



METHOD STATEMENT

Restoring Concrete Structures by Recasting Using Sika® Ready to use Mortars

JULY 2014 / V2 / SIKA AUSTRALIA

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1 SCOPE

This method statement describes the step by step procedure for repairing concrete structures using a technique of recasting using pourable Sika® MonoTop®, SikaTop® or Sika® EpoCem range ready to use mortar products.

2 SYSTEM DESCRIPTION

The Sika® concrete repair range is a system of products consisting of a bonding primer, reinforcement corrosion protection layer; mortar repair and levelling or smoothing mortar.

USES

- Bonding primers for promoting adhesion of a repair mortar on concrete
- Reinforcement corrosion protection applied on steel reinforcement bars in concrete (principle 11, method 11.1)
- Repair and reinstatement of damaged or contaminated concrete on buildings, bridges, infrastructure and super structure works (principle 3, methods 3.1 and 3.3)
- Increasing bearing capacity of a concrete structure by adding mortar for strengthening (Principle 4, method 4.4)
- Preserving or restoring passivity of steel reinforcement bars in concrete (Principle 7, methods 7.1 and 7.2)
- Increasing cover to reinforcement bars with additional mortar
- Repair of minor defects

CHARACTERISTICS/ ADVANTAGES

- Pre-mixed for quality
- 1-component products only add water
- Adjustable consistencies
- Versatile range of performances
- Low shrinkage
- Products with classified performance classes
- Bonding primer with long open time
- Systems with high resistance to water and chloride penetration
- Products which can be poured or machine applied by pumping
- Compatible system with Sikagard® concrete protection products

2.1 REFERENCES

This method statement has been written in accordance with the recommendations contained in European Standards EN 1504: Products and systems for the protection and repair of concrete structures, and the following relevant parts:

- EN 1504 Part 1: Definitions, requirements, quality control and evaluation of conformity
- EN 1504 Part 3: Structural and non-structural repair
- EN 1504 Part 7: Reinforcement corrosion protection
- EN 1504 Part 10: Site application of products and systems, and quality control of works

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2.2 LIMITATIONS

- Products shall only be applied in accordance with their intended use.
- Local differences in some products may result in some slight performance variations. The most recent and relevant local Product Sheet (PDS) and Material Safety Data Sheet (MSDS) shall apply
- For specific construction / build information refer to the Architects', Engineer's or Specialist's details, drawings, specifications and risk assessments.
- All work shall be carried out as directed by a Supervising Officer or a Qualified Engineer.
- This method statement is only a guide and shall be adapted to suit local products, Standards, legislations or other requirements.

3 PRODUCTS

Sika MonoTop® / SikaGrout®	1-component, ready to use repair mortar, bonding primer or reinforcement corrosion protection
SikaTop®	3-component, ready to use repair or levelling mortar
Sika® EpoCem®	3-component, ready to use bonding primer, reinforcement corrosion protection or levelling mortar

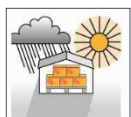
* INSERT LOCAL PRODUCT NAMES AND DESCRIPTIONS BUT NO PERFORMANCE VALUES (REFER TO PDS)

3.1 SYSTEM BUILD-UP

A Sika® repair system comprises a range of products to suit the needs.

Bonding Primer And Reinforcement Corrosion Protection	
Sika MonoTop®-910 N	Normal use
SikaTop®-110 EpoCem®	Demanding requirements
Concrete Repair Mortars	
Sika MonoTop®-436 N	R4 Fluid consistency normal use
SikaGrout® Deep Pour	R4 shrinkage compensated expanding pouring grout for deep pours up to 500 mm
Pore Sealer and Levelling Mortar	
Sika MonoTop®-723 N	R3 normal use
Sikagard®-720 EpoCem®	R4 demanding requirements

3.2 MATERIAL STORAGE



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

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4 EQUIPMENT

4.1 MIXING EQUIPMENT

Use professional equipment for mixing these products.



Single mixer with spindle paddle
small quantities



Double mixer with spindle paddles
medium quantities



Forced action pan mixer
large quantities

4.2 MATERIALS

Sufficient quantities Sika® repair materials	Refer to section 11
Sufficient clean potable water	For mixing 1-component, pre-wetting substrate & cleaning

4.3 ESSENTIAL EQUIPMENT

Hand tools	Trowels, floats, brushes for mortar application For constructing formwork
Concrete removal	Traditional tools, hammer-drill or suitable mechanical equipment for removing damaged or contaminated concrete
Measuring cylinder	For accurate measurement of mixing water
Mixing equipment	Refer to section 4.4
Mixing bowl	size ~18 - 20 litres per 20 kg bag
Formwork	To profile application
Sponge or pressurised air (oil free)	Wipe/blow away excess water from substrate
Sealant	For sealing formwork
Curing	Membrane or similar to protect exposed fresh mortar
Cleaning	Brush, low pressure water
Waste disposal	For paper bags and excess material

4.4 ADDITIONAL EQUIPMENT

Cleaning Equipment	Suitable for removing corrosion off reinforcement
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5 HEALTH AND SAFETY

5.1 RISK ASSESSMENT



The risk to health and safety from falling objects or defects in the structure shall be properly assessed.

Platforms and temporary structures shall provide a stable and safe area to work. Do not take any unnecessary risks!

5.2 PERSONAL PROTECTION



Work Safely!

Handling or processing cement products may generate dust which can cause mechanical irritation to the eyes, skin, nose and throat.

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

Approved dust masks shall be worn to protect the nose and throat from dust.

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

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

FOR DETAILED INFORMATION REFER TO THE MATERIAL SAFETY DATA SHEET

5.3 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

6 ENVIRONMENT

6.1 CLEANING TOOLS / EQUIPMENT

Clean all tools and application equipment with water immediately after use. Hardened material may only be removed mechanically.

6.2 WASTE DISPOSAL



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

FOR DETAILED INFORMATION REFER TO THE MATERIAL SAFETY DATA SHEET

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7 SUBSTRATE PREPARATION

7.1 CONCRETE

The concrete substrate shall be thoroughly clean, in a good sound condition and free from dust, loose material, surface contamination and materials which reduce bond. Delaminated, weak, damaged and deteriorated concrete shall be removed by suitable means. If necessary, some sound concrete may also be removed but not to detriment of the structural integrity and only as directed by a Supervising Officer or Qualified Engineer.

Methods of cleaning, roughening and concrete removal are summarised as follows:



	Cleaning	Roughening	Removal
<div> <div>■ Intended use</div> <div>□ For certain intended uses</div> </div>			
Hammer and chisel			■
Breaker		■	■
Grit and sand blasting	■	■	
Water Blasting with low pressure (max. 180 bar)	■		
Water Blasting with high pressure (max. 600 bar)		■	□
Water Blasting very high pressure (max.1100 bar)			■

Appropriate tool selection will depend on the type and extent of damage as well as the substrate quality and shall be agreed with the Supervising Officer or qualified Engineer.

Note: Hydro-demolition is a preferred fast and effective method of removing concrete which can result in no micro cracks in the concrete.

As defined in EN 1504-10, water jet categories are as follows:

- Low Pressure – Up to 18 N/mm² (MPa) / 180 bar / ~2,600 PSI
 - Used for cleaning concrete and steel substrate
- High Pressure – from 18 to 60 N/mm² (MPa) / 600 bar / ~8,700 PSI
 - Used for cleaning steel substrate and for removal of concrete
- Very High Pressure –from 60 to 110 N/mm² (MPa) / 1100 bar / ~16,000 PSI
 - Used for concrete removal when low water volume is available

Where: 1N/mm² = 10 bar = 145 PSI (lbf/in²)

Concrete removal shall be kept to a minimum and shall not reduce the structural integrity of the structure. Pneumatic equipment or tools which can damage concrete due to an intense vibration shall not be used.

The extent of concrete removal shall be in accordance with the chosen principle and method contained in EN 1504-9. In the case of repair and restoration the depth of contamination shall be established and taken into account when determining the depth of concrete removal.

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Removal of concrete shall continue to expose full circumference of the steel reinforcement to a minimum depth of 15 mm behind the back of the bars.

Breaking out shall continue along the reinforcement until non-corroded steel is reached as directed by the supervising officer or qualified engineer.



Edges around the patch repair shall be cut at an angle of $>90^\circ$ to avoid undercutting and a maximum angle of 135° to reduce the possibility of de-bonding.

Surface of the concrete substrate shall be roughened to 2 mm to increase bonding which can be tested in accordance with EN 1766: clause 7.2 for horizontal surfaces.

Micro cracked or delaminated concrete including damage caused cleaning, roughening or removal techniques shall be removed or repaired if they might reduce bond or structural integrity. Micro cracks can be detected by wetting the surface and allowing it to dry. Dark lines on the dried surface indicate cracks as they retain the water.

The finished surface shall be visually inspected prior to application and can be tapped lightly using a metal hammer to detect delaminated concrete. The supervising officer or qualified engineer shall be informed immediately of any loose, cracked or damaged surfaces. In these circumstances repair materials shall not be applied without prior written consent of the supervising officer or qualified engineer.

If a smoothing coat is required the whole application surface shall be properly prepared. Appropriate cleaning procedures consist of low pressure water blasting, abrasive grit and sand blasting, or high pressure water blasting to remove a laitance layer.

7.2 STEEL REINFORCEMENT



The steel reinforcement shall be thoroughly clean and free from rust, scale, mortar, concrete, dust and other loose and deleterious material which reduces bond or contributes to corrosion. Tie wire and nails shall also be removed.

The whole circumference of the bar shall be uniformly cleaned, except where structural considerations prevent this. Cleaning shall not damage in anyway the structural integrity of the steel. Immediately notify the supervising officer or qualified engineer if there is a possibility of damaging the steel by cleaning.

Exposed bars contaminated with chloride or other deleterious material shall be cleaned by low pressure water jet (18 MPa) and checked afterwards to ensure the contamination has been totally removed.

If a reinforcement corrosion protection layer in the form of an active coating (method 11.1 as defined in the European Standards EN 1504-9) is to be applied, then the steel reinforcement shall be cleaned to Sa 2 defined by ISO 8501-1.

If reinforcement corrosion protection layer in the form of a barrier coating (method 11.2 of EN 1504-9) is to be applied, then the steel reinforcement shall be prepared to Sa 2½ defined by ISO 8501-1.

Cleaned bars shall be protected against further contamination prior to application of a reinforcement corrosion protection layer.

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Loss of steel-area on reinforcement due to corrosion, or due to any other damage, shall immediately be brought to the attention of the supervising officer or qualified engineer prior to any further work. Any further action such as replacing reinforcement bars shall only be carried in accordance with the direct instruction of the supervising officer or qualified engineer. The scope of this method statement does not include replacement of steel reinforcement bars.

7.3 PRE-WETTING SUBSTRATE

Concrete surfaces shall be saturated with clean low pressure water a minimum 2 hours before application ensuring that all pores and pits are adequately wet. The surface shall not be allowed to dry before application.



Formwork shall be fixed immediately after pre-wetting to avoid loss of moisture from the substrate surface. Ensure there is no standing water on the surface before closing the formwork. The surface shall achieve a dark matt appearance without glistening and surface pores and pits shall not contain water (saturated surface dry). Use pressurised air (oil free) to blow away excess water in difficult to reach areas.

7.4 FORMWORK

Formwork shall be clean and fixed in place as soon as possible after the substrate has been prepared. If required, release agents shall be applied to the formwork before placing into position. Do not contaminate the substrate with the release agent and reduce bond of the grout material from spillage or run-off.

Openings in the formwork shall be protected to prevent ingress of debris or contamination. Formwork shall be watertight and free from obstructions to allow the free flow of pourable mortar.

Formwork shall be designed to allow the controlled escape of air and water bleed.

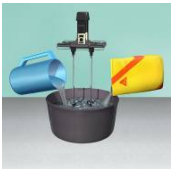
8 MIXING

Mixing shall always be carried out in accordance with the recommendations contained in the latest product data sheet (PDS).

Do not use water beyond the stated maximum and minimum limits.

In determining the mixing ratio the wind strength, humidity, ambient and substrate temperature and shall be taken into consideration.



8.1 ONE COMPONENT PRODUCTS

	Product	Procedure
	Sika MonoTop® / SikaGrout®	<ul style="list-style-type: none"> ■ Place minimum recommended water ratio in mixing container ■ Progressively add powder whilst mechanically mixing using low speed (maximum 500 rpm) electric drill ■ Add more water if required to suit the desired consistency and flow properties but not exceeding maximum dosage. Mix in total for minimum 3 minutes or until the material is homogenous

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8.2 THREE COMPONENT PRODUCTS

	Product	Procedure
	Sika® EpoCem® SikaTop®	<ul style="list-style-type: none"> ■ Shake thoroughly component A and B separately ■ Pour component A into component B and shake thoroughly ■ Pour mixed components A+B into mixing container and add component C progressively whilst mixing mechanically using low speed (maximum 500 rpm) electric drill ■ Mix for minimum 3 minutes until homogenous ■ Do not add water ■ Do not part mix components

9 APPLICATION

The product and system shall be appropriate for the type of substrate, structure and exposure conditions which they are required.

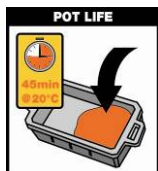
9.1 BEFORE APPLICATION



Working space shall be clean and tidy with no obstructions.

Record the substrate, ambient temperature and relative humidity. Check pot life information on bag or in the product data sheet and allow for climatic conditions e.g. high / low temperatures & humidity.

External applications shall be adequately protected. Do not apply mortar repair in direct sun, windy, humid or rainy conditions or if there is a risk of frost within 24 hours in unprotected areas. Ensure sure blow holes are not obstructed and can allow the escape of air.



Calculate the required volume for the application and then using the equation in section 10 of this method statement, calculate the yield of the product. Make sure there is enough material on job site to carry out the work.

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9.2 REINFORCEMENT CORROSION PROTECTION



Where a reinforcement corrosion protection is required, apply material to the whole circumference of the steel reinforcement bar in two layers. Wait until the first layer has dried before applying the second layer. Use a mirror to inspect behind the back of the bars to ensure full coverage.

Take care not to splash or apply material on a dry concrete substrate behind the bars.

For small areas use two paint brushes to apply 2 layers and ensure full coverage. For larger areas use hopper gun aim the spray in different directions to ensure coverage behind the back of the bars.

The repair mortar shall only be applied when the reinforcement corrosion protection is hardened (wet on dry). Refer to the relevant product data sheet for more information.

9.3 BONDING PRIMER



Refer to relevant repair mortar product data sheet if a bonding primer is required. If a bonding primer is required, the substrate surface shall be pre-wetted in accordance with section 6.3.

Bonding primers can be applied by hand pressing the material firmly into the surface using a brush or using a hopper gun for larger areas.

The repair mortar shall be applied wet on wet to a bonding primer. Ensure the substrate surface is fully covered behind the reinforcement bars. For large applications use only a bonding primer with long open time e.g. SikaTop® Armatex-110 EpoCem® refer to product data sheet.

9.4 RECASTING USING A POURABLE REPAIR MORTAR



A pourable repair material shall be applied into the prepared opening as soon as possible after mixing. A grout shall be poured into the prepared opening within 15 minutes to optimise the expansion properties of the material. Pot life shall also be taken into consideration, adjusting for climatic conditions, when planning the work duration.

Pour the grout through the “mouth” of the formwork allowing the material to flow to the opposite end. Always maintain sufficient pressure head while pouring. Ensure a process of continuous pouring to avoid air entrapment and prevent the material flow from coming to a stop before the operation is completed. Make sure air displaced by the material can easily escape.

Always pour from opposite ends to any air release (blow) holes. Maintain pouring until material escapes from the air release holes. Allow some material wastage until it is certain all air has been released and there is no air trapped air in the application.

Avoid the free fall of the material to prevent segregation of the aggregate (max ~2 cm).

Never make an application from two places as it will be difficult to determine if all air has been released, and the entire void has been filled.

Do not vibrate the formwork as this will cause segregation and bleeding.

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9.5 RECASTING USING A PUMPABLE REPAIR MORTAR

Pumping is a specialist technique is recommended to be carried out by an experienced Contractor. The risk associated with pumping a fluid mortar is bleeding as the sand separates while it is under pressure and can cause a blockage. It is recommended checking the compatibility of the pump equipment and grout before the main application.

Pump-able Sika® mortars are pre-mixed in the normal way, placed into the hopper of the equipment and pumped through a hose to the point of application. Typical pump machines can be:

- Screw Pumps e.g. Putzmeister S5
- Piston Pumps
- Double Piston Pumps
- Membrane Pump (for small grain sizes, refer to machine manufacturers recommendations)

The pump machine and ancillary equipment shall be of adequate capacity for the volumes to be applied.

All moving parts, fittings and hopper shall be inspected for cleanliness and damage before use. Any hardened material shall be removed. The equipment shall not leak.

Power for the equipment shall be approved for use on job site. Always conform to local laws and restrictions when using diesel powered equipment. When using an electric motor check the voltage requirement is available on job site.

The Contractor shall keep full details and records of the type of machine and equipment used for the project. This information shall be provided to the Engineer, when requested.

The hose or pipe shall not have any dents or kinks and be long enough to reach from the pump location to the point of application. It is advisable to use the shortest hose length available to reduce the risk of blockage.

Always consult with the recommendations provided by the machine manufacturer.

The method of pumping a material must ensure complete filling of the voids, crevices. Pumping equipment shall suit the material and purpose for which they are to be used. Always read the pump manufacturer's instructions and obtain further guidance if necessary.

Pumping shall generally be applied from the bottom of the application to force the air out of the top through controlled air release hole(s). Refer to section 9.1 for a typical example. Pumping shall only take place from one position on an application and shall continue until material escapes out of the controlled air release points. Allow some material wastage until it is certain all air has been released and there is no air trapped air in the application.

9.6 REMOVAL OF FORMWORK

The formwork shall not be removed until sufficient strength has been achieved. This time depends on the material characteristics and climate conditions. As guidance the formwork around a high performance, low shrinkage grout in normal 21°C / 55% relative humidity conditions may be removed approximately 12 to 24 hours after application.

Formwork shall only be removed with the agreement of the supervising officer or qualified engineer.

9.7 FORMWORK CURING

Best curing is achieved while the formwork is still in place. As soon as the formwork is removed, protect the still green material from premature drying.

Cure with proper curing methods for 3 days or spray with appropriate curing compound once any surface water has evaporated. Curing methods include jute and water, plastic sheets or other suitable membranes.

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9.8 SMOOTHING / LEVELLING MORTARS



Smoothing mortars can be applied by hand, by hopper gun or by mechanical spray equipment for large areas. Refer to relevant product data sheet for further information.

A smoothing coat shall be applied over the whole prepared concrete surface (including repair and non-repaired areas). Any laitance layer on the surface shall be removed (section 6.1) and surface pre-wet in accordance with section 6.3.



Wait until the repair material has properly hardened before applying a smoothing coat.

Use a toothed trowel to apply the mortar by hand in a vertical direction onto the surface. Hold the trowel at an acute angle to the surface and use different size toothed trowels to regulate the application thickness.

Toothed Trowel Size	Approximate Application Thickness	
	30°	45°
10 mm	~ 5.0 mm	~ 7.0 mm
5 mm	~ 2.5 mm	~ 3.5 mm
2 mm	~ 1.0 mm	~ 1.5 mm



Table 1 Approximate application thickness guide



When 1st layer is hard, apply the second layer between the vertical lines. The hardness can be tested by the ease at which a finger nail can be inserted into the mortar.

Finish surface with damp sponge, wooden or plastic float after material has set. Do not add apply additional water on the surface as this will cause discoloration and cracking.

9.9 CURING



Cure levelling mortars with proper curing methods for 3 days or spray with appropriate curing compound (once any surface water has evaporated) or appropriate curing method. Curing methods include jute and water, plastic sheets or other suitable membranes.

The application shall be protected from wind, rain, frost and direct sunlight. The curing period is dependent on climate conditions. In warm temperatures with low humidity the application shall be protected from premature drying.

9.10 APPLICATION LIMITS

- Avoid application in direct sun and/or strong winds
- Do not add water over the maximum recommended dosage
- Always check the material's pot life and adjust for climate conditions
- Temperature of the repair mortar and substrate shall not differ significantly
- Where the structure is subject to dynamic loading, it is recommended for overhead applications to use repair systems specially tested for this situation

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10 INSPECTION, SAMPLING, QUALITY CONTROL

As part of “Good Practice” the contractor shall provide a QC report containing the following recommended data. For more detailed information refer to EN 1504-10 Annex A, or any other local standards or legislation which may apply.

10.1 SUBSTRATE QUALITY CONTROL - BEFORE AND AFTER PREPARATION

The following checks should be carried out before and after preparation.

Characteristic	References	Frequency	Parameters
Cleanliness of Concrete	Visual	After preparation & immediately before application	No contamination, loose particles or defects
Cleanliness of Steel Bars	DIN EN ISO 8501-1	After preparation & immediately before application	No rust, scale or contamination. [Grade Sa 2 or SA 2 ½ for methods 11.1 or 11.2]
Delaminating Concrete	Hammer Sounding	After preparation	No delaminating concrete
Roughness	Visual or EN 1766 on horizontal surfaces	After preparation	Minimum roughness 2 mm (repair area) No laitance layer (smoothing mortars)
Surface Tensile Strength of the Substrate	EN 1542	After preparation works	> 1.0 N/mm ² for structural repair

Table 2 QC summary before and after preparation

10.2 BEFORE, DURING AND AFTER APPLICATION

The following checks should be carried out before during and after the application.

Characteristic	References	Frequency	Parameters
Packaging	Visual	Every bag	No damage
Dry product aspect	Visual	2 bags per 10	Loose, no lumps and not compacted
Mixed material	Visual	Every mix	Homogeneous, no lumps no un-mixed dry powder
Precipitation	Record	During application	Keep records and provide protection
Wind Strength	Record	daily	Less than 8 m/sec or provide protection
Batch Number	Visual	All bags	Keep records

Table 3 QC summary before during and after application

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10.3 PERFORMANCE TESTING

The following can be used on job site to check the adequacy of the application.

Characteristic	References	Frequency	Parameters
Compressive Strength on 40x40x160 prisms	EN 12190	3 prisms per batch	Within PDS limits
Cracking	Visual	28 days after application	No cracking on application
Presence of Voids/ Delaminating	EN 12504-1 Hammer sounding or *ultrasonic testing	After application	No delaminating concrete
Adhesion Bond *(pull off) (non-laboratory performance)	EN 1542 (Acc EN 1504-10 Table A.2)	Min 3 on a test area	1.2 – 1.5 N/mm ² (Structural use) 0.7 N/mm ² (non-structural use)

* Optional testing

Table 4 QC summary of performance testing

11 YIELD & CONSUMPTION

The yield of a product can be determined from the following equation (assuming no wastage).

Equation:
$$\text{yield (litres)} = \frac{\text{weight of powder (kg)} + \text{weight of water (kg)}}{\text{density of mixture (kg/l)}}$$

Given: weight of water 1 litre = ~1 kg

Example:

Calculate consumption of a bag weighing 20 kg mixed with 3.6 litres of water, when the density of the fresh material is 2.1 kg/l.

1 bag of 25 kg yields:
$$\frac{(20 + 3.6)}{2.1} = \sim 11.2 \text{ litres of mortar}$$

Therefore, the number of bags required for 1m³ of mortar will be:

N^o of bags required per 1m³ = (1/yield) x 1000
$$(1/11.2) \times 1000 = \sim 89 \text{ bags}$$

Consumption of a product can be calculated as follows:

Calculate how many kg of powder is required to cover a 10 mm thick application over an area 1 m² (assuming no wastage)

Weight of mixed mortar (kg)
$$\begin{aligned} &= \text{volume (m}^3\text{)} \times \text{density (kg/m}^3\text{)} \\ &= (1 \times 0.01) \times 2100 \\ &= 21 \text{ kg (total)} \end{aligned}$$

Less weight of water;

If water to powder mixing ratio
$$= *14.5\% \text{ then;}$$

Required weight of powder
$$\begin{aligned} &= 21 / ((100+14.5)/100) \\ &= \sim 18.3 \text{ kg powder} \end{aligned}$$

* refer to PDS for exact figure

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12 ADDITIONAL GUIDANCE

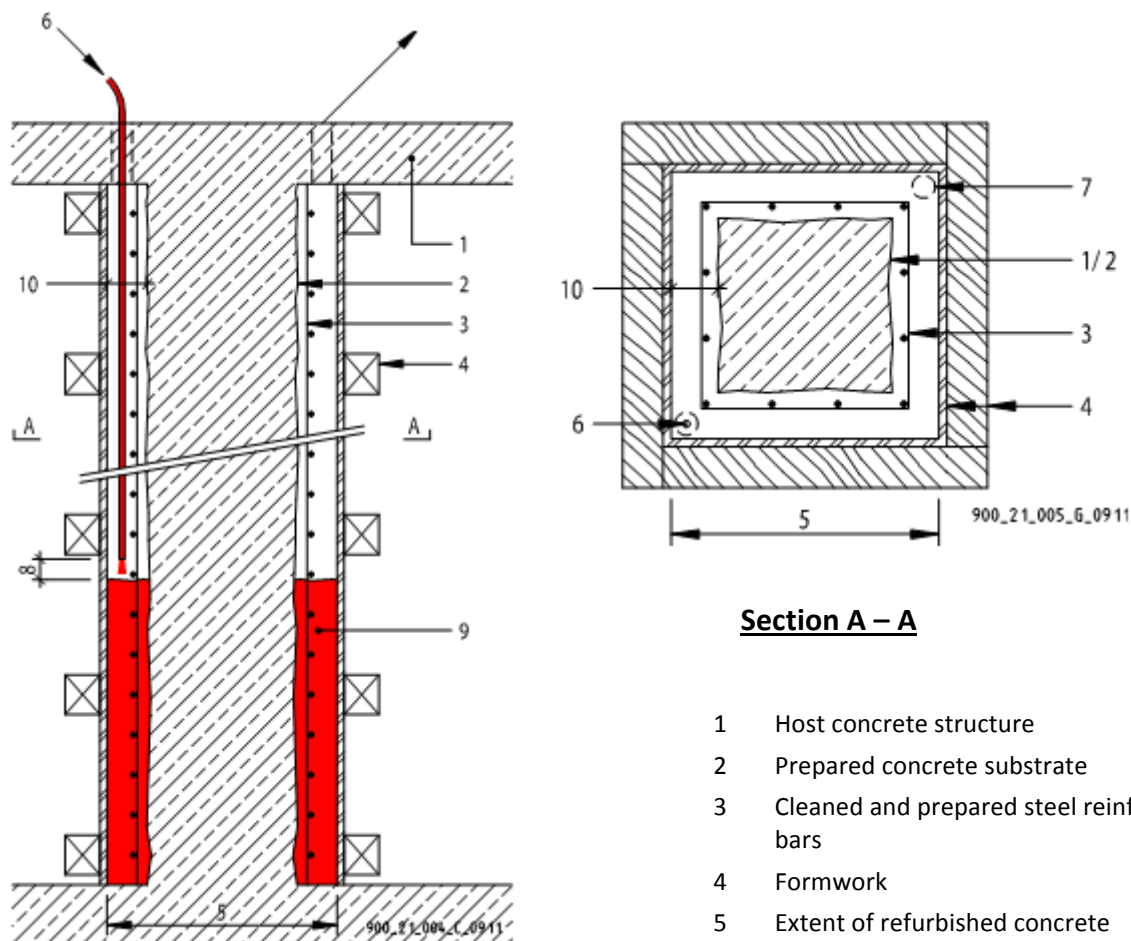
The following applications offer further guidance in specific situations.

12.1 EXAMPLES OF RECASTING

The following are two examples of recasting a concrete column for purposes of restoration, structural strengthening, preserving or restoring passivity using a pouring and pumping method.

12.2 POURING METHOD

The detail is for illustration purposes and not to be used as a construction drawing.



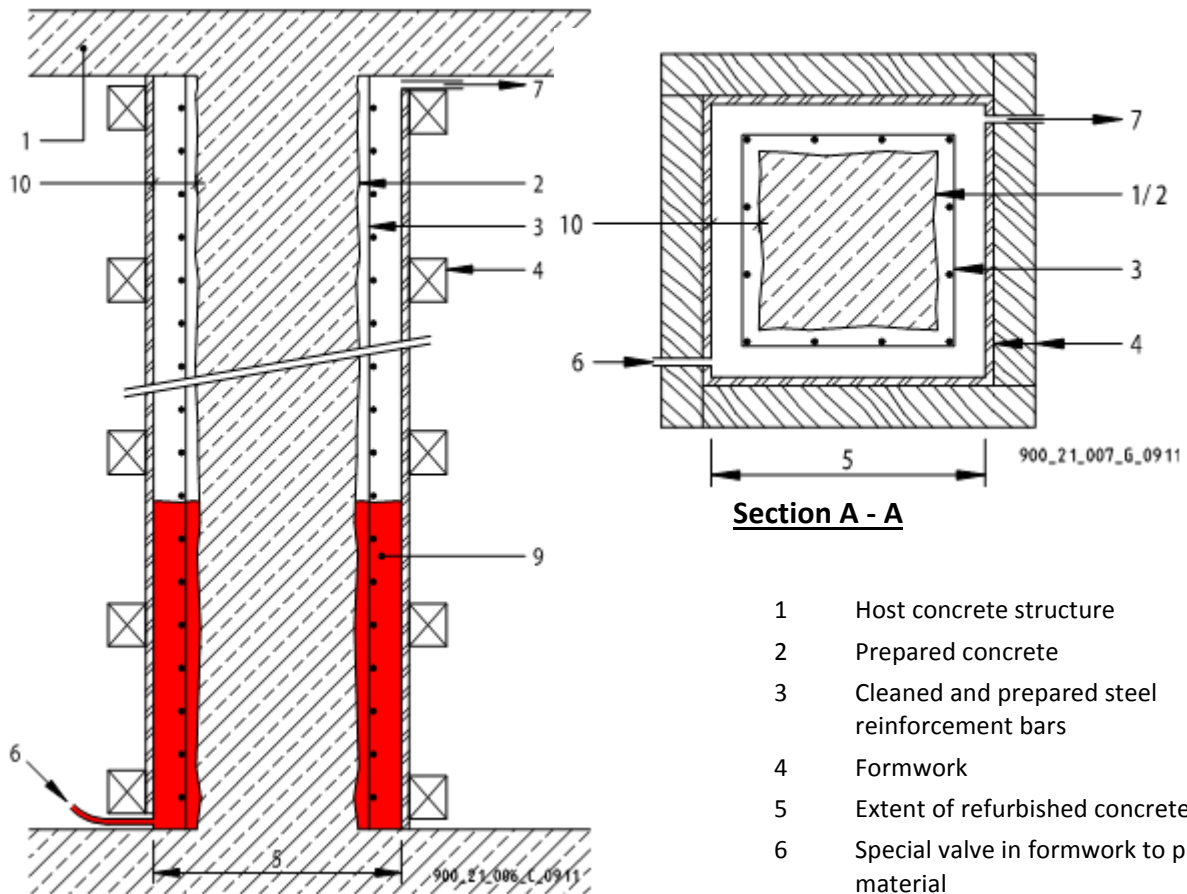
- 1 Host concrete structure
- 2 Prepared concrete substrate
- 3 Cleaned and prepared steel reinforcement bars
- 4 Formwork
- 5 Extent of refurbished concrete
- 6 Opening made in existing structure for material application
- 7 Opening made in existing structure for air release
- 8 Maintain application ~ 2 cm above material level
- 9 Pouring mortar suitable for methods 3.2, 4.4, 7.1 and 7.2 to European Standard EN 1504-9 e.g. SikaGrout® -Deep Pour or Sika MonoTop® 436 N
- 10 Application thickness

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12.3 PUMPING METHOD

The detail is for illustration purposes and not to be used as a construction drawing.



Section A - A

Elevation Section

- 1 Host concrete structure
- 2 Prepared concrete
- 3 Cleaned and prepared steel reinforcement bars
- 4 Formwork
- 5 Extent of refurbished concrete
- 6 Special valve in formwork to pump in material
- 7 Valve in top of formwork for air release
- 9 High performance, low shrinkage pouring mortar suitable for methods 3.2, 4.4, 7.1 and 7.2 to European Standard EN 1504-9
- 10 Application thickness

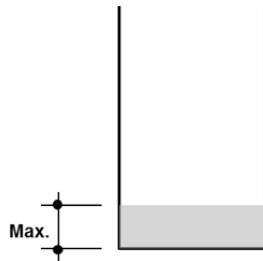
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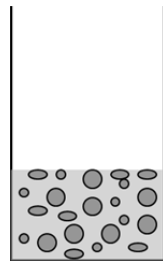
12.4 INCREASING MAXIMUM LAYER THICKNESS

The application thickness of some pourable mortars can be increased with the addition of more aggregate. This technique only applies for filling voids or applications subject to static compression loads.

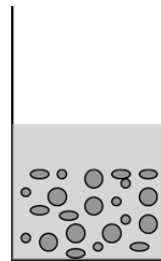
Method 1 – Filling a Void



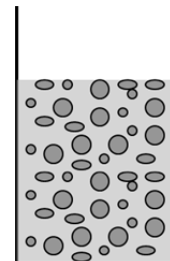
Step 1 - Pour repair mortar in maximum layer thickness into void



Step 2 – Place by hand single size aggregate slowly into the fresh mortar until stones can be seen on surface



Step 3 – Repeat step 1. Pour 2nd maximum layer thickness on 1st layer



Step 4 – Repeat step 2.

Example

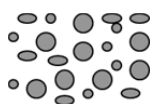
Material

*SikaGrout®-Deep Pour with single sized rounded stones of between 16 – 32 mm (can be all 16mm or all 32 mm or a size in between – optional) or Sikagrout Aggregate.

This method is only suitable for filling a void subject to compression loads only. Sides of the void must be thoroughly clean; the laitance layer must be removed and surface can be slightly roughened if necessary.

Do not add additional water and do not use additional fines.

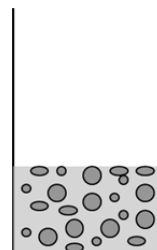
Method 2 – Adding Additional Aggregate



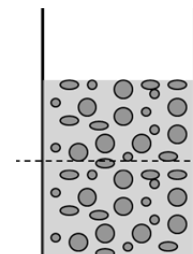
Step 1 – Pre-wash / wet the aggregate. The aggregate shall be saturated surface dry when adding to the mortar.



Step 2 – Mix repair mortar as normal. Slowly add the aggregate and mix slowly until homogeneous. Over mixing will aerate. Leave to stand for 2 minutes.



Step 3 – Apply mix into void



Step 4 – Build up in layers. The first layer shall be hardened, exothermic reaction completed and be at ambient temperature before applying next layer

The new repair mortar's characteristics will be affected with the addition of more aggregate, significantly the flow. These new characteristics shall be taken into account when the technique on job site. For example pot life.

Pre-testing of the modified material shall be carried out first to determine an acceptable construction method together with new material mechanical performances.

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- Always pre-test the new material characteristics
- Always check no bleeding or sedimentation
- Use same aggregate and grading to be used on job site
- Consider ambient and substrate temperatures
- Check the new mechanical properties

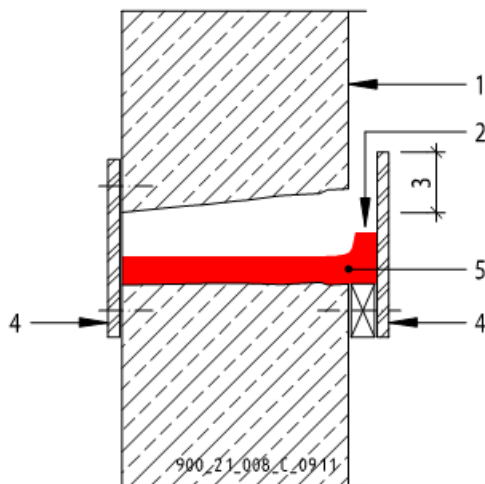
Material	Application thickness
*SikaGrout® Deep Pour	25 – 500 mm
*SikaGrout® Deep Pour + 40% by weight 8 mm to 16-24 mm washed well graded clean rounded aggregate free from fine graded material e.g. silts, sands etc.	Up to ~700 mm

The general rule for additional aggregate is to use a rounded clean well graded between d_{max} to $(2 \text{ or } 3 \times d_{max})$

- Do not add more water to the mix
- Aggregate shall not be wet

12.5 SEALING PENETRATIONS

The following example shows how a penetration can be sealed in a vertical concrete wall using a poured grout. The soffit of the void shall not be horizontal. It shall be profiled at an angle to allow the escape of air.



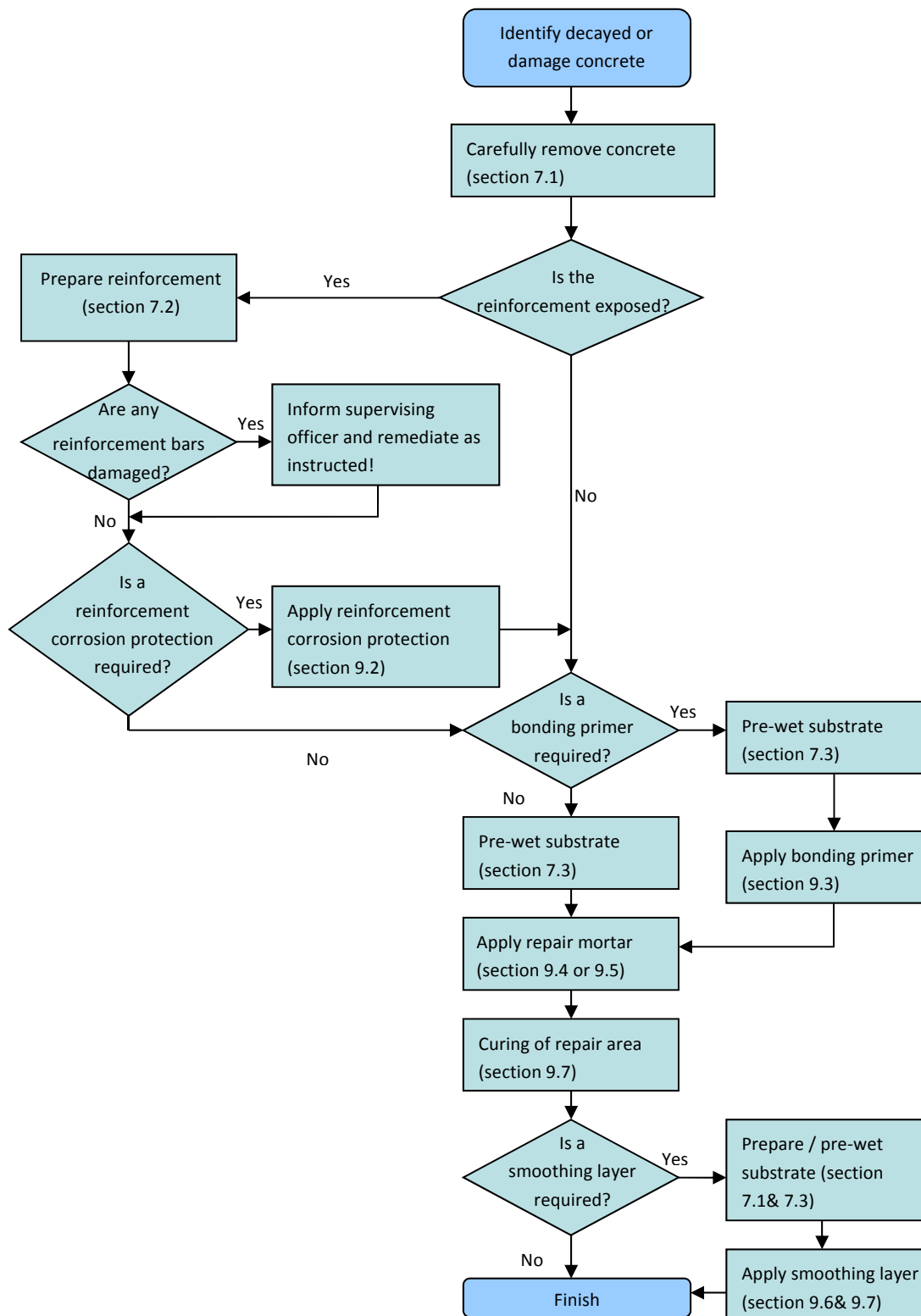
- 1 Host concrete structure
- 2 Opening to pour mortar
- 3 Pressure head
- 4 Temporary formwork
- 5 Repair material e.g. SikaGrout® Deep Pour

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13 CONCRETE REPAIR FLOW CHART

The following is a guide of how to carrying out a concrete repair. This is not intended as a definitive guide to repair concrete and shall at all times be read in conjunction with all Architect's, Engineer's or specialist specifications together with EN 1504-10, local standards and all relevant product data sheets.



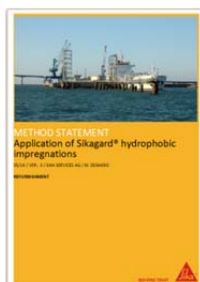
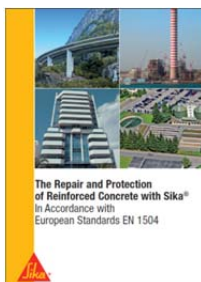
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14 LEGAL NOTE

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.

FOR MORE Restoring Concrete Structures by Recasting Using Sika Ready to use Mortars INFORMATION:



15 KEY WORDS

Refurbishment, method, statement, process, EN1504, Sika MonoTop, SikaTop, SikaGrout, EpoCem, concrete, repair, damage, R4, R3, R2, pouring, pumping, formwork, curing, pre-mix, reinforcement, corrosion, smoothing, levelling

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