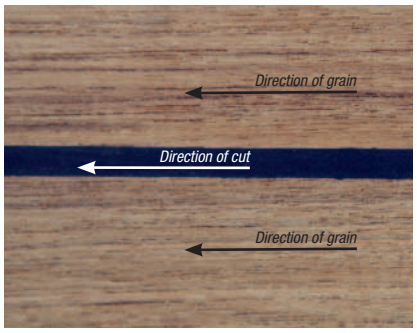


Fig. 33 Always ensure that the direction of cut is with the grain to avoid 'digging-in' damage to the sides of the planks

Important:

It is important to take care and ensure that the directions of cut is WITH the grain as shown in Fig. 33

Fig. 34 Using a craft knife to cut along the part of the joint to be removed

Removal with a sharp knife

Insert the blade of a craft knife into one side of the joint perpendicular to the deck surface

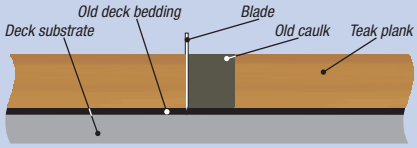


Fig. 35 First cut using blade in left of joint at 90 °

Cut along the joint taking care to keep the blade straight otherwise the wood might get damaged, or the old caulking will not be completely cut away

Insert the blade at an angle from the top of one side of the joint to the bottom of the other

Cut along the joint taking care to keep the blade at a constant angle
This will remove a triangular bead of old caulking along the length of the joint

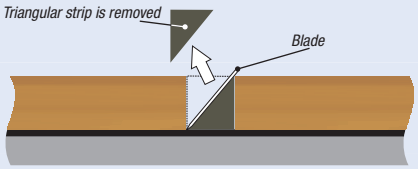


Fig. 36 Second cut using blade in right of joint at about 45 °

Insert the blade vertically at the other side of the joint. Once again, care should be taken to keep the blade straight otherwise the wood might get damaged, or the old caulking will not be completely cut away

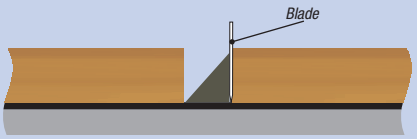


Fig. 37 Third cut using blade in right of cut at 90 °

Adjust the blade to cut an opposite diagonal, to remove half of the remaining caulk

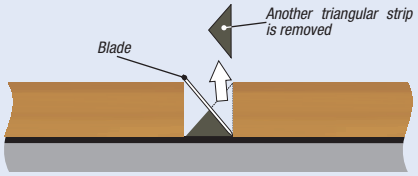


Fig. 38 Fourth cut using blade at about 45 ° to the left

Remove the 'A' shaped remainder using a scraper of appropriate width. A hand-chisel of the same width of the joint or slightly less would be ideal for this purpose

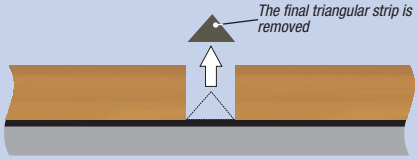


Fig. 39 Fifth cut using a scraper along the bottom of the joint

Removal with an oscillating cutter

Switch on the oscillating cutter. Grind the blade with a grinding stone (from the tool manufacturer).

Fig. 40 The oscillating cutter

Insert the blade in the joint and remove it. For this joints it may be necessary to do this in two steps.

Fig. 41 Removal of joints

The cut caulking will be ejected out of the joint with a continuous strip.

Fig. 42 Removal blades

Removal with an electrical rubbercut tool

Switch on the Rubbercut tool

Exert a pressure to the cutting head in the forward direction. The tip will heat up to a temperature which cuts the old caulking

Insert the tool and advance it along the joint, taking care not to damage the planks at the sides of the joint and in the case of smoking, insert a new cutting blade

The cut caulking will be ejected out of the joint in a continuous strip

Fig. 43 The rubbercut tool

Fig. 44 Blades for rubbercut

Fig. 45 A triangular cut of the old caulking being removed manually

Replacing of old joints

Old and damaged or detached sealants should be replaced to prevent water intrusion in between Teak and Substrate. One of the problems could be a incompatibility of the old sealants with the new joint sealant.

The best solution is to remove the old sealant completely using a guided router and the new sealant adheres to the teakwood.

If the old sealant cannot be removed completely, an analyse of the old sealant should be done to detect possible incompatibilities between old and new sealant (see page 14)

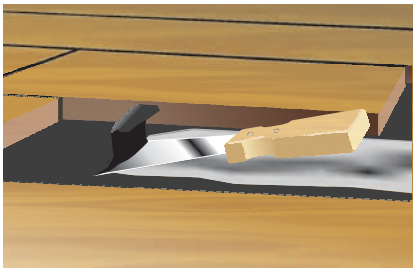


Fig. 46 Old bedding should first be scraped off using a scraper

Fig. 47 A useful and effective vibrating scraper power tool

Replacing defective planks

Completely remove the caulking from the joints around any planks that are to be removed. (See 'Removing Old Caulking' on page 15)

Identify the damaged planks with a chalk

Remove the damaged plank, taking care not to damage the substrate. (If a strong adhesive has been used to bed the plank in place, it may be necessary to destroy the first plank removed in any series. The aperture can then be used to insert a shim beneath adjacent planks to enable their removal if necessary.)

If only part of the plank is to be replaced. Cut off the damaged area using a vibrating saw. Prepare the new plank to the same dimensions as the damaged one

Remove any old adhesives, bedding or other foreign matter from the substrate and remove the jointing material from around the edge using a craft knife, a scraper and sandpaper to ensure that the exposed edges are completely free of any residue

Analyse the type of sealant. (see page 13)

In case of silicone as original sealant, grind the edge of the planks or better using a router with a guide to assure a complete removal of the old sealant

Dry fit the new plank to make sure that it will locate and align with the existing planks

Clean, or if necessary, prime the substrate according to the type of material as described in the appropriate procedure

SMM

Prime all faces of the remaining planking as well as of the new plank (including the hidden side) using Sika® MultiPrimer Marine

Drying time: 30 min to 24 h

298

Apply and spread bedding compound Sikaflex®-298 at the appropriate depth to the sub deck

Insert the replacement plank, bedding it in place and aligning and levelling it carefully with existing planking

Hold the new planking in position using weights, screws or wedges

Allow the Sikaflex®-298 to cure for a minimum period of 24 hrs

290i DC

Apply Sikaflex®-290i DC caulking, ensuring that no air is trapped in the joints and allowing the compound to slightly overfill the gap

Slightly overfill the joint. Leave it if the deck will be sanded after caulking or use a spatula at 60° angle to press the sealant slightly into the joint.

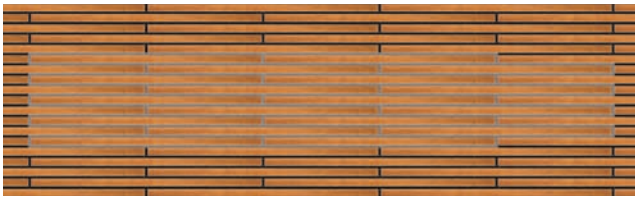
Let the Sikaflex® 290i DC cure as indicated in Fig. 8

Important:

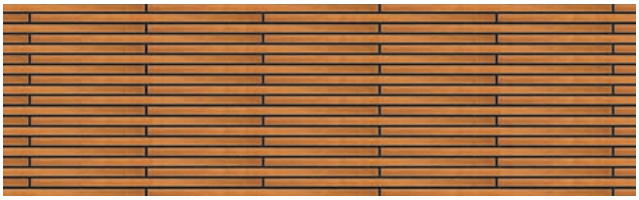
If the deck should not be grinded, the joint filling process can be done using masking tapes

1. Damaged area

2. Removed planks



3. Embedded new planks



4. Repaired deck

Fig. 48 Cutting planks with vibrating knife

Fig. 49 Picuture Removal overstanding Sikaflex®-290i DC with a vibrating scraper power tool

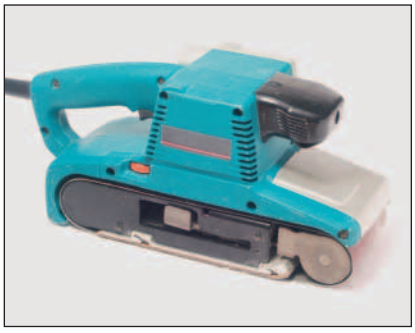


Fig. 50 Belt sander

Sanding of the deck

	To reduce sanding time we recommend to remove most of the hardened bead of Sikaflex®-290i DC with an electric vibrating scraper
	For efficient sanding results, use an industrial sander. It is recommended to begin with a medium paper at about 80. Suitable sanders are belt sanders, flat plate, or elastically suspended sanders
	Connection areas may be sanded with a palm sander (see Fig. 51)
	When the surface is uniformly smooth. Change the sanding belt to 120 grit and re-sand the whole area again, keeping the sander aligned with the wood grain as much as possible
	Remove all dust with a vacuum cleaner

Replacing the whole deck

In such case the wood has to be removed and the deck has to be cleaned. Sanding or sandblasting has to be done down to the original substrate. Then install a new deck as outlined in part 4.1.4 for in situ produced deck covering or in part 4.1.5 in case of prefabricated decks.

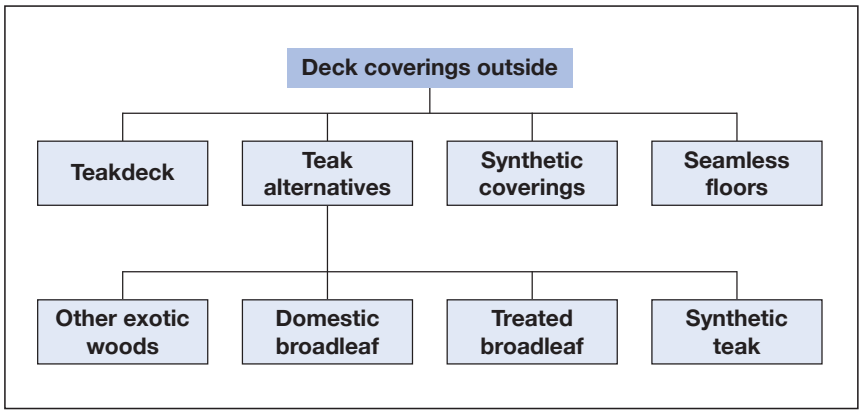
Fig. 51 palm sander

4.1.8 Alternatives to Teak

Teak has been used for hundreds of years as a durable deck material.

Alternatives for teak such as iroko, padouk etc. are used in some cases but necessitate an intensive protection work to assure a long time function. Usually they are used in workboats as thick protective floors.

Teak deck alternatives are shown in the chart beside



Other woods

Advantages:

- Not submitted to legislation (FSC-label)
- Good relation price / durability

Disadvantages:

- Durability of these wood is lower than teak
- Shrinkage (hygric) is higher than teak
- No longtime experience in decking's are known
- More irregular grain such as alternating spiral growth etc. Periodical deck control is necessary.

Frequently used woods:

Iroko (Kambala)

Padouk

Others possible alternatives are: oregon pine, afromosia, basralocus, cedro, cordia, kahja, sipo, IPE etc.

Important:

Decks done with these woods may show an irregular hygric movement.

Such deck coverings have to be observed frequently and eventually noticed joint detachments have to be repaired immediately

Surface preparation are identical to the manufacture of a teak deck (see chapter 4.1.4).

Treated broadleaf

This type of wood are home-grown broadleaf treated with natural or synthetic resins.

One example of these product types is Kebony. This is a maple wood treated with natural resins.

With this treatment the following characteristics are achieved:

- Durability comparable to teak with the same colour change to grey – brown.
- Hardness, abrasion resistance higher than Teak
- Expansion property as teak

Surface preparation and adhesives are identical to chapter 4.1.4.

Fig. 52 Kebony new

Fig. 53 Kebony aged

Synthetic (engineered) teak

Synthetic teak consists in thin layers of teak which are bonded together. The advantage of this process is the use of the entire tree. (Heartwood and sapwood).

Further information's have to be requested by the manufacturer.

Synthetic coverings

These prefabricated decks are made of different plastics. Quality and durability may differ as well as slip resistance and feel. These coverings are mainly used on yachts.

We distinguish between principally three types of synthetic coverings:

- Polyurethane elastomers / GRP backing
- Synthetic rubber composites
- PVC based coverings

Polyurethane elastomers

One product of this category is Esthec from Bolith.

This company offers a broad range of coverings (form, colour design)

Sikaflex®-298 or Sikaflex®-291i are an ideal bonding solution.

These elastic products compensates the thermal and dynamic movement between the deck and the covering and increases the inherent acoustic dampening characteristics.

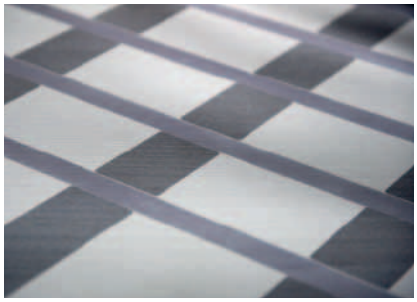


Fig. 54 Different designs, photos: Esthec

Preparing PUR based deck coverings

	The covering material must be free from release agents or other media used in the production process. Use appropriate solvent recommended by the manufacturer
SA	*On nonporous coverings, the side that is to be bonded should be cleaned with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Preparation of the deck

GRP decks

208	*Heavily soiled surfaces should first be cleaned off with a pure solvent like, Sika® Remover-208, to remove the worst of the soiling*
	Lightly abrade the contact area with a very fine sanding pad
	Remove the dust with a vacuum cleaner
SA	*Clean the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Timber decks

	Abrade the contact area on the deck with a sanding paper (80/100 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a felt applicator.*
	Drying times: Sika® MultiPrimer Marine – 30 minutes (min) to 24 hours (max)

Aluminium or steel decks

	Steel: *Grind (36 P grit) or sand-blast the surface in accordance with ISO 8501-1: 1996 SA 2½* ***Aluminium:*** *Lightly sweep-blast the surface*
	Thoroughly vacuum clean the surface
205	*If the area is contaminated, treat the surface with Sika® Aktivator 205 using a clean towel*
	Flash-off: 10 minutes (min) to 2 hours (max)
	Avoid dust or other contamination until the next step has been carried out
ZP	*Apply a continuous coating of two-component SikaCor® ZP Primer within 2 hours of the Sika® Aktivator treatment to the surface, using a clean brush or a roller at a consumption of approx. 200 gr/m² or 80 µm thickness.*

Aluminium or steel decks, coated with a two-component paint, varnish or fairing compound

	Ensure that the treated metal deck is compatible with Sikaflex®-291i or Sikaflex®-298. Test the paint with a solvent like acetone or a commercial available silicon remover or paint thinner. If the paint can be removed, sandblast off the paint down to the metallic surface and use SikaCor® ZP Primer (see page 5)
	Lightly abrade the contact area with a very fine abrasive pad
SA	*Treat the substrate with Sika® Aktivator, using a clean, lint-free rag or paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

For the preparation of other substrates, please refer to the Pre-Treatment Charts for Sika Marine Applications.

Bonding process

	Apply Sikaflex®-298 or 291i on the previously prepared surface and spread using a spreader with 4 mm triangular notches. The thickness layer should be about 1.2 mm, 2x 600 ml sausages per m²
	The covering material must be placed in position within 20-30 minutes of applying the adhesive, therefore the adhesive should be applied only to an area large enough to receive the section of covering that can be fitted in this time. Prevent air entrapment!
Steel	*Once the covering has been placed in position it should be rolled down with a rubber roller, working from the centre outwards to expel any entrapped air and push any excess adhesive out to the edges, where it can be removed. It is essential to ensure that no trapped air remains To accelerate the curing process we recommend to apply a mist of water using a paint gun. Do it sparingly as Sikaflex® needs only 1 gram of water per square meter.* ***Caution:*** *If the covering material is laid under tension, the edges must be held or suitably weighted*
	Fix the deck with weights or vacuum press over night
208	*Uncured Sikaflex® may be removed from Tools with Sika® Remover-208. On rough surfaces we recommend to leavs the adhesive to cure and remove it mechanically*

Synthetic rubber composites

Typical products in this range is Norament.

The surface preparation as well as the bonding process is the same as described for Esthec.

PVC-coverings

Most of the alternatives for teak decks are based on PVC. The composition varies for each deckings. PVC coverings contain organic plasticizer. This plasticizer may have an long time interaction with the used adhesive. Therefore we do not give any recommendation for bonding such products. In such case it is best to get in contact with he distributor in order to recieve an adhesive which is recommended by the manufacturer.

Important:

Due to the variety of the deck coverings we recommend to seek advice from the procedure of the coverings or contact your local Technical Service department, Sika Industry.

4.1.9 Bonding of timber elements

In yachts and pleasure craft as well as in ocean-going vessels, stairs, companionways and handrails are frequently made from tropical hardwood, chosen both for their durability and their attractive appearance.

The use of screws to attach these fixtures can impair both their durability and their appearance as they are vulnerable to moisture gaining access through the fixing holes. Hardwood components like these can be fixed with adhesives, where the absence of screw holes leaves the wood unimpaired and more resistant. This is of particular importance where the wood is load bearing as in the construction of accommodation ladders.

Bonding also has other benefits. The resilient adhesive layer softens the sound of footsteps and cushions vibrations, the integrity of painted surfaces can be preserved without loss of corrosion protection and the effects of moisture penetration are eliminated.

The Sika products for bonding timber elements are Sikaflex®-298 (low viscous) for big bonding parts or parts which do not need a instant fixation until the hardening process took place (horizontal applications).

For smaller parts or parts which are bonded on an inclined substrate we recommend Sikaflex®-291i.

Substrate preparation

GRP

208	*Heavily soiled surfaces should first be cleaned off with Sika® Remover-208 to remove the worst of the soiling*
	Lightly abrade the contact area with a very fine sanding pad (abrasive pad very fine)
	Remove the dust with a vacuum cleaner
205	*Treat the substrate with Sika® Aktivator-205, using a clean, lint-free rag or paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

Metall deck coated with a 2 C-paint

	Ensure that the painted metal deck is compatible with Sikaflex®-291i or Sikaflex®-298. Test the surface with a rag and thinner. The paint should not be removable by this operation. When the paint is disolvable sandblast off the paint down to the metallic surface and use SikaCor® ZP Primer (see page 4)
	Lightly abrade the contact area with a very fine sanding pad (Scotch Brite very fine)
	Remove all dust with a vacuum cleaner
SA	*Treat the substrate with Sika® Aktivator, using a clean lint-free rag or paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Untreated Wood

	If the surface is soiled, abrade the contact area with a sanding pad (80/100 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine, using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

Stainless steel

208	*Heavily soiled surfaces should first be cleaned off with Sika® Remover-208 to remove the worst of the soiling*
	Lightly abrade the contact area with a very fine abrasive pad (abrasive pad very fine)
	Clean with a proper rag or a vacuum cleaner
SA	*Pre-treat the substrates with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

Application of Sikaflex®-298 and Sikaflex®-291i

The choice whether you use Sikaflex®-291i or -298 depends on the parts to be bonded.

Big horizontal areas are better to bond with Sikaflex®-298 as this low viscous product is easier to apply with a trowel. The bedding process should be made with weights or with a vacuum press.

Smaller parts, inclinates on vertical applications, or parts which have to be fixed with a vacuum press are best to be bonded with Sikaflex®-291i. The higher viscosity of this product prevents a squiring out during vacuum application.

291i	*Apply Sikaflex® with a notched trowel on the prepared surface. Use a notched trowel with 4 mm rectangular notches depending of the roughness of the substrates*
291i	*The thickness of the layer depends on the roughness of the surface but has to be at least 1.2 mm (2 sausages 600 ml/m²)*
	Apply the timber within the open time of 15 minutes. Fix the components for 24 hours

Fig. 55 Application of Sikaflex®-298

Important:

it is essential that the elements are completely pressed down to the substrate to avoid water penetration underneath the timber element. This may create fouling and subsequent degradation of the wood.

Remove cured excess Sikaflex®-298 or -291i with a knife and seal the edge without additional pre-treatment.

If necessary joints on the side of the elements may be sealed with a weathering resistant sealant like Sikaflex®-295 UV.

4.2 Bedding and Sealing Fittings and Hardware

4.2.1 General description

All kinds of deck fittings and hardware need to be securely fixed and totally watertight. Some of these fittings can be subject to very high forces and such as tensile, torsion and shear stresses.

Poorly sealed joints can suffer serious damage such as metal corrosion, osmosis and water leaks which, in turn, can cause damage to interior furnishings and fittings.

Bedding and sealing of fittings subject to high mechanical stresses

Deck fittings such as chain plates, winches and guide rollers must absorb very high dynamic stresses. For this purpose a high-performance product, such as Sikaflex®-292i, should be used in conjunction with additional mechanical fixings.

Bedding and sealing of fittings subject to minimal mechanical stresses

Deck fittings, such as ventilators and cover strips, need to be waterproofed, but are not subject to high tensile or torsion stresses.

These fittings can be effectively bedded and sealed with only Sikaflex®-291i or if the joint remains visible and is exposed to weathering, the use of Sikaflex®-295 UV is recommended.

4.2.2 Bedding and sealing fittings and hardware

Substrate preparation

Timber decks

	Abrade the contact area on the deck with a sanding pad (80/100 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a roller felt applicator.*
	Drying times: Sika® MultiPrimer Marine 30 minutes (min) to 24 hours (max)

Painted decks

SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Bronze, brass or stainless steel fittings

SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine, using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

Aluminium fittings

	Lightly abrade the contact area with a very fine sanding paper
SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine, using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

Application of Sikaflex®-291i, -292i or -295 UV adhesives

	Mask the surrounding area before priming and sealing
	These adhesives should be applied to the deck and to the screw fixing holes in a bead of the required thickness. The fitting should then be pressed into position
	The fixing screws should be tightened slightly to leave about 1 mm of adhesive under the fitting
	Use a plastic spatula to remove excess sealant squeezed out around the edges and remove the masking tape
	After 24 hours tighten the screws

Important:

For the preparation of other substrates, please refer to the Sika Pre-Treatment Charts for Marine Applications.

Fig. 1 A selection of cleats that can be sealed or bonded using Sika adhesives

Fig. 2 Applying Sikaflex®-292i

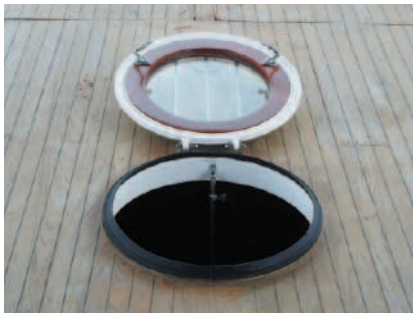


Fig. 3 A port-hatch, both bonded and sealed using Sikaflex®

4.3 Bonding of Rub Rails and Fenders

4.3.1 General description

Rub rails and fenders are designed to protect the hull of a vessel against damage. These act as a bumper to absorb impacts and scrapes, and the more elastic these are, the more effectively they perform this function.

The elastic behaviour varies according to the type of material used, so the shock-absorbing performance of the rub rail can be significantly improved by the use of an elastic adhesive joint. This provides maximum protection to the hull.

Rub rails of timber, PVC or polyurethane can be securely bonded to marine hulls using Sikaflex®-292i. The resulting elastic joint helps to absorb most of the shear and tensile stresses to which they are subjected when a vessel is docking or casting off.

If rub rails are secured with screws, a similar effect can be obtained by backfilling the rail profile with Sikaflex®-291i; a highly elastic polyurethane sealant. As well as absorbing torsional stresses, this technology also seals the screw holes and prevents water or dirt from getting behind the rub rail.

Important:

If the rub rail has a different chemical composition and is not fixed using a mechanical fixing method, please seek advice from your local Sika company.

4.3.2 Bonding rub rails to the hull

Substrate preparation

GRP hulls

208	*Heavily soiled surfaces should first be cleaned off with a pure solvent, like Sika® Remover-208, to remove the worst of the soiling*
	Lightly abrade the contact area with a very fine sanding pad
	Remove the dust with a vacuum cleaner
SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine, using a clean brush or a felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

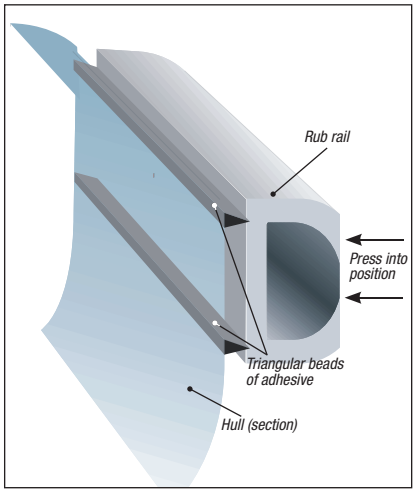


Fig. 1 Assembly of a rub rail

Finished painted hulls of aluminium or steel, coated with a two-part lacquer

SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Timber rub rails

	Abrade the contact area of the hull with a sanding pad (80/100 grit)
	Remove the dust with a vacuum cleaner
SMM	*Apply a thin, continuous coat of Sika® MultiPrimer Marine using a clean brush or a felt applicator.*
	Drying times: Sika® MultiPrimer Marine 30 minutes (min) to 24 hours (max)

Moulded PVC or polyurethane rub rails

	The bond face of the rub rails must be free from mould release agents or other chemical contaminants. All traces of such substances must be removed before proceeding with Sika® Remover-208
	Abrade the bond face of the rub rail with coarse sand paper (60/80 grit) to key the surface
208	*Pre-treat the substrate with Sika® Aktivator-205 using a lint-free rag or paper towel. Change rag frequently.*
	Flash-off min. 10 min to max 2h.
SMM	*Apply a thin continuous coat of Sika® MultiPrimer Marine using a clean brush or felt applicator*
	Drying time: 30 minutes (min) to 24 hours (max)

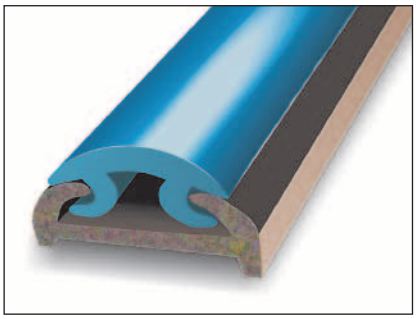


Fig. 2 A sample section of rub-rail

Application of Sikaflex®-292i or Sikaflex®-291i

	Apply a masking tape on the substrate
292i 291i	*Apply Sikaflex®-292i (or Sikaflex®-291i if rub rails are to be held using additional mechanical fixings) to the bond area using an appropriate triangular bead (Fig.1)*
	Assemble the components within 20 minutes of applying the adhesive
	Press the rub rail into place, either directly onto the face of the hull
	Use clamps, etc., to hold the rub rail in position while the adhesive sets. If the rub rail is to be secured with mechanical fixings, any holes should also be filled with adhesive
	Remove over standing adhesive and the masking tape
208	*Uncured Sika adhesives or sealants can be removed with Sika® Remover-208*
	Clamps and other fastening aids can be removed after 24 hours Full service strength is attained after approximately 7 days

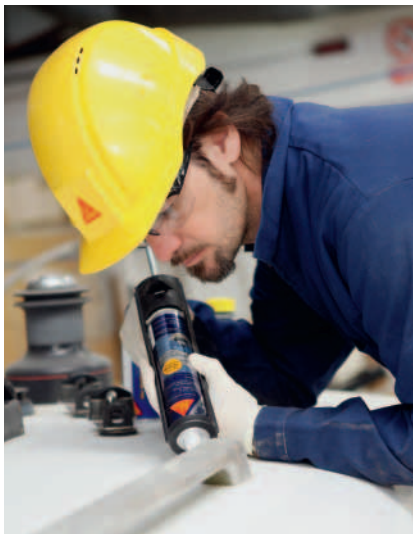


Fig. 3 Sealing the edge of a chrome hand-rail

4.4 Sealing Sacrificial Anodes

4.4.1 General description

A sacrificial anode, or sacrificial rod, is a metallic anode used in cathode protection where it is intended to be dissolved to protect other metallic components. The more active metal is more easily oxidized than the protected metal and corrodes first (hence the term “sacrificial”); it generally must oxidize nearly completely before the less active metal will corrode, thus acting as a barrier against corrosion for the protected metal.

In marine the sacrificial anode is made of Zink, where the Cathode which has to be protected is steel.

Sea water is a particularly good electrolyte and accelerates corrosion of metals exposed to it.

As fixing the anodes mechanically means that the hull is pierced, the anodes must therefore be sealed to the outside of the hull to prevent water ingress. Sikaflex®-291i provides a sound watertight seal for this application.

4.4.2 Sealing sacrificial anodes

Substrate preparation

Painted steel hull

SA	*Pre-treat the substrate with Sika® Aktivator, using a clean, lint-free rag or a paper towel. Change the rag frequently!*
	Flash-off: 10 minutes (min) to 2 hours (max)

Sacrificial anode

SA	*Clean the anode with Sika® Aktivator*
	Let dry for 10 minutes (minimum) and 2 hours (maximum)

Application of Sikaflex®-291i sealant

291i	*Sikaflex®-291i should be applied around the hole and the bolt in a fillet around all the edges of the fixing once it is securely fastened*
	Use a plastic spatula to remove excess sealant squeezed out around the edges
208	*Uncured Sika adhesives or sealants can be removed with Sika® Remover-208*

Fig. 1 Sikaflex®-291i is applied

Fig. 2 The anode is fitted

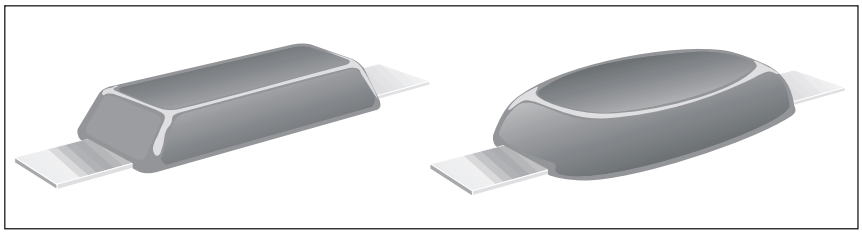


Fig. 3 Examples of weld-on sacrificial anodes

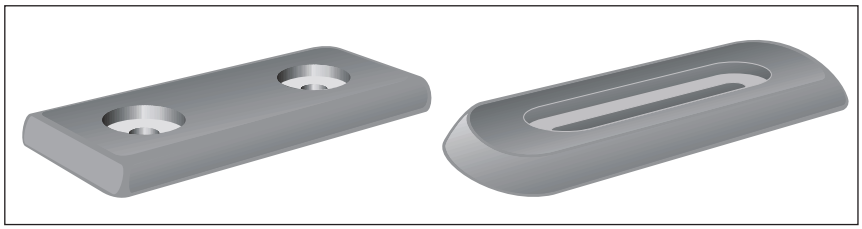


Fig. 4 Examples of bolt-on type sacrificial anodes

4.5 Bonding Decorative Panels and Work Surfaces

4.5.1 General description

The interiors of many boats are based on a variety of traditional and modern materials including mirrored glass, Avonite® and Corian®. These panels can be used functionally as working surfaces (galley worktops, etc.) or cosmetically. Either way, elastic bonding provides an easy, durable method of fixing without visible and unsightly mechanical fixings.

As the variety of materials used for panels, surfaces and supporting substrates is so vast, please consult the local Technical Service of Sika Industry or proceed to preliminary trials.

4.5.2 Bonding decorative panels and tables

Surface preparation

	Lightly abrade the bonding area with a very fine abrasive pad
SMM	*Apply a thin conitinuous coat of Sika® MultiPrimer Marine using a clean brush or felt applicator*
	Felt applicator drying time: Sika® MultiPrimer Marine 30 min (min) to 24 hours (max)

Application of Sikaflex® adhesive to vertical panels

	Prepare the substrate according to the Pre-Treatment Chart for Marine Application
	Place spacers in position (thickness 2 mm, approximately 50 Shore A hardness). These can be pressed into the adhesive once applied
	Apply appropriate beads of Sikaflex®-292i in an 8 mm x 10 mm triangular profile
	Assemble the components within 20 minutes of applying the adhesive
	Apply pressure with fastening aids to compress the adhesive to the height of the spacers
	Wait at least 24 hours before walking on the bonded plates
208	*Uncured Sika adhesives or sealants can be removed with Sika® Remover-208*

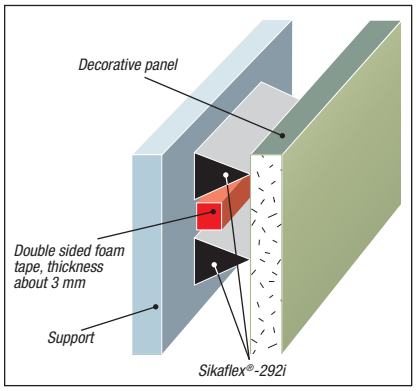


Fig. 1 Bonding a decorative panel vertically

Application of Sikaflex® adhesive to horizontal panels

298	*Horizontal surfaces: Sikaflex®-298*
	Inclined surfaces: Sikaflex®-291i
	Slightly abrade the surface with a abrasive pad very fine
	Pre-treat the surface with Sika® Aktivator-205 wing a lint-free rag or paper towel. Change the rag frequently!
	Flash-off time min. 10 min to max. 2 h
	Apply adhesive to the previously prepared surface and spread over the area to be covered, using a spreader with 4 mm triangular notches. The bed thickness may vary depending on the thickness of any gaps that needs to be filled (normally 1–2 mm)
	If vapour-tight substrates are used, spray a fine mist of water (1 g/m²) onto the Sikaflex®-298 surface for faster curing
	The deck panel must be positioned accurately within the tack free time of the adhesive and pressed firmly into place to avoid air-entrapment
	Clamps, weights or screws (removable once the adhesive has set) can be used to secure the panel while the adhesive sets. After about 24 hours the panels can carry their full service load and the temporary fastenings can be removed

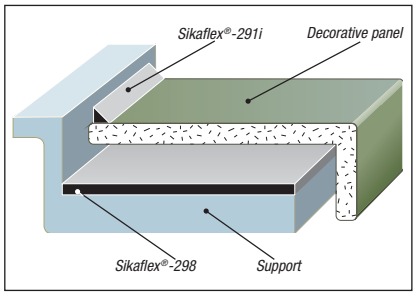


Fig. 2 Bonding a decorative panel horizontally

Fig. 3 A galley work surface fitted using Sikaflex®-292i

Important:

Always refer to the current Sika Product Datasheets and Material Safety Datasheets obtainable through your local Sika company

Fig. 4 Application of Sikaflex®-291i

4.6 Bonding Lightweight Internal Partitions

4.6.1 General description

These lightweight panels are usually constructed of wood sandwiches with internal polyurethane foam or honeycomb core. They are particularly suited as partitions for cabins and technical rooms as they are of lighter weight than wood filled panels and have good soundproofing properties.

Due to the low density core, lightweight panels cannot be mechanically fixed to the hull structures in the same way as traditional plywood panels. However, bonding with Sikaflex®-292i is an ideal replacement fixing method that also possesses the flexibility to respond to the movements and stresses of the assembly. The uniform stress distribution prevents damages which may be result of stress concentration (example screw)

This process is also endorsed by the manufacturers of the lightweight panels.

4.6.2 Bonding lightweight internal partitions

Substrate preparation

Please refer to the Sika Pre-Treatment Chart for Marine Applications.

Application of Sikaflex®-292i adhesive

	Dry fit the panels to ensure an accurate fit and correct dimensioning. Prepare the surface accordingly
	Place the spacers in position (thickness typically 3 mm, approximately 50 Shore A hardness)
	Apply Sikaflex®-292i to the appropriate bond face using an appropriate bead
	Assemble the components within 20 minutes of applying the adhesive
208	*Uncured Sika adhesives or sealants may be removed with Sika® Remover-208*
	Panels can be held in place during cure by clamps or support brackets
	Clamps and other fastening aids can be removed after 24 hours

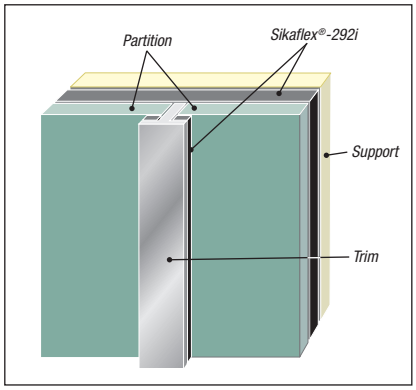


Fig. 1 Sikaflex®-292i bead application for bonding to the support

Fig. 2 Lightweight panels being fitted to an open hull

Fig. 3 Sikaflex®-292i applied to a lightweight panel prior to fitting

Fig. 4 High-quality lightweight panels finished in traditional high-gloss wood veneer and bonded using Sikaflex®-292i

4.7 Bonding Anti-Slip Plates for Engine Rooms

4.7.1 General description

Anti-slip plates used in technical, storage or engine rooms are traditionally fixed using rivets or other mechanical fixings. Being in an area that is subjected to intense vibration, these often become loosened and a regular amount of repair work or maintenance is often required. The use of elastic bonding technology not only absorbs vibration and noise but also allows a better distribution of the stresses, thus avoiding the need for repair work. In addition, both the fixing and the sealing of the plates can be carried out in a single timesaving operation.

4.7.2 Bonding anti-slip plates

Surface preparation

Aluminium

	Lightly abrade the bonding area with a very fine abrasive pad
	Treat the surface with Sika® Aktivator-205 with a lint free paoer towel
	Flash-off 10 minutes (min) to 2 hours (max)
SMM	*Apply a thin conituous coat of Sika® MultiPrimer Marine using a clean brushor a felt applicator*
	Drying time: Sika® MultiPrimer Marine 30 min (min) to 24 hours (max)

Two-component coating on metals

252i	*Ensure that the paint is compatible with Sikaflex®-252i.*
Acetone	*Test the paint with a solvent like acetone or a comercial available silicone remover.*
	If the paintcan be removed, sandblast off the paintdown to the metallic surface and prepared as indicated in the Sika Marine Pre-Treatment Chart.
	Treat the surface with Sika® Aktivator
	Flash-off 10 minutes (min) to 2 hours (max)

Application of Sikaflex®-292i adhesive

	Place spacers in position (thickness 2 mm, approximately 50 Shore A hardness). These can be pressed into the adhesive once applied
	Apply appropriate beads of Sikaflex®-292i in an 8 mm x 10 mm triangular profile
	Assemble the components within 20 minutes of applying the adhesive
	Apply pressure with weights or other fastening aids to compress the adhesive to the height of the spacers
	Wait at least 24 hours before walking on the bonded plates
208	*Uncured Sika adhesives or sealants can be removed with Sika® Remover-208*

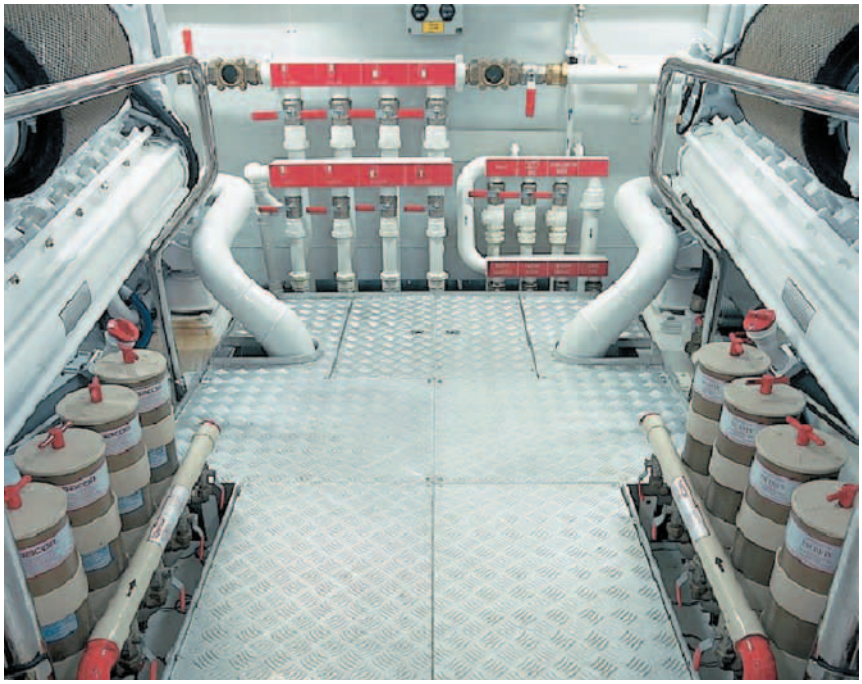


Fig. 1 Engine room floor

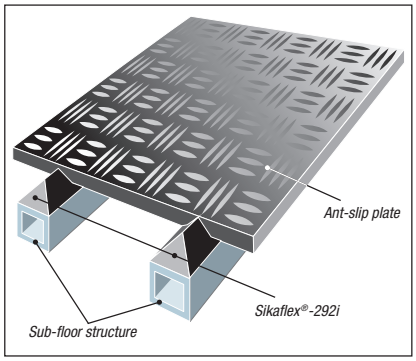


Fig. 2 Bonding anti-slip plates to the sub-floor structure