

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

## **[Concrete Repair Site: Text for Concrete Repair Products and Systems Page](#)**

### **Concrete Repair Products and Systems**

Concrete repair products and systems have been developed extensively since the late 1970's, as more of the technology and requirements for durable concrete repairs has been increasingly understood. This increased level of expertise and experience led to the first development of a complete 'Systems Approach' to concrete repair and protection, which was originally pioneered by Lechler Chemie, now part of the Sika Group, format this date in Germany and then elsewhere including the UK since 1981.

One interesting hypothesis was that this development first took place in Germany due to the massive rebuilding of Germany during the late 1940's and the 1950's in reinforced concrete, which had led to major problems being visible on many of these buildings and structures by the early 1970's; as opposed to the situation in the UK, whose own building boom in reinforced concrete predominantly began 10 years later in the 1960's - With the same major corrosion and damage problems then also arising extensively 10 years later than the German experience, in the early 1980's.

As a result most leading materials manufacturers followed the Sika Concrete Repair and Protection 'System Approach' example and today all provide a 'complete system', together with ancillary products such as deck coatings, joint sealants, injection resins and composite structural strengthening materials.

The most important concrete repair product and system manufacturers in the UK today, alphabetically includes: BASF (formerly MBT), Fosroc, Remmers, Sika (including the former Lechler Chemie and Inertol companies) and Weber (formerly SBD).

Expert independent advice on all of these and other companies' products and systems, together with the most cost effective pricing and logistics support are available from NCC to suit your specific project's requirements. Please call any of our offices for advice and guidance on any aspect of these concrete repair materials, their selection and specification, detailing or their application and quality control on-site.

The following is a brief overview of the main functional component materials and products that make up all of these complete concrete repair systems, which are of course now all produced to be in accordance with the performance requirements of EN1504, the latest European Standards for Concrete Repair and Protection works

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

## **I). Steel Reinforcement Primers for Concrete repairs**

Steel Reinforcement Primers are important in complete concrete repair and protection systems, where they are designed to provide additional protection and act as a barrier to prevent any future water penetration and corrosion of the steel surfaces. The steel reinforcement primer is applied to any exposed steel reinforcement that has been cleaned and prepared, preferably by mechanical blast-cleaning, once the damaged concrete and any contaminants such as chlorides have been removed. Steel Reinforcement Primers are also particularly useful when the profile or other constraints of the reinforced concrete structure or element, mean that the correct thickness of concrete cover cannot be reinstated over the steel reinforcement bars. Additionally they can be used as a barrier when even after the washing, cleaning and preparation works; there are still potentially residual contaminants, such as chlorides, in the adjacent existing concrete.

Steel Reinforcement Primer products are normally designed to provide this additional protective barrier around the steel reinforcement that prevents the future ingress of water and other aggressive liquids or gases to the steel surface. Additionally some steel reinforcement primers also contain or has electrochemically active pigments that can block or inhibit corrosion.

In the European Standard EN1504: Part 9 Principle 11 Control of Anodic Areas. Methods 11.1 (Active coatings) and 11.2 (Barrier coatings) can both apply dependent on the requirements on each individual structure and concrete repair project.

## **II). Bonding Bridges for Concrete Repair Mortars**

Bonding Bridges are used in concrete repair works to increase the adhesion or bond of the subsequent concrete repair mortar to the cleaned and prepared existing concrete substrate. These materials improve the 'wetting' of the profiled surface, filling troughs in the concrete surface profile; reduce suction due to the concrete porosity and lubricating the interface to ensure a fully homogenous bond and optimum adhesion. They are not specifically referenced in the EN1504 Standards as 'stand-alone' products, but as being necessary concrete repair system components, according to the type and nature of the specific concrete repair mortar being used and the type and extent of the concrete damage being repaired.

In the European Standard EN: 1504 Principle 3 Concrete Restoration. Methods 3.1 (Hand Application), 3.2 (Recasting) and 3.3 (Sprayed Application) can all apply, according to the specific requirements of each specific structure and concrete repair project.

## **III). Concrete Repair Mortars / Replacement Concretes**

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

Concrete repair mortars are generally classified as 'Replacement Concretes', in the European Standards and are to be selected according to the structural strength and exposure requirements of the structure. Concrete repair mortars are described and detailed in European Standard EN 1504: Part 9 Principle 3 Concrete Restoration. These concrete repair mortars are then subdivided and classified according to their method of application / installation i.e.

**Method 3.1 Hand Applied Concrete Repair Mortars (hand / trowelled)**

**Method 3.2 Machine Applied (Sprayed) Concrete Repair Mortars**

**Method 3.3 Poured / Flow Applied (Recast) Concrete Repair Mortars**

**The main characteristics of each of these types of concrete repair mortars can be summarised as follows:**

## **1. Hand Applied Concrete Repair Mortars**

Hand placed concrete repair mortars should normally be pre-batched, cement based mortars possibly modified for improved strength or resistance with polymers and / or other additions such as silica fume, or special graded sands and aggregates, etc.

Hand applied concrete repair mortars are applied by gloved hands or trowels and finished by trowel, to match the original line and profile of the parent concrete. They are ideal for patch repairs and repairs to concrete spalling in areas of locally corroding reinforcement, etc.

NCC, the creator of Concrete Repair Site, is a major distributor of hand applied concrete repair mortars, and many other special concrete repair products that are available for all kinds of specific repair applications. This includes concrete repair mortars that are specifically designed for structural concrete repairs, cosmetic concrete repairs and lightweight concrete repair mortars for easy overhead application.

Please contact any of our offices for advice and assistance with the selection of the right hand placed, or any other type of concrete repair product for your specific refurbishment project.

## **2. Machine Applied / Sprayed Concrete Repair Mortars**

Machine applied / sprayed concrete repair mortars are now also supplied generally pre-batched for most projects in order to meet Quality Control and performance standards, like hand placed concrete repair mortars they can also be modified with polymers and other additives to improve their performance, particularly the cohesion of the sprayed mortar, which can also therefore greatly reduce the amount of rebound and wastage.

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

Machine Applied Concrete Repair Mortars are primarily designed for use where large volumes of the repair mortars are needed, or where a significant volume has to be applied as fast as possible to minimise downtime or closures.

Traditional Guniting systems for sprayed concrete repairs are not normally pre-batched but produced on site - therefore they are now generally only used for applications requiring thicker layers of repair, where their constituent materials grading and granulometry is not as critical as it is for layers of sprayed concrete below 50mm thickness for example.

Machine applied concrete repairs / Sprayed concrete repairs / Guniting concrete repairs are a specialist area requiring specialist sprayed concrete equipment, operative training and materials - therefore Concrete Repair Site has produced a dedicated page on this website for this method and these concrete repair materials '[Sprayed Concrete Repairs / Machine Applied Concrete Repairs / Guniting Repairs](#)'.

**NCC Concrete Repair Site is very experienced in both the dry and wet processes for machine applied concrete repairs and in the use of sprayed concrete materials including Guniting systems. For specific advice or assistance on your project please call any of our offices – our concrete repair specialists will be pleased to help.**

Most sprayed repair mortar applications require specialist equipment, training and experience, therefore we do not include many concrete repair mortar products that are designed to be exclusively spray applied in our Online Shop, although with the right knowledge and equipment it is possible to wet or dry spray almost any mortar products these days – Please call any of our office for specific advice on any aspect of sprayed concrete repairs.

### **3. Poured / Flow Applied Concrete Repairs (Re-casting Concrete Repairs):**

Poured / Flow Applied Concrete repair materials are also now normally always supplied as pre-batched mortars for Quality Control purposes, as they are frequently used where there is difficult access or around congested reinforcement. This means that their aggregate grading and granulometry, their Water : Cement ratio and in particular, their flow properties, must all be as specified and consistently so. Therefore these concrete repair materials are also modified with polymers and super-plasticizers that improve their flow and ensure a good surface finish against the formwork. Concrete repair products used for flow application in smaller scale repair / re-casting situations are also frequently known as 'grouts' and based on modified cement grout technologies.

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

**NCC Concrete Repair Site is one of the UK's largest suppliers of these specialist flow applied concrete repair mortars and specialist cement grouts (and also even higher strength epoxy grouts where required) for all types of concrete repair works. Please contact any of our offices for advice and assistance with the right flow applied concrete repair or grouting product selection for your specific project.**

## **IV). Levelling / Fairing Mortars for Concrete Repairs**

Surface Levelling Mortars (also known as Concrete Fairing Mortars) are used after localised concrete patch repairs have been carried out, to fill and level any additional minor surface defects, such as blowholes in the concrete surface, which would otherwise allow the future ingress of water and aggressive liquids or gases into the concrete.

Surface Levelling Mortars are also used to effectively add additional concrete cover, but with only a thin layer of the material that is equivalent to a much greater thickness of normal concrete i.e. they have much greater resistance to atmospheric CO<sub>2</sub> and water ingress, which means a much greater resistance to carbonation and provides additional protection to the embedded steel reinforcement. Surface Levelling Mortars are also used to restore the original line, level, profile and texture to the concrete surface, plus they also provides an ideal substrate when an additional protective coating needs to be applied i.e. the surface is made uniform and any voids such as blowholes, which would allow penetration through a surface coating, are affectively pre-sealed.

Surface levelling mortars are therefore usually specified in one of two ways, either: to 'fill and level any surface defects and blow holes' i.e. there is no defined thickness or 'to be applied at a nominal thickness of Xmm (usually 2mm) to provide the defined amount of additional concrete cover required. The choice of specification and levelling mortar selection is therefore dependant on the most important reasons and the requirement for their use on your specific repair project. NCC Concrete Repair Site can always assist you to make the right decision for your projects.

This means that the specification and required thickness of the surface levelling mortar can be a critical part of a technically correct concrete repair and protection solution. It can also have a significant cost, so if this aspect is carried out unnecessarily or incorrectly, it can add considerable additional cost. However if it is overlooked or omitted from the specification for the works, then the result is possibly much worse, with inadequate protection provided meaning that there will be future damage and more repair works will be required.

In the European Standard EN1504: Part 9 Principle 5 (Physical Resistance), Method 5.1 Overlays or Coatings; Principle 6 (Chemical Resistance) Method 6.1 Overlays or Coatings; and Principle 7 (Preserving or Restoring Passivity)

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

Method 7.1 Increasing Cover with Additional Cementitious Mortar – All can apply as appropriate for the specific requirements of the project.

**NCC are experts in this surface repair and levelling process and can advise you to ensure the most cost effective and correct specification and application of the most appropriate type and thickness of material to meet your project requirements. Please call any of our offices for expert assistance.**

## **V). Protective Surface Coatings for Concrete**

Protective surface coatings are primarily used to protect new or repaired concrete surfaces from future chemical attack (e.g. against sulphurous and nitrous pollutants) and the ingress of aggressive liquids and gases (e.g. waterborne chlorides or atmospheric carbon dioxide). This concrete surface protection can also be specified to be: water-repelling through impregnation and pore blocking; elastic and crack-bridging (to different degrees of elasticity at different temperatures); resistant to different chemicals (such as in containment zones); or abrasion and wear resistant (e.g. on horizontal concrete surfaces such as balconies and car park decks).

In order to meet all of the different requirements for concrete facades and horizontal concrete surfaces on different structures and in different exposure conditions, there are a wide range of different protective concrete coating products and systems required.

On reinforced concrete facades single pack, acrylic resin based anti-carbonation coatings are normally ideal as the protective coating solution. Also ideal are protective coatings based on, elastic film-forming, styrene acrylates or other copolymer resin based products, which should be used when additional crack-bridging properties are required. On horizontal decks for combined chemical and wear resistance, the best protective deck coating products are usually 2 component epoxy and polyurethane resin based solutions that are specifically designed to accommodate this additional stress and exposure.

In the European Standard EN1504 Part 9 Principle 1 (Protection Against Ingress) Method 1.2 Surface Coating - With or Without Crack-Bridging Capability; Principle 2 (Moisture Control) Method 2.2 Surface Coating; Principle 5 (Physical Resistance), Method 5.1 Overlays or Coatings; Principle 6 (Chemical Resistance) Method 6.1 Overlays or Coatings; Principle 8 (Increasing Resistivity) Method 8.1 Increasing Resistivity by the Use of Surface Treatments or Coatings; and Principle 9 (Cathodic Control) Method 9.1 Limiting Oxygen Content (at the Cathode) by Saturation or Surface Coating – All of these Principles and Methods can apply as appropriate for the individual reinforced concrete structure's condition and requirements.

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

The characteristics and performance requirements for Protective Surface Coatings to be used on reinforced concrete are defined in the European Standard EN1504 Part 2, with the appropriate product selection then to be made in accordance with the specific requirements and exposure conditions of your project.

**NCC has extensive expertise in protective coating and application technologies and will advise on the most appropriate materials, specific products and their optimum method of application for your specific project requirements. Please call any of our offices for expert assistance on any aspect of protective coatings for concrete surfaces.**

## **VI). Hydrophobic Impregnations for Concrete Protection**

Hydrophobic impregnations for effective concrete protection are generally based on Silanes or Siloxanes, or blends of these materials. Due to their small molecular size and penetrating ability, together with their unique water-repelling or hydrophobic properties, they can penetrate completely into the surface pores and capillaries of concrete and other facade surfaces; thereby creating a water repellent (hydrophobic) surface, but without any significant residual surface film and therefore this is also achieved without changing the surface appearance (as would a protective paint coating or cement based material).

As a result the reinforced concrete façade surface is waterproof; which prevents further water ingress, but it is still open for water vapour diffusion in each direction. This allows any residual moisture, internally generated water vapour or interstitial condensation within the structure, to escape and therefore this also protects and prevents against freeze thaw damage, such as scaling etc. With all types of hydrophobic impregnation the amount of material that is applied and the depth to which it is able to penetrate into the concrete surface, are critical factors in the effectiveness of the treatment, the resulting water-repelling performance and most significantly, the durability of the water-repellancy. In all projects it is therefore important to specify exactly what type of hydrophobic impregnation and preferably exactly which product should be used, together with the amount of material that is to be applied in order to achieve the desired level and durability of performance.

Hydrophobic impregnation products designed to protect concrete surfaces can be supplied many in different formulations, which include:

- **100% Silane impregnations:** - These are very expensive and somewhat volatile, so effective in penetration and performance, but with high wastage and at a very significant cost;
- **Solvent diluted silane and siloxane impregnations** (and blends thereof):–

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

These are less efficient but more cost effective and lower wastage, with the best performance on damp surfaces or in colder conditions, however there are the associated risks associated with solvent containing materials;

▪ **Water dispersed silane and siloxane impregnations** (and blends thereof):– These are less efficient than solvent diluted impregnation materials and significantly more expensive, however there are no associated solvent risks or excessive wastage factors due to premature evaporation.

▪ **Gel or Cream formulations of silane and siloxane impregnations** (and blends thereof):– This type of hydrophobic impregnation is a relatively modern development. Gel formulations 'sit on the surface' allowing precise levels of consumption, optimum penetration depth from the longer penetration time available (i.e. no run off or evaporation), they are also much easier to control in application and to minimize waste.

In the European Standard EN1504 Part 9 Principle 5 (Physical Resistance), Method 5.2 Impregnation; Principle 6 (Chemical Resistance) Method 6.2 Impregnation; Principle 8 (Increasing Resistivity) Method 8.1 Increasing Resistivity by the Use of Surface Treatments or Coatings – Can all apply as appropriate to the specific structures requirements.

Protective Hydrophobic Impregnations characteristics and performance requirements are also defined in European Standard EN1504 Part 2, with the appropriate product selection then being in accordance with the specific requirements and exposure conditions of the project.

NCC has extensive experience with the wide range of hydrophobic impregnation products available for protecting reinforced concrete surfaces on different types of structures, in different exposures and with different access and performance requirements. Therefore our specialists can advise on the selection, specification and application of the best material for your project. You can call any of our offices for assistance with hydrophobic impregnations.

## **VII). Corrosion Inhibitors for Concrete Repairs**

Corrosion Inhibitors are not a completely new technology. Many different corrosion inhibitors have been used in heating systems and around automotive and electronic components during storage and / or service for more than 540 years. However corrosion inhibitors were only developed for widespread commercial use protecting the embedded steel bars in reinforced concrete during the last 20-30 years.

Inorganic corrosion Inhibitors based on sodium nitrate and organic corrosion inhibitors based on amino alcohols are both now widely used in new reinforced concrete structures to provide additional 'integral' protection, usually against chloride ingress for severely exposed structures.



# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

The organic amino alcohol types have also now proven to be very effective for post-construction treatment and as an integral part of a complete concrete repair and protection system. These materials are also known as 'Migratory Corrosion Inhibitors', because when they are applied to the concrete surface, they penetrate into and through the concrete by both vapour (gaseous) diffusion and liquid diffusion, to form an additional protective monomolecular layer around the embedded steel reinforcement.

The electrochemically active layer on the steel surface prevents the formation of both anodic and cathodic areas, which as a result, significantly extends the time to the onset of corrosion, and it also significantly reduces the rate of any corrosion that is eventually able to take place.

This is why these corrosion inhibitors can form such a valuable part of an overall concrete repair and protection system; because they can effectively extend the service life of reinforced concrete structures. **Importantly for many building and civil engineering structure owners, migrating corrosion inhibitors can also considerably reduce the amount of expensive and disruptive concrete breakout required – a distinct advantage on many concrete repair projects.**

NCC Concrete Repair Site specialists have been involved in the use of corrosion inhibitors for the concrete repair market since their introduction to the UK in the early 1990's (with the Sika FerroGard 903 system from Sika). Like hydrophobic impregnations, the performance of corrosion inhibitors is dependent on their correct application and the penetration of the correct quantity of the product to the level of the steel reinforcement. There are special tests that have been developed to monitor and confirm all of these aspects on your project, we can also advise and assist you with these tests, both pre-contract and on site.

European Standards EN1504 Part 9 (Cathodic Control) Method 9.1 Limiting Oxygen Content (at the Cathode) by Saturation or Surface Coating; Principle 11 (Control of Anodic Areas) Method 11.3 Applying Inhibitors to the Concrete – All can apply as appropriate to the individual project's requirements.

**If you think, or would like to know if a Migratory Corrosion Inhibitor could be suitable for inclusion in a cost effective repair and protection solution, or to increase the durability of the concrete repair and protection works, and therefore the service life of your project, please call any of our offices and one of our technical experts will be pleased to assist you.**

Corrosion inhibitor products are definitely best to be selected and applied by experience and qualified specialists; as there is normally a requirement for detailed electrochemical understanding of the processes on-going in the

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

structure and future monitoring for the onset and / or the rate of steel reinforcement may be required. Therefore we do not include them in our Online Shop.

## **VIII). Structural Strengthening to Repair Reinforced Concrete**

In many concrete repair situations there is also a requirement for simultaneous Structural Strengthening (i.e. due to increased loads, additional openings or access routes, new equipment installation, or simply due to a change of use). There are traditional external structural strengthening traditional approaches involving additional steel reinforcement, which is either fixed or bonded into holes drilled in the concrete using special cartridge applied epoxy resin bonding agents (such as the Sika Anchorfix range), or otherwise mechanically fixed and possibly bonded to the concrete surface (i.e. with Sikadur 31 Epoxy Adhesive).

**Structural Strengthening may also involve the filling or injection of cracks with suitable structural epoxy resins – we cover the Resin Injection of Cracks (structural and non-structural cracks) in the next Specialist Concrete repair Products and Systems section below.**

Since the late 1980's there has been a lot of pioneering work in many research and testing facilities around the world, that resulted in huge advances in structural strengthening techniques, particularly with composite carbon fibre reinforced plastic (CFRP) extruded plate and woven fabric systems. These bonded CFRP systems (the best known of which are Sika CarboDur plates and SikaWrap Fabrics) are specifically designed for use as ultra-lightweight, but extremely high strength and durable, external reinforcement, which is bonded to the structure with high performance epoxy resin adhesives. These structural strengthening systems are also totally corrosion resistant and provide long term maintenance-free solutions, yet they are often incredibly cost effective versus traditional steel or additional reinforced concrete strengthening and rebuilding options for the owner.

The pre-formed extruded CFRP plates with precisely defined properties are externally bonded to the prepared concrete surfaces of the structure, at locations determined by the responsible Structural Engineer. The woven CFRP fabrics allow an almost unlimited range of shapes including round columns, curved sections and any size of element to be strengthened. The CFRP fabrics are effectively laminated together as required around the shape of the structure on site, with the same epoxy resin adhesive that also bonds them to the structure. There are also other fabrics that can be used for certain special strengthening application including Aramid and Glass Fibre Fabrics.

Structural Strengthening always has a very detailed structural engineering input requirement and responsibilities. Therefore the involvement of an experienced Structural Engineer is always essential, and an experienced

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

Specialist Contractor is recommended to do the work.

European Standard EN1504: Part 9 Principle 4 (Structural Strengthening) Method 4.2 Installing Bonded Rebar in Preformed or Drilled Holes in the Parent Concrete: and Method 4.3 Plate Bonding. – Can both apply, according to the nature of the specific strengthening works required.

**NCC Concrete Repair Site works with the leading structural strengthening engineers, contractors and can introduce and advise you on the correct requirements and approach for your project. The strengthening works can usually be included within the remit and programme of the overall concrete repair and protection works, so for specific advice on your project, please call any of our offices and our experts will be happy to assist you.**

Structural strengthening works should only be carried out by trained and experienced contractors after qualified structural investigation and analysis, therefore we do not include structural strengthening products in our Online Shop.

## **IX). Movement Joint Sealants for Concrete Repair Works**

According to their future exposure and the potential joint movement capability, all of the construction and expansion joints in a reinforced concrete structure require appropriate treatment and sealing as an integral part of any concrete repair and protection project.

This sealing of construction and movement joints is generally considered and covered in accordance with European Standard EN 1504 Part 9 Principle 1 (Preventing Moisture Ingress), however the materials to be used and details of their installation on site are not currently covered by the current EN 1504 Series of Standards. However it is obvious that if not treated and sealed appropriately with the right joint sealing materials, then any of the joints in a structure can be the source of future problems with further deterioration and water damage likely, together with additional cost.

**Fortunately NCC is also one of the UK's leading Materials and Consultants and Distributors for joint sealing technologies and products. Therefore for specific advice on your joint sealing requirements please contact any of our offices and one of our specialists will be pleased to assist you.**

## **X). Cracked Concrete Repairs by Resin Injection of the Cracks.**

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

Cracks in concrete buildings and other structures must always be inspected by the responsible Structural Engineer before the concrete repair and protection works begin. The precise nature / reason for the crack, together with its full extent and any structural or other significance must first be determined.

From this structural assessment, which is usually undertaken as part of the Condition Survey and Diagnostic Assessment the most appropriate remedial solution such as resin injection can be specified and incorporated into the schedule of the overall concrete repair and protection works.

## **Resin Injection to Repair Non–Structural Cracks in Concrete.**

If the crack in the reinforced concrete is due to past movement or excessive loading applied to the element or the structure as a whole i.e. during the original construction, work, or the installation of heavy equipment for example; then it may well have no structural significance.

When the structural engineer confirms that it is no longer moving then it may simply be filled with an appropriate repair or surface levelling mortar and overcoated to prevent the ingress of aggressive liquids or gases i.e. with the same protective coating as the rest of the surface. However if it is possible that at least some thermal or other slight movement could occur in the future, causing the crack to open again, then the crack can be structurally re-bonded with a suitable low pressure epoxy injection resin for example, or at least a crack bridging coating should be used.

Where the crack has no structural significance but is definitely subject to significant thermal or other movement, then a suitable crack bridging surface coating should always be used or dependent on its size and location, the crack may be transferred and treated as a movement joint in the surface i.e. formed to the correct size, brought through to the surface and sealed with an elastic joint sealant such as Sikaflex Construction.

European Standard EN1504 Part 9 Principle 1 (Protection Against Ingress) Method 1.2 Surface Coating with Crack-Bridging Ability; Method 1.3 Locally Bandaged Cracks; Method 1.4 Filling Cracks; and Method 1.5 Transferring into Joints – Can all apply as appropriate to the structure's situation and requirements.

## **Resin Injection of Structural Cracks in Concrete.**

When a crack has structural significance then provided that the responsible Structural Engineer is satisfied that the source of the damage i.e. excessive load imposed by extraordinary circumstances during the construction process or other unique event, has been removed, then the crack can be structurally

# **NCC's Concrete Repair Site –**

**[www.ConcreteRepairSite.co.uk](http://www.ConcreteRepairSite.co.uk)**

re-bonded using epoxyresin injection techniques, or by 'stitching' with additional bonded steel dowel bars as reinforcement.

Alternatively if the crack has led to, or been caused by other significant or larger voids such as areas of honeycombing or inadequate compaction around reinforcement or other details or penetrations through the concrete, then these should be filled with an appropriate cement or resin based grout. Alternatively the whole area of damage should be cut out and repaired with a suitable repair mortar as replacement concrete.

In all structural resin injection situations we recommend that the work is carried out using modern low pressure techniques and a resin with an extended 'pot-life' to allow a longer period for the material to penetrate and fill all areas of the cracks. This is to prevent the risk of ancillary structural damage that can be caused by less controllable high pressure resin injection systems, similarly to prevent contamination outside of the structure with resins or other materials during the process. There are special resin injection materials that are suitable and approved for use in contact with potable (drinking) water, plus materials that can accommodate, or even displace any water in the cracks within the structure.

The correct resin injection process can fully restore structural integrity to cracked areas or sections of reinforced concrete and ensure long term durability, with an extended service life of the structure.

European Standard EN1504: Part 9 Principle 4 (Structural Strengthening) Method 4.5 Injecting Cracks, Voids or Interstices; and Method 4.6 Filling Cracks, Voids or Interstices – Can apply according to the specific requirements of the individual structure and the nature of the cracks.

**Once again, NCC is also one of the UK's leading Materials and Consultants and Distributors for resin injection and cement grouting products. Therefore for specific advice on your project injection or grouting requirements please contact any of our offices and one of our specialists will be pleased to assist you.**

As with other structural strengthening works, resin crack injection should only be carried out by trained and experienced contractors after qualified structural investigation and analysis. However we do stock and sell a whole range of **Epoxy Resin Grouts and Resin Anchors / Resin Adhesives** that are used for many different structural and non-structural bonding and fixing jobs and these are available here in our Online Shop.