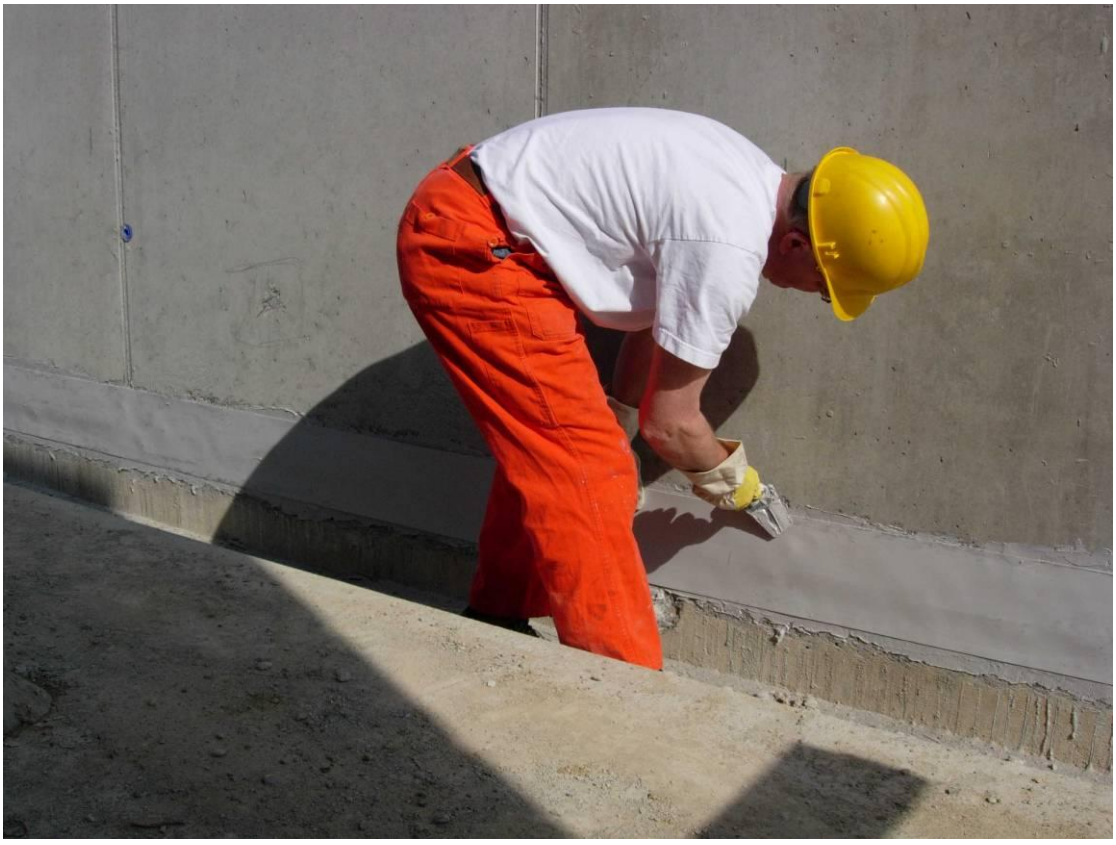
Construction

Method Statement
Sikadur-Combiflex® SG System
"Sika Services AG"

Storage Place: Sika Intranet BU Contractors
Key Words:
Joint waterproofing system, construction joints, expansion joints, crack repair, FPO tape,
Scope:
System description, system build-up, application and welding procedures for the Sikadur-Combiflex SG system.



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1. System Description

The Sikadur-Combiflex SG system is a high performance joint and crack sealing system for construction joints, expansion (movement) joints and connection joints or cracks. The system allows variable and high levels of movement in one or more directions, whilst maintaining a high quality watertight seal.

The Sikadur-Combiflex® SG system consists of a modified flexible Polyolefin (FPO) waterproofing tape, with advanced adhesion properties and a range of different special Sikadur® epoxy adhesives for use in different types of applications and conditions.

Uses
Sealing all types of joints and cracks in many different structures and applications including:

- Tunnels and culverts
- Hydro electric power plants
- Sewage treatment plants
- Basements
- Water retaining structures, including drinking water reservoirs
- Cast iron, steel and concrete pipes
- Swimming pools

Sealing of:

- Joints with high movement
- Joints with movement in more than one direction
- Structures where differential settlement is anticipated
- Cracks – moving and non-moving

Repair / reinstatement of existing damaged / leaking joint sealing systems such as:

- Waterbars
- Old deteriorated joint sealing systems

Characteristics/Advantages

- Advanced adhesion between the tapes and the adhesives, no activation of the tapes is required on site
- Fast and easy to install
- Suitable for dry and damp concrete surfaces
- Extremely flexible
- Performs within a wide range of temperatures
- Excellent adhesion to many different substrate materials
- Weathering and water resistant
- Available with normal and rapid hardening grades of the adhesives
- Root penetration resistant
- Good resistance to many different chemicals
- Versatile sealing system suitable for installation and problem solving in many difficult situations

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1.1. References

To ensure the correct application of Sikadur-Combiflex SG system, please refer to the following reference documents:

- PDS (Product Data Sheet)
- MSDS (Material Safety Data Sheet)

Approvals
Hygiene Institute: Test report No. K-178989-09 for contact with potable / drinking water according to KTW-Guideline of the Federal Environment Agency (UBA), July 2009

Assessment for resistance to root penetration according to CEN/TS 14416

1.2. Limitations

According to the Product Data Sheet, certain limitations are defined for the products in application and service:

In application:

- Substrate temperature
- Ambient temperature
- Substrate moisture content
- Dew point conditions

In service:

- Chemical resistance
- Heat resistance
- Maximum permissible expansion movement

Please refer to the PDS (Product Data Sheet) to confirm the precise details of these application and service limitations.

2. Products

The Sikadur-Combiflex SG system consists of the flexible / elastic waterproofing tapes Sikadur-Combiflex SG and a range of defined Sikadur adhesives for different applications and conditions.

Sikadur-Combiflex SG tapes
The Sikadur-Combiflex® SG tapes are flexible / elastic preformed waterproofing tapes based on modified flexible Polyolefin (FPO) with excellent adhesion to Sikadur epoxy adhesives.

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Sikadur-Combiflex SG type P
Flexible light grey membrane supplied as tapes / sheets

	Sikadur-Combiflex® SG-10 P	Sikadur-Combiflex® SG-20 P
Tape thickness [mm]	1.0	2.0
Tape width [mm]	100, 150, 200, 250, 300, 400, 500, 1000, 2000	150, 200, 250, 300, 400, 500, 1000, 2000
Tape length [m]	25	25

Sikadur-Combiflex SG type M
Flexible light grey membrane tapes with temporary red masking strip for easier application in movement joints.

	Sikadur-Combiflex® SG-10 M	Sikadur-Combiflex® SG-20 M
Tape thickness [mm]	1.0	2.0
Tape width [mm]	100, 150, 200, 250, 300	150, 200, 250, 300
Tape length [m]	25	25

Sikadur Adhesives
To achieve a durable, watertight connection between the Sikadur®-Combiflex® SG tape and the substrate, a range of Sikadur® epoxy resin based adhesives are used.

Sikadur®-Combiflex® CF Adhesive
Light grey 2- component epoxy resin based

- Optimum workability and ease of finishing
- Provides a smooth surface finish
- Normal and rapid hardening grades available

Packaging
20 kg units part A
10 kg units part B

Sikadur®-31 CF
Light grey 2- component epoxy resin based

- For use where a higher layer thickness is required
- Normal and rapid hardening grades available

Packaging
6 kg units (A+B) combined pack
20 kg unit part A
10 kg unit part B

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Sikadur®-31 DW
Grey 2- component epoxy resin based

- For installation where approval for contact with potable / drinking water is required

Packaging
6 kg units (A+B) combined pack
30 kg units part A
10 kg units part B

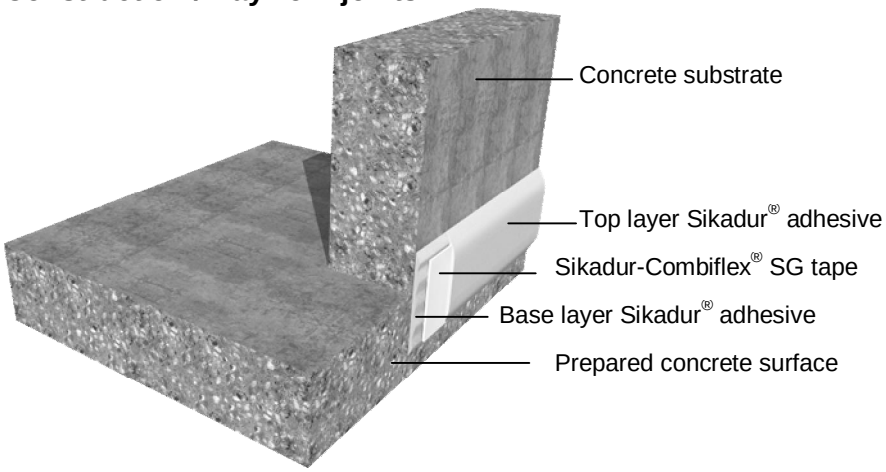
Sikadur®-33

- Designed for machine mixing and dosage with the *Sika® CoMix-101*
- Ideal when very high volumes are required

Packaging
15 L units part A
15 L units part B

2.1. System Build - Ups

Construction / Daywork joints



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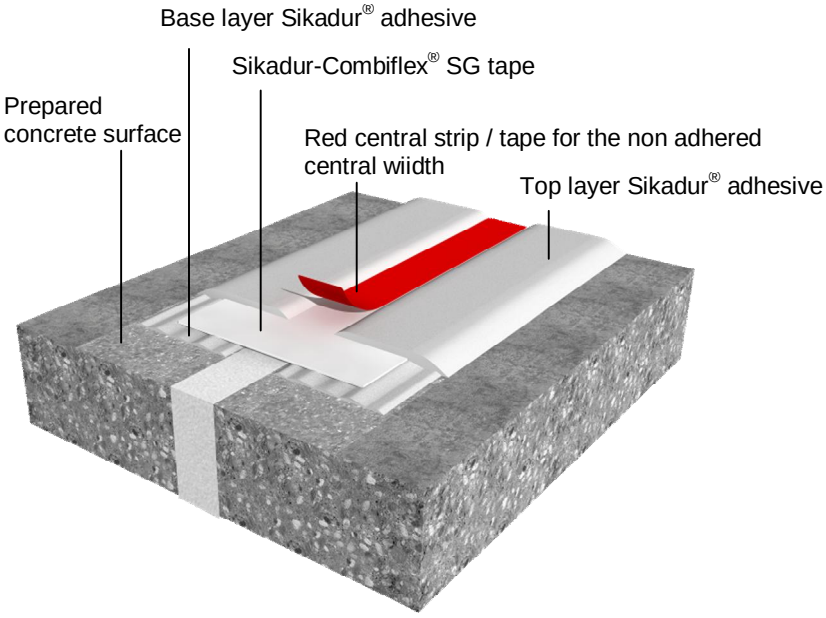
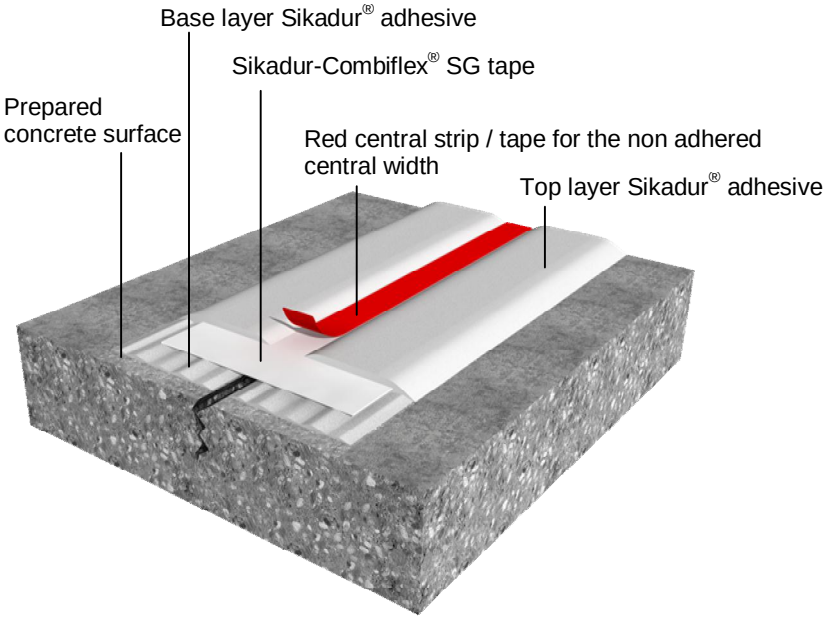
Movement / Expansion joints



Crack repair



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3. Safety Measures on Site

Personal Protection:

The following symbols are typical of the internationally required labelling for epoxy resins and hardeners. In accordance with these labels, the products should be transported, stored and applied according to the appropriate local regulations. Please also observe any other relevant local regulations (Please also refer to the local PDS and MSDS).

The following protective equipment is essential for anyone working with any epoxy resin based product and therefore these instructions must be strictly adhered to:


Wear protective overalls


Wear safety goggles


Wear protective gloves

In addition to protective clothing it is also recommended to use a barrier cream on the skin. The use of a barrier cream is more useful and effective than often reputed, they are inexpensive, convenient, and protect well if they are not frequently flushed with solvents. However, barrier creams are only a supplement to and not a replacement for protective gloves, so always wear gloves. Always ensure there is no contamination inside gloves before reusing them.

Ensure sufficient ventilation during application in closed or confined spaces.

If any epoxy resin or hardener component gets on to 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 epoxy gets on it. Avoid using solvents since they can help epoxy material penetrate in to the skin and solvents themselves are aggressive and harmful to the skin. If water is not available at any time, then clean the contamination with sand instead, it works well. Certain hand cleaners also work without harmful effects. Citrus skin cleaners, for example, are effective and mild. Soap and water takes time, but also eventually works for small areas of the skin.

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Avoiding skin contact by keeping tools and equipment clean is one of the best ways to protect oneself. Remember, epoxy resin based products are very sticky, which is partly why they work so well in construction, so it is important to keep them from sticking to people on site.

Despite taking all recommended safety precautions, if there are any instances of skin contact then rinse immediately with clean water and use warm water and soap to thoroughly clean the skin.

A good skin cleaner is:

Skin cleaner
Sika Topclean T

No epoxy resin applications should proceed without sufficient water being immediately available and adjacent to the work area for eye washing. If adequate clean water is not provided then the project should not commence, no matter what the urgency.

Numerous workers and observers have suffered injury due to resin entering their eyes when there was no water available to clean them. If a professional eyewash kit is not available, then at the very minimum one quart of clean water must be present. The water can be in a pail, plastic jug or via a hosepipe, but it must always be directly adjacent to the work area i.e. a water source on the opposite side of the building or site is not good enough. Safety glasses or other eye protection obviously reduce the risk but they can also create a false sense of security. Do not take risks with health and safety!

Professional eyewash kit available

In the event of any spillage or contact with the eyes, always seek medical advice immediately after rinsing and cleaning the eyes with clean water

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Dependent on local regulations respiratory breathing masks may be required. Please observe all relevant local regulations.

Breathing protection required

The following equipment is also generally recommended on construction sites:

Wear hard hats

Wear safety shoes with steel toe caps

Wear ear protection. For use of mixing equipment **à** please refer to the manufacturers advice

Please refer to the local regulations and the specific construction site requirements.

Waste Disposal:

Brush away and remove any excess adhesive into appropriate containers for disposal when cured, before it has hardened.

Hardened epoxy resin can be disposed of with other combustible waste in a waste incineration plant.

In no circumstances, burn the epoxy in an open fire due to the potentially dangerous fumes that could be released.

Uncured epoxy resin must be disposed of as hazardous waste. It is forbidden to mix it with conventional waste.

Always dispose of excess or waste materials in accordance with local regulations.

Cleaning of Tools:

Uncured material can be removed with Sika Colma Cleaner.

Cured material can only be removed mechanically (or with heat treatment).

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3.1. Surface Preparation

Substrate surface preparation is one of the most important criteria for good adhesion with resin systems such as the Sikadur epoxy adhesives, which have excellent adhesion on many different substrates correctly prepared as follows:-

Requirements for the substrate prior to preparation:

- Any weak or damaged concrete must be removed and any surface defects such as blowholes or voids must be fully exposed and repaired if required.
- Concrete and cement mortars must be older than 28 days (according to the minimum substrate strength requirements).
- Confirm the substrate strength (concrete, masonry, natural stone etc). If in doubt, make a test area first.
- The substrate surfaces must all be sound, clean and free from contaminants such as dirt, oil, grease, rust, existing surface treatments and coatings etc.
- All loose particles must be removed.
- The substrate must be dry or mat damp and free from any standing water, ice etc.

If in doubt, make a test area first and confirm the bond strength with pull-off testing equipment, as shown on the left.
(i.e. Proceq or similar equipment)

The surface preparation:

Concrete, cement mortar, natural stone:
These substrates must be mechanically prepared e.g. by blastcleaning, to be free from any cement laitance, damaged concrete, old surface treatments or coatings and then all loose or friable particles must be removed to achieve a contaminant free, open textured surface.

Construction Steel (Grade 37):
Blastcleaning or equivalent mechanical means followed by thorough vacuum / dust removal. Avoid dew point conditions during application.

V2A-Stainless Steel (WN 1.4301):
Light grinding followed by thorough vacuum/dust removal. Avoid dew point conditions during application.

Polyester, epoxy resin, ceramic and, glass substrates:
Light abrasive roughening followed by thorough vacuum/dust removal.
Do not apply to siliconised or silicone oil treated substrates (debonding agent). Avoid dew point conditions during application.

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3.2. Mixing

Pre-batched units:
Stir each component and then mix parts A+B together in the Part A tin for at least 2 minutes with a resin mortar mixing paddle attached to a slow speed electric drill (max. 500 rpm) until the material becomes smooth in consistency and a uniform grey colour. Avoid aeration while mixing. Then, pour the whole mix into a clean container and stir again for approx. 1 more minute at low speed to keep air entrapment at a minimum. Mix only that quantity which can be used within its pot life.

Bulk packaging, i.e. non pre-batched units:
First, stir each part thoroughly. Add the parts in the correct proportions to a suitable mixing container and mix using an electric low speed mixer as outlined above for the pre-batched units.

4. Application / Installation

Substrate and ambient temperatures

Sikadur®-Combiflex® CF Adhesive and Sikadur®-31 CF:

Type Slow:from +25°C to +45°C
Type Rapid: from +5°C to +15°C
Type Normal: from +10°C to +30°C

Sikadur®-31 DW:

From +10°C to +30°C

Substrate moisture content
Cementitious substrates:
Dry, or mat damp, with no standing water
When applied to mat damp concrete, brush the adhesive well into substrate.

Relative humidity (air)
85% Maximum (at +25°C)

Dew Point
Avoid condensation
The substrate must be at least 3°C above the dew point.

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4.1. Application Method

Surface preparation as outlined in Section 3.1 Substrate Preparation above

Tape preparation
If there is any dirt on the tapes clean their surface with a clean, dry or damp cloth. Use water and no solvents for this cleaning. Check the integrity of the Sikadur-Combiflex® SG Tapes to ensure that there is no damage from storage and transport. Remove any damaged sections if necessary.
Note: No activation of the Sikadur-Combiflex® SG Tapes is required on site

Masking tape
For installation on expansion joints or cracks > 1 mm the centre of the tape must not be “bonded” to the joint filler or substrate. In these situations, apply masking tape on top of the joint / crack and on both outer sides of the prepared joint / crack area before applying the adhesive.

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Mixing As Section 3.2 Mixing above

First layer of Sikadur® adhesive
Apply the mixed Sikadur® adhesive on both sides of the joint / crack onto the prepared substrate using a suitable brush, trowel or spatula. If the concrete substrate is damp, force the adhesive firmly into the substrate. The thickness of this layer of adhesive should be 1 - 2 mm and the width on each side of the joint / crack at least 40 mm.

Before placing the Sikadur-Combiflex® SG Tapes remove the masking tape on top of the central expansion joint / crack area

Sikadur-Combiflex® SG Tape application
Apply the Combiflex SG tape within the open time of the adhesive. Press the tape firmly, without entrapping air, into the adhesive using a suitable roller. The adhesive should be squeezed out on both sides of the tape by ~ 5 mm.
For expansion joints / cracks > 1 mm apply the Sikadur-Combiflex® SG-10/-20 M Tape with the central red strip facing upwards.
In situations with high joint movement, place the tape into the joint as a loop.

Top layer of Sikadur® adhesive
Let the first layer of the Sikadur®-adhesive stiffen and begin to harden before the top layer is applied. Apply the top layer of adhesive at a thickness of ~ 1 mm on both sides of the joint / crack, producing a fully covering layer which tapers outwards to almost zero.

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Remove masking tape and red central strip
Remove the outer edge masking tapes, then remove the red central strip to ensure a neat and precise detail.

Tape connections
The Sikadur-Combiflex® SG Tape ends are connected by hot air thermal welding. The welding area must be prepared by abrading and roughening the surface with scotch-brite pads or sandpaper.
Roughen the tapes only in the welding areas otherwise their adhesive bond can be affected.
All Combiflex SG Tape welded overlaps have to be 40 - 50 mm.

Notes for application

- If the joints are to be subjected to positive hydrostatic water pressure, the Combiflex® SG tape must be supported in the joint. Hard foam filler or an extended joint sealant is recommended. For exposure to negative water pressure from outside, the Sikadur-Combiflex® SG Tape must be secured with a steel plate fixed on one side of the joint.
  Pressure limits without support are: For 5 mm wide joints at +20°C and max. 1 bar head of water, a Combiflex SG tape – 20 P or -20 M of 2 mm thickness has to be used.

- If a bituminous wearing layer is to be installed on top of the Sikadur-Combiflex® SG System, then the temperature of the hot bitumen must not exceed +180°C if it is up to a maximum 50mm thickness. However for thicker bitumen layers up to 10 mm thickness, the temperature can be a maximum +220°C, if necessary apply the bitumen in layers and allow them to cool in-between.

- The Sikadur-Combiflex® SG Tapes must be protected from mechanical damage.

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§ The Sikadur-Combiflex® SG Tapes can not be connected to the Sikaplan WT membranes by hot air welding. (Use Sikaplan WT tapes – as an alternative – refer to the local Sika Technical Department for advice)

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4.2. Hot air welding

The Sikadur-Combiflex SG tape ends are connected by hot air thermal welding. Welding requirements are slightly different to the traditional Sikadur Combiflex Hypalon based tapes as follows

- The welding area must be prepared by abrading and roughening the surface with scotch-brite pads or sandpaper. Roughen the tapes in the welding area only otherwise their adhesive bond can be affected.
- Welding temperature: 380-400°C
- Overlaps to be 40 - 50 mm
- Solvents such as Sika Colma Cleaner do not improve the welding properties

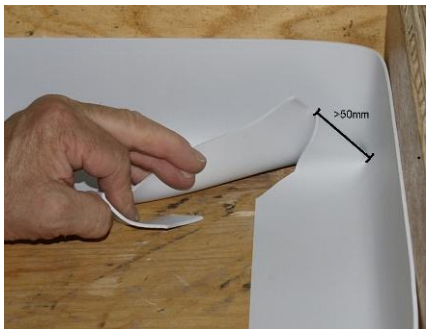
Inner corners

1. Remove the red central strip in the corner area.

2. Avoid welding already adhered tapes (Danger: Burning of the Sikadur epoxy adhesive). Therefore only bond the tapes up to 30 cm from the welding areas.

3. Install the tape:

Place the tape centred into the corner (half the tape width on the horizontal surface and half on the vertical side). Shape the protruding central fold into a crease with a 45° angle.



4. Cut the crease to form a 50 mm pocket

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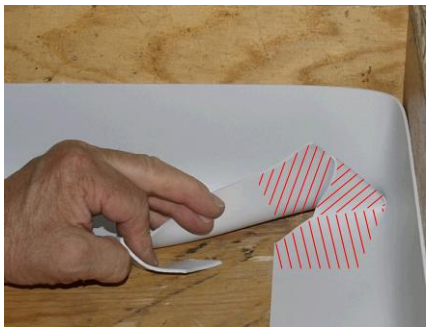
5..Roughen the inside of the pocket with sandpaper or scotch-brite pads

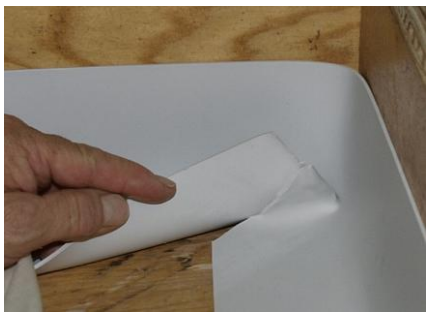


6. Roughen the tape side which is folded down and the area underneath it by using sandpaper or scotch-brite pads

7. Heat the inside of the pocket with the hot air welding gun.

Important Note:

To prevent heat accumulation in the corner, do not overheat the Sikadur-Combiflex SG Tape



8. Manually press the sides of the crease together from the inside to the outside.

Important Note:

The crease sides must be firmly pressed together. There must not be any air pockets / hollows.

9. Weld to close the overlap and manually press down on the pocket firmly. Welding is done from the inside of the corner working outwards.

10. Weld the overlap by using the roller and the hot air welding gun.

Important Note: There must be no loose areas, voids or “channels” underneath the welded, folded down areas.

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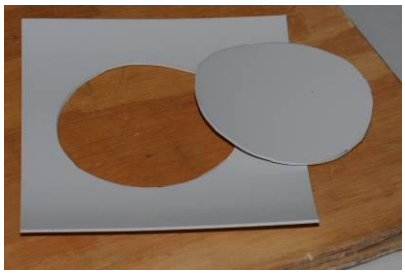
11. The welded seams are checked with a blade of a screwdriver on both sides and if necessary any defects made good

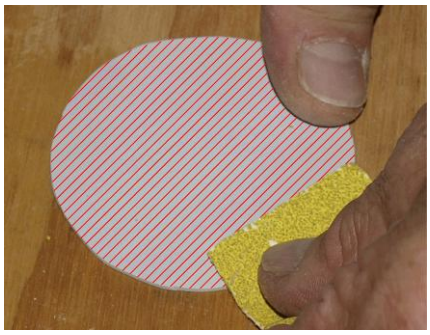
Important Note: Check carefully that the corner area on the reverse side has been formed properly and does not show any burn marks.

Repairs



12. After welding and inspection, if the corner area shows any signs of being burnt, then a repair must be carried out.

A square piece of the Combiflex SG tape is cut from the roll and then a roundel cut from it.



13. The roundel has to be roughened on its bottom side with sandpaper or scotch-brite pads.

14. Installing the Tape roundel:

Forming two creases at the bottom, the roundel is pressed into the corner.

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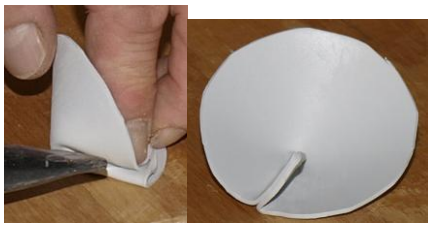
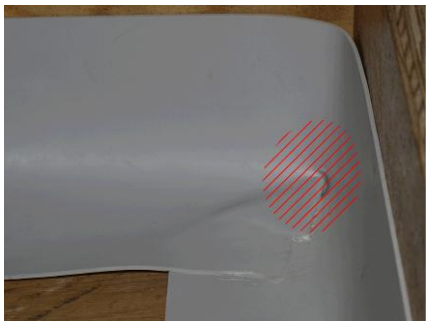


15. Heat the first crease and press it down firmly from inside the corner.

16. Roughen the area in the second fold

17. Heat the corner area and press it down firmly.



18. The formed roundel is then fully welded onto the damaged area after further abrasion to roughen the welding area of the existing tape.

19. Using hot air and manual pressure weld the roundel into place. We recommend spot welding it in to position first, to avoid any displacement during welding.

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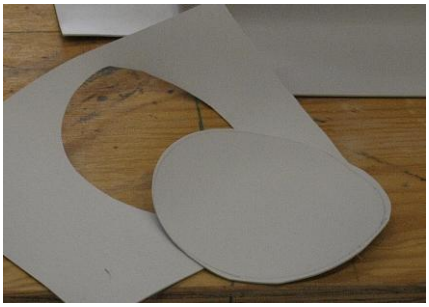
External Corners

1. Remove the red central strip in the corner area.

2. Avoid welding already adhered tapes (Danger: Burning of the Sikadur epoxy adhesive). Therefore only bond the tapes up to 30 cm from the welding areas.

3. Mark corners and cut the tape as required

4. Cut the horizontal side and fold the tape around the corner



5. A square piece of tape is cut form the roll and cut to a roundel. It is recommended to use a 2 mm thick tape for this as it is easier to install.

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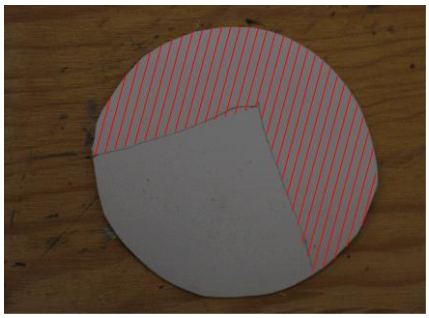
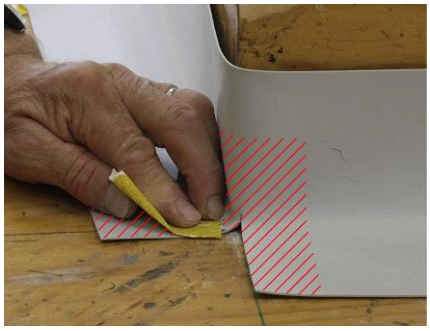
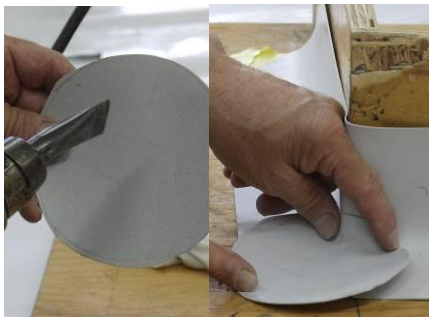
6. Mark the welding area.



7. Roughen the welding area on the roundel with sandpaper or scotch-brite pads



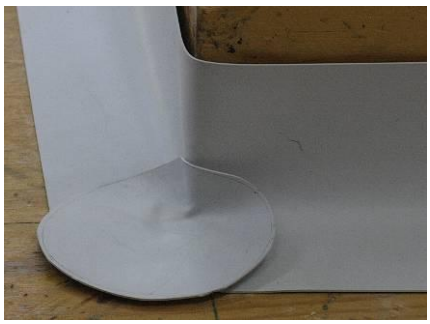
8. Roughen the welding area on the corners



9. Heat and shape the roundel to fit exactly over the corner area.

Practical Tip - Form the roundel by heating gently with the hot air welding gun over a sealant cartridge and pre-forming it to shape.

Important Note:
Form the roundel to shape slowly, otherwise the material can tear.



10. The roundel is ready as soon as it fits exactly over the corner area.

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Construction

11. Fix the roundel in position vertically by spot welding.

12. Heat weld the roundel vertically around the corner and press it on the previously applied tape

13. Weld the roundel on one side of the corner with the aid of a silicone roller. Repeat for the other side.

14. The welding seams on both sides are finally checked with the blade of a screwdriver, if required a repair must be carried out.

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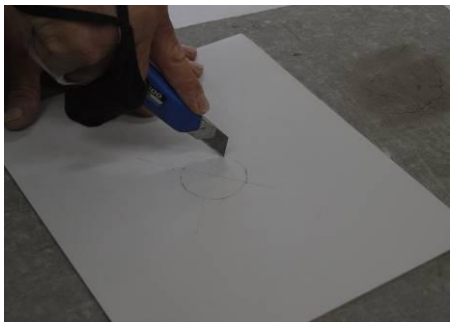
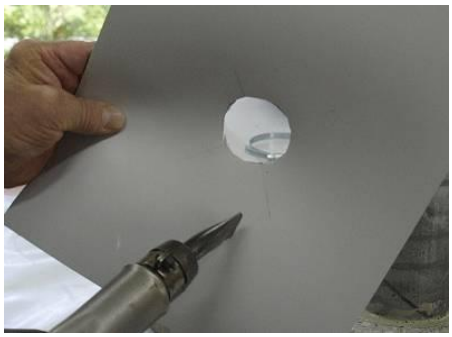
Construction

Pipe penetrations



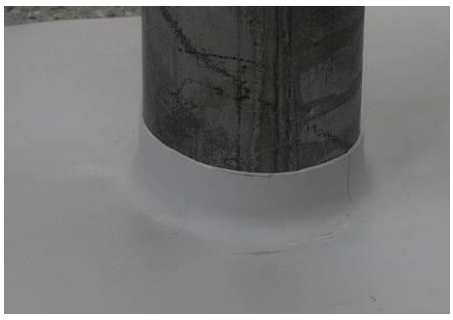
1. Cut a suitably sized square (e.g. 30 x 30 cm), using 2 mm thick tape.

Cut a small, round hole in the tape, diameter around 3-4 cm, or approximately half the pipes diameter.



2. Heat the tape around the cut hole

3. Position over the pipe and heat the tape again, widening the hole until the required diameter has been achieved.



4. Pull the tape square completely down to the concrete substrate.

5. Cut a piece of 1mm or 2mm x 15cm wide tape to form a sleeve overlap of at least 2-3 cm.

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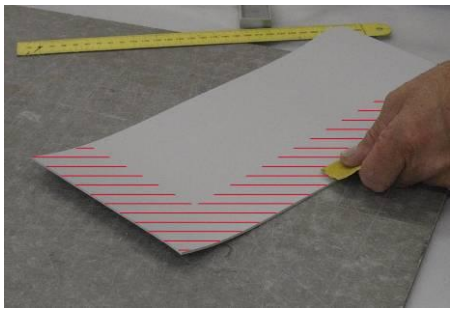
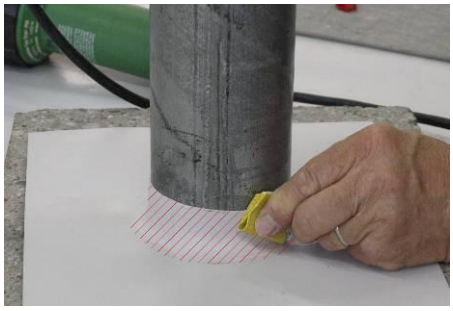
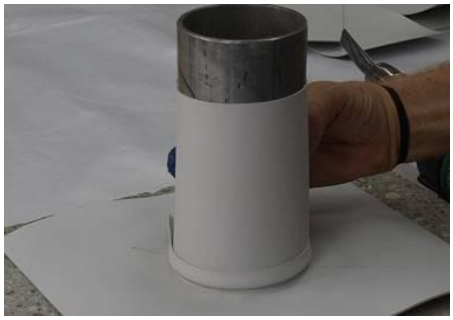


6. Roughen the welding area on the sleeve using sandpaper or scotch-brite pads.



7. Roughen the vertical area on the bottom square of tape



8. Heat the sleeve and fold to form a flange in position around the pipe.

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9. Spot weld the sleeve in the overlapping area on to the bottom piece around the pipe.

Then spot fix the sleeve to itself by overlapping

10. Weld the stretched flange on to the horizontal surface

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11. Weld the vertical sleeve overlap working from the bottom to the top.

Then the welded seams must be checked with the blade of a screwdriver and any repairs carried out if required.

Bonding the steel pipe penetration detail to the concrete

The finished detailing piece is lifted carefully. Then, on the horizontal backing a 1-2 mm thick layer of Sikadur-adhesive is applied onto the prepared concrete (not to the steel pipe). Now, the piece of tape is slowly pulled down and the horizontal area fully bedded in the adhesive with a roller, avoid any air entrapment.

Note: Substrate preparation and adhesive / primer selection according to the Product Data Sheet.

The top of the sleeve is pulled away from the pipe with a screwdriver and the tape is glued to the prepared and primed steel pipe, using Sikaflex-11FC (adhesive approx. 1-2 mm thick, for approx. 40 mm down / along and all around the pipe).

Note: Substrate preparation and adhesive / primer selection according to the Product Data Sheet.

Finally a stainless steel clamp is fixed (roughly in the centre of the area where the Sikaflex®-11FC was applied under the sleeve). Seal the top of the Combiflex SG pipe sleeve with Sikaflex®-11FC.

Important Note: Ensure that the clamp is well tightened.

Finally, the horizontal tape is bonded with a the 2nd layer of Sikadur adhesive (layer thickness approx. 1 mm).

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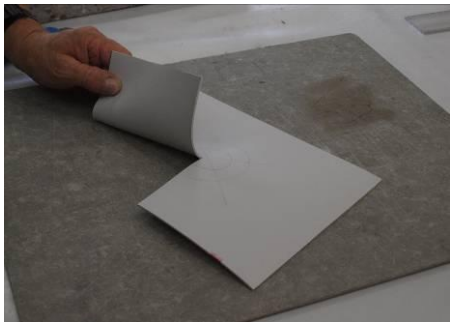
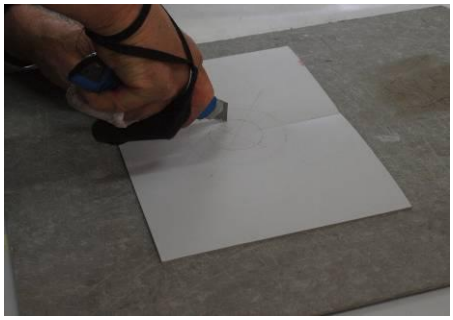
Construction

Lengthy Pipe Penetrations (no useable end opening)

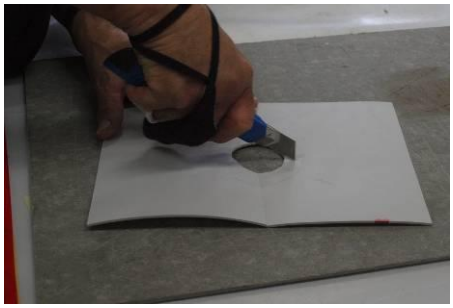


1. Cut a suitable square (e.g. 30 x 30 cm), of 2 mm thick Combiflex SG tape. Cut the tape to the centre as shown.



2. Cut a small, round hole in the centre of the tape, diameter 3-4 cm, or around half the pipes diameter.

Mark the pipes diameter on the tape.



3. Cut the tape from the cut hole to the marked diameter at intervals of approximately 15 mm.

4. Shape the piece of tape around the pipe.

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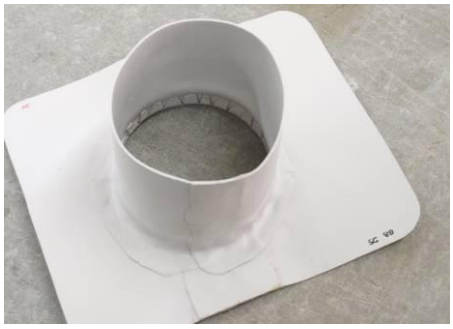
5. Cut an approximately 6 cm wide tape strip for use as a sleeve.

6. Roughen the back side of the 6cm strip with sandpaper or scotch-brite pads

7. Roughen the bottom piece in the butt joint area with sandpaper or scotch-brite pads

8. Weld the tape sleeve onto the base square using a hot air welding gun and roller.



9. Weld the sleeve in position, bond the tape to the substrate to the substrate etc. - All as.detailed to in the earlier sections above, of this Method Statement.

5. Equipment - Tools

Professional tools and equipment are required for safe application and to produce a watertight joint / detailing installation

Application of the Sikadur® adhesive

- Googles
- Butyl rubber/nitrile rubber gloves
- Respirator / breathing mask (in case of poor ventilation)
- Mixing paddle (twisted bar – non air entraining)
- Trowel / spatula / brush
- Masking tape

Welding equipment

- Hot air gun for tape welding
- Wire brush to clean the hot air gun.
- Roller to apply pressure whilst welding
- Scissors/cutter: cutting the tapes to the right dimensions

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Construction

6. Certificates

Hygiene Institute: Test report No. K-178989-09 suitable for use in contact with potable / drinking water suitability according to KTW-Guideline of the Federal Environment Agency (UBA), July 2009

Determination of resistance to root penetration according to CEN/TS 14416

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