



## METHOD STATEMENT

# Joint Sealing of Rails in Track Superstructures with Sikaflex®-406 KC

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**CORPORATE CONSTRUCTION**

**BUILDING TRUST**



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# 1 INTRODUCTION

This method statement outlines general requirements and recommendations for applying Sikaflex®-406 KC joint sealant. Following this guideline will help to ensure good sealant performance.

Since conditions vary by project, these statements are not intended to be a complete and comprehensive quality assurance program. Field tests (see section 5) are required to ensure good sealant performance. Always follow instructions given in the most recent product data sheet (PDS).

# 2 SYSTEM DESCRIPTION

The rapid completion and re-opening of areas to traffic is a key requirement on infrastructure projects, especially during refurbishment works. Their closure to traffic for any extended periods is always an issue, which has become even more difficult with increasing traffic, be this at a road junction or a roundabout, on an airport apron or for a suburban tramline. Full traffic access with normal service demands needs to be returned as soon as possible, ideally within just a few hours so that vehicles can pass again without delay.

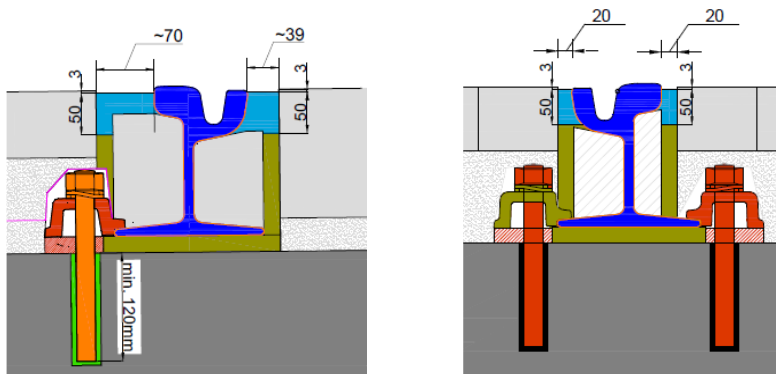
Sikaflex®-406 KC is a one-part, self-levelling, elastic joint sealant, with high mechanical and chemical resistance. Rapid and homogeneous curing throughout the entire sealant is achieved by the addition of Sikaflex®-406 KC Booster.

# 3 JOINT DIMENSIONING AND CONSUMPTION

To ensure Sikaflex®-406 KC performs properly, the joint must be dimensioned according to the following guidelines.

The joint width must be dimensioned to accommodate the expected movements (e.g. thermal expansion/compression) of the adjacent concrete elements and the movement capability of Sikaflex®-406 KC ( $\pm 35\%$  according to EN 14188-2).

For further information, please contact Sika Technical Service. Also, the sealant must always be recessed below the pavement surface since it is not designed to withstand permanent wheel traffic.



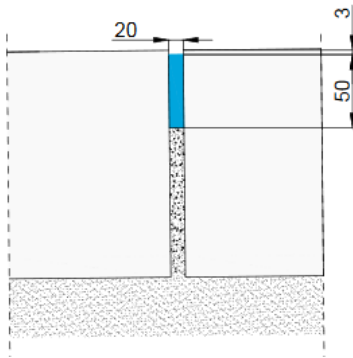
### CAUTION:

Final consumption depends on the type of the filler blocks, it should be calculated based on final drawing.

The joint width shall not exceed 70 mm and not more than 50 mm in depth. The minimum thickness of Sikaflex 406 KC is 15 mm. To prevent leakage of sealant during application, bottom and arises of joint must be tight. Top level of joint sealant should be kept at least 3 mm lower than top of the adjacent surfaces.

**For larger joints please contact Sika Technical Service.**

Refer to the table and drawing below for **standard joint dimensions** and consumption:



A - joint width [mm]	B - sealant depth [mm]	C - recessed below surface [mm]	Consumption litre per 1 m joint length	Consumption [kg] per 1 m joint length
15	50	3	0,75	1,05
20	50	3	1,0	1,40
25	50	3	1,25	1,75

### 3.1 JOINT SEALING PROCEDURE

The following steps summarize the application procedure for Sikaflex-406 KC:

Step	Action
1	Preparation Joint surface must be prepared according to the surface requirements
2	Backing Use quartz sand or backing rod as the bottom layer fill
3	Priming Primer is applied to the clean, prepared surface
4	Mixing Sikaflex-406 KC Booster has to be squeezed in the Sikaflex-406 KC pail and has to be mixed
5	Sealing Sealant is applied into the joint
6	Blinding (broadcasting) with quartz sand Quartz sand 0,4 – 0,8 mm granulometry is applied onto the fresh Sikaflex 406 KC, app 1-3 kg per meter of the rail joint

## 4 JOINT AND SURFACE PREPARATION

### 4.1 SURFACE PREPARATION

The substrate must be clean, dry, sound and homogeneous, free from oil, grease, dust and loose or friable particles. Sikaflex®-406 KC adheres without primers and/or activators. However, for optimum adhesion and critical, high performance applications, such as rail connection joints, highly stressed joints, extreme weather exposure or water immersion, the following priming and/or pretreatment procedures shall be followed: Sikaflex-406 KC is designed for concrete joints where the cement laitance and saw residue has been removed. Achieving a sound, clean, dry surface free from dust, loose particles, and frost is crucial to achieving a good bond and sealant performance. The bond strength is directly dependent on the substrate condition, so it is especially important that any weaker layer or cement laitance is removed so that the sealant can bond directly to sound concrete. Weak, loose, or foreign material between the sealant and substrate will cause a failure point. The joint face should be checked by rubbing a finger or clean cloth on the surface face which should come away clean and free of dust or contaminants. It is important that this condition is achieved for the entire surface where the sealant will adhere, taking into consideration the sealant recess.

Different cases may require slightly different processes for surface preparation. The following steps can be taken, as required:

## Non-porous substrates

Aluminum, anodized aluminum, stainless steel, galvanized steel, powder coated metals or glazed tiles have to be cleaned and pre-treated using Sika® Aktivator-205, wiped on with a clean towel. Before sealing, allow a flash-off time of > 15 minutes (< 6 hours). Other metals, such as copper, brass and titanium-zinc, also have to be cleaned and pre-treated using Sika® Aktivator-205, wiped on with a clean towel. After the necessary flash-off time, use a brush to apply Sika® Primer-115 and allow a further flash-off time of > 30 minutes (< 8 hours) before sealing the joints.

## Steel:

Free from dirt, grease and oil. Steel shall be prepared with blast cleaning to SA 2 ½ or SA 3 according to ISO 12944, part 4. Use Sika® Primer-115 (flash-off time of > 30 minutes < 8 hours) or for an optimum corrosion protection use Sikdur-32 or SikaCor® -299 Airless (curing time of min. 24 hours). It is recommended to blind (broadcast) with quartz sand on freshly primed surfaces using Sikadur 32 or SikaCore® 299 Airless

## Porous substrates:

**Concrete:** "green" (2-3 days old), mat-wet (surface dry), dry, aerated concrete and cement based renders, mortars and bricks shall be primed with Sika® Primer-115, applied with a brush. The surface must be firm, fine grapping, free from loose, "cementitious milk" and friable particles, dust and other contaminations. Before sealing, allow a flash-off time of > 30 minutes (< 8 hours).

1. Surface preparation for application on "green" concrete
  - 1.1. Cement milk, loose and friable particles brushed after casting, start of the application limited by the accessibility of on the concrete surface without footprint
2. Surface preparation for application on mat-wet (surface dry) concrete
  - 2.1. Cement milk, loose and friable particles have to be removed by grinding or high pressure cleaner
3. Water in liquid form (droplets) must be removed e.g. by compressed air
4. Surface preparation for application on dry, aerated concrete and cement based renders, mortars and bricks
  - 4.1. Cement milk loose and friable particles removed by
    - 4.1.1. Grinding or wire brushing,
      - typically done with angle grinder,
      - only recommended on joints that have not been saw cut
      - for removing cement laitance or significant foreign material
    - 4.1.2. Sandblasting
      - Recommended to remove any residual laitance or foreign material

Typically joints on concrete roads are saw cut. Here, it is important to first pressure wash the joints after saw-cutting to get rid of the residue and loose material. At this point, the joint should be inspected to decide the further necessary steps. It is recommended to sand blast the joints to remove further laitance from the concrete surface, followed by blowing high pressure air to remove the sand and foreign material. In some cases, the sandblasting step can be skipped, only if the required surface conditions are met after saw-cutting and high pressure washing.

The joint face should be checked by wiping a clean cloth on the surface which should come away clean and free of dust or contaminants. It is important that this condition is achieved for the entire surface where the sealant will adhere, taking into consideration the sealant recess.

**Hot rolled asphalt according to EN 13108-1:** The joint is made by cutting the asphalt with a diamond saw to achieve a proper surface. Minimum 50% of the surface must be gravels. Clean the cut joint area by pressure washing or sandblasting and remove all cutting residuals and loose particles by vacuuming. Let dry the substrate properly, do not use gas heater or electrical heater above 40°C air temperature to ensure not melting the asphalt. Use Sika® Primer-115 (flash-off time of > 30 minutes < 8 hours).

**Hot poured asphalt mastic asphalt according to EN 13108-6:** The joint usually is made by a temporary filler, which is removed when the asphalt has solidified and is not cut. To achieve a minimum 50% of clean aggregate surface the joint must be sand blasted. Aggregate surface must be free of binder. Remove all residuals and loose particles by vacuuming. Use Sika® Primer-115 (flash-off time of > 30 minutes < 8 hours).

*Note: If there are leaks in the asphalt after removing the temporary fillers, then flame them with a non-oiling flame before sand blasting.*

#### **Rubber:**

There are many rubbers and often the rubber surface has remains of demolding or extrusion agents. Special cleaning and priming are mandatory and adhesion and compatibility tests have to be carried out. Please contact local Sika Technical Services Department for advice.

## **4.2 REPLACING EXISTING SEALANTS**

When replacing existing sealants, the best performance is obtained when the existing sealant is completely removed mechanically and a sound, clean concrete or asphalt substrate is exposed for the new sealant to bond to. The method for removing the existing sealant will depend on its condition. The best results are achieved by saw cutting the joint again with a slightly wider blade. Sometimes the existing sealant can be completely removed by hand or by using a claw-like metal ripper device to expose the concrete substrate. This can be machine driven. In both cases, it is important to follow the procedure in Section 3.1 after sealant removal.

See also method statement: Method Statement Floor and Speciality

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## **4.3 PRIMER APPLICATION**

Primer application is crucial for the performance of Sikaflex®-406 KC.

Different surface applications require different primers:

The primer is applied after the backing is inserted. Although Sikaflex®-406 KC with Sikaflex®-406 KC Booster adheres quite well without primers and/or activators especially for exterior application the pretreatment of the joint is mandatory. Water from rain, spillage, washing goes through the porous concrete to the interface of the sealant. The liquid primer can penetrate the concrete and "protect, strengthen" the interface.

The primer is applied by hand using a clean brush. For primer and application method, the following points apply:

- Apply the primer according to the application rate in the PDS. This is basically applying the primer as thin as possible, while still completely covering the joint bonding surface.
- Applying too much primer can cause failure within the primer.
- The primer must be allowed to flash off at least the minimum flash off time given in the PDS, but no more than the maximum prior to sealant application. Any surfaces primed but not sealed within maximum flash off time must be re-cleaned and re-primed before sealant application.
- The primer reacts with moisture in the air. Opened containers should be closed between use and air exposure time limited during application. In addition, limit the time the primer being applied is exposed to air.

Different substrates may require slightly different processes for surface preparation:

Before primer application, ensure the joint surfaces are clean and primed (see Section 4.1). The primer can be applied by hand using a clean brush.

#### 4.4 SEALANT MIXING

- Before adding the Sikaflex-406 KC Booster the Sikaflex-406 KC has to be premixed for approx. 2 min in order to achieve to get an easier mixing of the Booster and better flow.
- Add Sikaflex®-406 KC Booster to Sikaflex®-406 KC and mix continuously for 2 to 3 minutes until a uniformly colored mix has been achieved. For mixing a U-shaped stirring device with ~600 rpm has to be used and avoid air entrapment.



Picture 1: U shaped mixing device

#### 4.5 MANUAL SEALANT APPLICATION

After mixing, the sealant can be applied into the joint manually by using an open tin with a spout to pour the sealant into the joint.



Picture 2: Application of Sikaflex-406 KC directly out of the pail



Picture 3: Broadcasting of Sikaflex-406 KC with quartz sand

Freshly applied Sikaflex®-406 KC can be broadcasted with quartz sand after ~ 1 h at 23 °C.

#### 4.6 APPLICATION NOTES

- The pot-life of the mixed sealant is approximately ~20 min (23 °C / 50 % r.h.). The pot-life decreases with increasing temperature.

#### 4.7 CURING

The temperature has a strong influence on the reaction kinetics. In the table below the results are summarized. The degree of curing (%) refers to the final hardness of the sealant which is around 28 Shore A.

#### Curing Times at different temperatures:

Temperature	Cure state in % of final hardness		
	25%	50%	80%
5°C	14 h	24 h	48 h
23°C	5 h	8 h	24 h
35°C	3 h	6 h	24 h

Table 1: 100% refers to a Shore A hardness of 28, the fully cured state. At 80% of final hardness we consider the sealant as cured enough to bear mechanical load.

#### 4.8 BROADCASTING

**Tack-free time:** Without sand broadcast: ~3.5 hours, with sand broadcast: ~ 1 hour (@23°C).

**Trafficable by pneumatic car tires:** After approx. 3 hours (+23°C), based on recessed joints, surface broadcast with sand and for joint widths up to 70 mm.

The joint can be opened to traffic if 30 % of the final Shore A is achieved. If earlier release to traffic is necessary after 2 – 4 hours but:

- Joint must be recessed to avoid wheel contact. Smaller joints are obviously less at risk than large joints.
- Broadcast sealant with quartz sand 0.5 - 0.7 mm after 1 h, 23 °C.

**Note:** It is not recommended to broadcast joints that are frequently cleaned e.g. airport aprons or runways due to the increased roughness of the surface.

#### 4.9 CLEANING

Clean application equipment and tools immediately after use. Methyl ethyl ketone (MEK) achieves the best results as a cleaning solvent for Sikaflex®-406 KC. Alternatively, Sika® Colma Cleaner or Sika® Remover-208 can be used for cleaning uncured material. Once cured, material can only be removed mechanically.

#### CAUTION:

- Always refer to the relevant safety data sheet of the recommended cleaner/solvent for proper handling and personal protection procedures.
- Solvents can degrade plastic parts in equipment therefore, limit exposure time and potentially rinse plastic parts with water after cleaning with solvent.

## 5 FIELD TEST

#### Measurement of hardness

Control of Shore A hardness of cured Sikaflex 406 KC

#### Field Adhesion Test

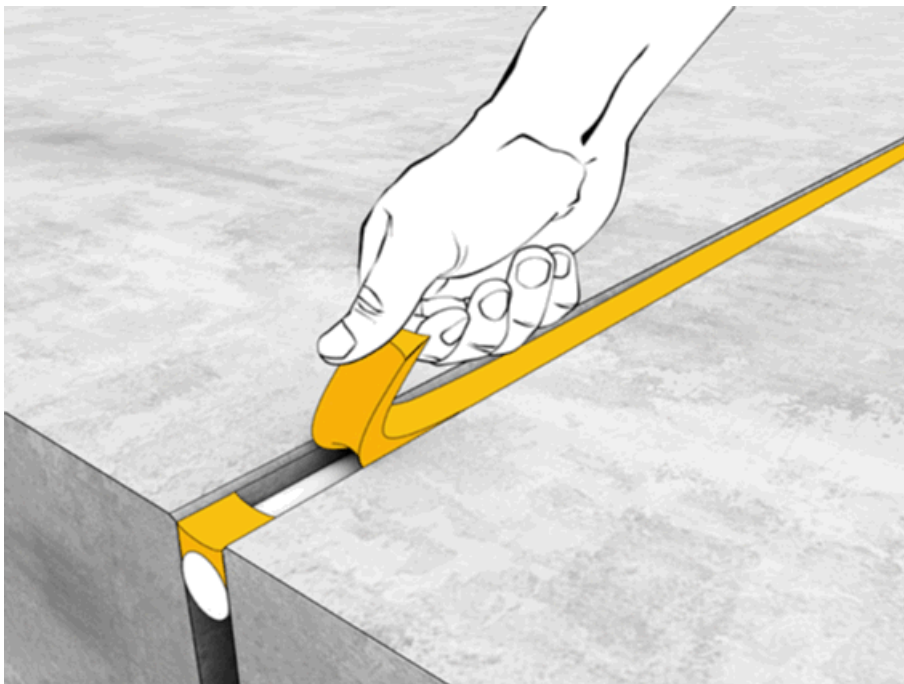
The field adhesion test is a qualitative screening procedure that may help to identify poor installation techniques used in the application of sealants. This will include poor cleaning, incorrect use of primer which could include selection of an unsuitable primer or omitting to use a primer when one is required, poor primer application or improper joint design. To evaluate the sealant adhesion on site, a simple hand pull test can be used at the job site.

Field adhesion testing should be documented. It is suggested that 5 tests for the first 500 meters and one test per 500 meters thereafter are carried out.



The hand pull field adhesion test procedure is as follows (see image below):

- Make a knife cut from one side of the joint to the other (perpendicular to the joint).
- Make two cuts (parallel to the joint) from the horizontal cut approximately 75 mm long, at both sides of the joint, making sure no damage is caused to the substrate surfaces.
- Place a 25 mm mark on the sealant tab.
- Hold a 50 mm piece of sealant firmly just beyond the 25 mm mark and pull at a 90° angle.
- Check the adhesion of the sealant to both substrates separately, even if they are of the same material. This is accomplished by extending the parallel cut along one side of the joint, checking adhesion to the opposite side, and then repeating for the other surface.
- 100% cohesive failure indicates a passed test and sufficient adhesion. If any signs of adhesive failure are observed, then Sika Technical Service should be contacted and a more detailed examination undertaken. For specific advice please contact Sika Technical Service.
- While executing the field adhesion test, inspect the quality of the joint section removed. Check if the sealant completely fills the joint, no voids or air bubbles are present and the sealant joint dimensions are in line with those specified on the drawings.
- Record the test results in a project log book so that the results can be included in the project records. Finally the removed part of the joint have to be replaced.



Picture 4. Field Peel Adhesion Test

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## 6 LEGAL NOTE

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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