



METHOD STATEMENT

Sika[®] Crack Injection, structural

30.04.2021 /VERSION 5 / SIKA UK / STEPHEN ARMFIELD

WATERPROOFING

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1 SCOPE

This method statement describes the step by step procedure for structural crack repair by injection.

2 DESCRIPTION

This method statement describes the structural (= force transmitting) crack repair of dry, wet and even oily cracks by means of epoxy resin injection via packers and injection pumps.



2.1 LIMITATIONS

- Products shall only be applied in accordance with their intended use.
- Local product differences may result in performance variations. The most recent and relevant local Product Data Sheets (PDS) and Material Safety Data Sheets (MSDS) shall apply.
- All work shall be carried out as directed by a supervising officer or a qualified specialist.
- Not all products are available in local countries.
- Crack filling by gravity – pouring – can also be done with Sika® Injection-400 Series and Sikadur® -52. As a simple application procedure this is not handled in this Method Statement.

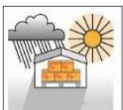
3 REFERENCES

To ensure correct application of all components of Sika® Injection and Sikadur®, please refer to PDS (Product Data Sheet) and MSDS (Material Safety Data Sheet) of each product component.

4 PRODUCTS

Sika Products	Description key words
Sikadur® -52 Sika® Injection-458 Sika® Injection-456	 Epoxy-based, compact, high strength injection resins with low viscosity for durable structural crack repair . (example picture)
Sikadur® -31 CF	 Epoxy-based, compact, high strength putty for durable crack patching . (example picture)

4.1 MATERIAL STORAGE



Materials shall be stored properly in undamaged original sealed packaging, in cool, dry conditions. Refer to specific information contained in the product data sheet regarding minimum and maximum storage temperatures.

5 EQUIPMENT

5.1 INJECTION EQUIPMENT

1-Component Injection pump equipped with high pressure hose and ball valve.

A handgun valve is convenient and safe.

Piston pumps and diaphragm (airless) pumps are recommended.

Nipple-gripper for round-head nipples (4 claws recommended).

Connection between pump and Sika® Injection Packer Type MPS.

The nipple-gripper shall be replaced periodically as the seal wears through normal usage

Sika® Mechanical Packers, Type MPS		
Length (mm)	Ø (mm)	Type of fitting
70	13 / 17	Zerk, M6
115	13 / 17	Zerk, M6
Product Name: Sika® Injection Packer MPS Length-Ø e.g. Sika® Injection Packer 115-13		

Sika Surface Packer, Ø= 44mm → Sika® Injection Packer SP 44

Mixing Paddle (plastic, steel, wooden)

Depending on the quantity

Driller:

Diameter: depending on packer (+1mm wider than the packer)

Length : >250mm depending on structure



Impact drill (we recommend Hilti)



Tool box with screwdrivers, wrenches, ratchet set (Diameter 6mm up to 24mm), tongs, etc.



Battery drill (we recommend Hilti)



Clean buckets



Measuring cups



Cleaning towels



6 HEALTH AND SAFETY

6.1 PERSONAL PROTECTION

Work Safely!



Handling or processing injection products can cause chemical irritation to the eyes, skin, nose and throat.

Appropriate eye protection should be worn at all times while handling and mixing products.

Safety shoes, gloves and other appropriate skin protection must be worn at all times.

Always wash hands with suitable soap after handling products and before food consumption.

In addition to protective clothing it is also recommended to use a barrier cream on the skin. If any injection resin gets on clothing, remove the garment at once. The friction of resin-saturated fabric on the skin can cause serious chemical burns. Wash your exposed skin occasionally during the workday and immediately if any material gets on it. Avoid using solvents, since they can help material penetrate into the skin and solvents themselves are aggressive and harmful to the skin. Avoiding skin contact by keeping tools and equipment clean is one of the best ways to protect oneself. Despite safety precautions, with any instances of skin contact rinse immediately with clean warm water and use soap to thoroughly clean the skin.

FOR DETAILED INFORMATION REFER TO THE MATERIAL SAFETY DATA SHEET

6.2 FIRST AID



Seek immediate medical attention in the event of excessive inhalation, ingestion or eye contact causing irritation. Do not induce vomiting unless directed by medical personnel.

Flush eyes with plenty of clean water, occasionally lifting upper and lower eyelids. Remove contact lenses immediately. Continue to rinse eye for 10 minutes and then seek medical attention.

Rinse contaminated skin with plenty of water. Remove contaminated clothing and continue to rinse for 10 minutes and seek medical attention.

FOR DETAILED INFORMATION REFER TO THE MATERIAL SAFETY DATA SHEET OF THE CORRESPONDING PRODUCT!

7 ENVIRONMENT

7.1 CLEANING TOOLS / EQUIPMENT

Tools and equipment used for mixing and applying Sika® Injections can be cleaned according to the PDS Sika® Injection Cleaning Systems.

Sika Products Injection Material	Description Key words
Sika® Injection Cleaner C1	Cleaning agent for cleaning injection pumps during or directly after the injection
Sika® Injection Cleaner C2	Very strong cleaning agent for cured resins. It can be used to remove cured resins from tools and pump parts. Not for pump cleaning.
Sika® Injection Conservator	Cares for the valves and seals of a pump if the pump will not be used for a long time.

7.2 WASTE DISPOSAL



Do not empty surplus material into drains. Dispose responsibly through a licensed waste disposal contractor in accordance with legislation and local / regional authority requirements. Avoid run-off into soil or waterways, drains or sewers.

Hardened resins can be disposed of with other combustible waste in a waste incineration plant. Under no circumstances burn the resin in an open fire, due to the potentially dangerous gases which could be released. Uncured resin must be disposed of as hazardous waste. It is forbidden to mix it with conventional waste.

FOR DETAILED INFORMATION REFER TO THE MATERIAL SAFETY DATA SHEET

8 SUBSTRATE PREPARATION

Cleaning of the surface helps the technician to identify the exact location and the width of the crack to be injected. Sometimes the concrete surface is hidden under a surface of mineral deposits left from long-term water leakage. Items that obscure the crack should be removed, because the crack must be seen clearly in order to lay out the drilling patterns for the injection holes.

The cracks must be free from loose particles, dust, oil, grease or any other contamination etc.

Moisture, dampness up to non-pressing water and small amounts of oil can be tolerated if special resins are used.

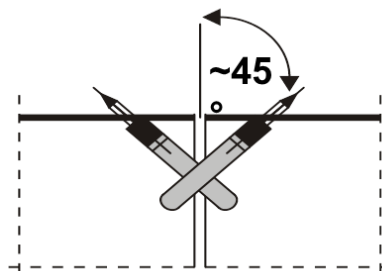
9 INSTALLATION OF PACKERS

9.1 INJECTION VIA DRILL HOLE PACKERS

In order to inject the resin into a crack that reaches into the middle of the structure, usually mechanical injection packers are used. In some exceptional cases such as very thin structures, heavily reinforced structures, drilling prohibited, etc. surface packers are used (see 9.2). The objective of the repair depends on the degree of penetration (crack width/thickness). For structural repair >75% of the crack's volume must be filled.

The correct installation is very important to ensure a continuous injection and durable crack repairing results.

Drill packer holes at 45° angle to the concrete



Dimension of the drill-hole depending on the used packer and thickness of the wall; typically 7-14 mm.

\varnothing of drill hole = \varnothing of packer + 1 mm

Drill hole depth:

$\sim d$ = long enough to reach minimum the middle of the structure under approx. 45° drilling angle



d: building component thickness

d/2: interval

- from packer to packer

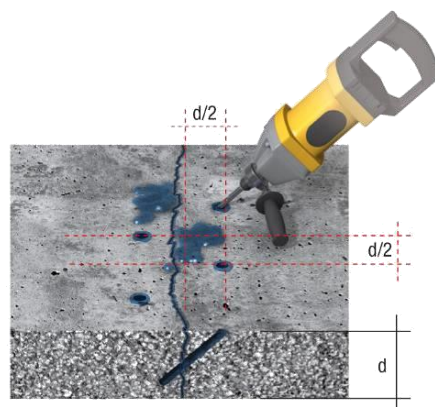
- from packer to crack

Packer placing alternately on both sides of the crack.

After drilling, remove dust e.g. using oil free compressed air. Otherwise the dust can block the fine crack branches.

Optional crack patching e.g. with Sikadur®-31 CF avoids spilling of resin and ensures the high degree of filled volume.

Place Sika® Injection Packers in the previously drilled hole, so that the top of the rubber sleeve is below the concrete surface. If the packer cannot be pushed into the hole, tap it in. Tighten the packer with a wrench. Remove the nipples in order to check the connectivity and flow of injection resin later on.



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Crack patching (e.g. with SikaDur-31 CF) is necessary to avoid spilling of the resin. It allows building up pressure in the crack and makes sure the crack is fully filled after the injection process.

Leave a venting hole (in vertical cracks the last packer in the row at the highest point of the crack) for controlling the filling progress.

Observe curing times and refer to relevant PDS.



Fix the nipple on the first (starting) packer.

In horizontal cracks the starting packer is the one at narrowest part of the crack.

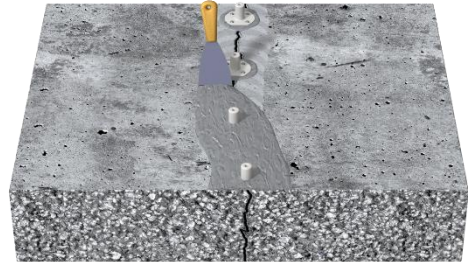
In vertical cracks the starting packer is the lowest one.

Injection can be started after patching is cured

9.2 INJECTION VIA SURFACE PACKERS

Fix the surface packer with a nail directly on the crack.

The nail will keep the injection canal open and holds the packer until the adhesive is cured. Use epoxy adhesive e.g. SikaDur-31 CF for installation/patching.



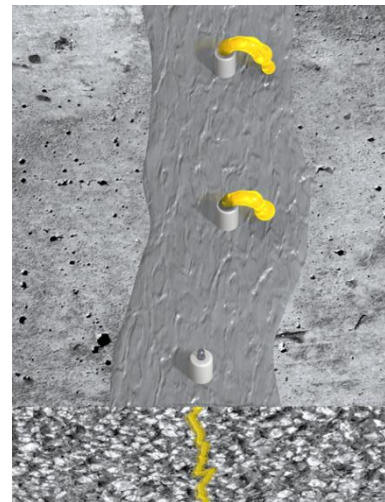
If surface packers are used, e.g. thin structure or when drilling is prohibited, it must be considered that full crack penetration is mandatory for structural repair.

Fix the nipple on the first (starting) packer.

In horizontal cracks the starting packer is the one at narrowest part of the crack.

In vertical cracks the starting packer is the lowest one.

Injection can be started after patching is cured.



10 MIXING

Prepare the injection material according to the Product Data Sheet and fill into the pump hopper. Measure accurately, stir briefly and use within the pot life. Prepare only that amount you are able to apply well within the pot-life. Epoxy resins may create a lot of heat during reaction.

11 INJECTION

The applicator should be carefully watching three points of reference:

- The crack/packers Resin flowing out of the work face.
- The pressure line For pump pulsations indicating resin flow.
- The gauge (if available) For actual injection pressure applied.

Begin the injection at the point of highest resistance to ensure good penetration and minimal loss of chemicals. This is usually the lowest point on a vertical crack and the narrowest on a horizontal surface.

Material:

Crack filling materials for structural repair must have excellent bond to crack edges and achieve equal or even higher mechanical values than the ambient structure.

If new cracks appear – these will show up in untreated areas beside the previously repaired crack.

Epoxy based injection resins: Sika® Injection-400 Series or Sikadur®-52 can be used (always refer to PDS).

Objective	State of Moisture		
	Dry	Damp	Wet <small>(even oily, no pressure)</small>
Just closing	Sikadur®-52 Sika® Injection-458	Sikadur®-52 Sika® Injection-458	Sika® Injection-456
Structural Repair	Sikadur®-52 Sika® Injection-458	Sika® Injection-458 Sika® Injection-456	Sika® Injection-456

11.1 STRUCTURAL REPAIR OF DRY, DAMP, WET (WITHOUT HYDROSTATIC PRESSURE) AND EVEN OILY CRACKS

Products: Sika® Injection-400 Series or Sikadur®-52

Start pumping Once the connection is made, start the pump and begin injecting through the starting Sika® Injection Packer.

Injection process Injection material is now filling the packer then the drill hole (mechanical packers) and finally the crack.

Injection can be successfully performed at the lowest possible injection pressures. The pump should be set to the lowest level. This allows to penetrate well into all gaps and even finest hairline fissures down to approx. 0.15 mm (depending on the material used and application temperature).

Slow, low-pressure injections are more effective than rapid, high-pressure injections. A successful injection will be indicated by the pump’s refusal of injection resin (quit pumping) or by the sight of resin seeping out of any of the

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open packers. When this happens, install a nipple at the next packer in the row and continue the injection in this way until resin is visible at the last packer.

Within the pot-life of the resin a secondary injection should be done, ensuring the crack is completely filled (optional).

In that case injection is started at the first packer again. All nipples except the last one stay installed. Usually resin will immediately be visible from the venting hole/ last packer. If not – injection has to be continued and again controlled by a secondary injection.

Finally the last packer can also be closed and some few strokes of resin injected at lowest pressure into it.

Attention: High injection pressure can damage the structure and can occur an additional damage of the structure (a zip effect). For maximum injection pressure see section 11.2.

Injection progress can be checked by monitoring injection material coming out of the next packer.

Stop pumping

After the injection is finished, close the ball valve on the pump assembly and turn the pressure down. Disconnect the pump hose from the Sika® Injection Packer. Stop the pump and release pressure from the hose.

Cleaning

Clean pump and tools according to the PDS of Sika® Injection Cleaning System. Uncured resins can easily be flushed out with Sika® Injection Cleaner C1. Then fresh cleaner should be circled through the pump for at least 2 minutes.

Finish

The crack is repaired after material is fully cured.

Preparing the surface

After curing, packers can be removed (e.g. knocked off). Fill drill holes with suitable mortar/patching material. Clean the crack surface if required. Remove patching mechanically by grinding and/or with hot-air-gun.



11.2 APPLICATION LIMITS

- Always check the material's pot life and adjust for climate conditions. Do a hand test before injection.
- Best results can be achieved when the crack is widest open – e.g. cold season, early morning.

- Cracks filled with water or oil must be flushed with Sika® Injection-456 prior to final crack filling. Resin mixed with these substances has to be flushed out before fresh resin will do the job.
- Very high quantities of oil should be reduced by flushing with warm water/soap water before injecting starts.
- The maximum injection pressure can be calculated through:

$$P_{max.} = (\text{concrete strength} \times 10) / 3$$

Best injection results are achieved by holding a low pressure for as long as possible in order to fill all cracks, gaps, branches and hairline fissures.

12 INSPECTION, QUALITY CONTROL

As part of "Good Practice" the contractor shall apply an inspection procedure to check the quality of the applied repair system. This includes a **hand test** cup sample of the material as well as a **visual inspection** of the finished job.

13 DISCLAIMER AND ADDRESS OF SIKA COMPANY

The information contained herein and any other advice 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. The information only applies to the application(s) and product(s) expressly referred to herein and is based on laboratory tests which do not replace practical tests. In case of changes in the parameters of the application, such as changes in substrates etc., or in case of a different application, consult Sika's Technical Service prior to using Sika products. The information contained herein does not relieve the user of the products from testing them for the intended application and purpose. 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.

14 KEY WORDS

Sika® Injection, Cracks, Crack, Injection, Injections, Sika® Injection-458, Sika® Injection-456, Sikadur®-52, Resin, Sikadur®-31, Epoxy, Structural, Force transmitting, Crack Repair, Refurbishment, Waterproofing.

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