



# SITE FUNDI

CONCRETE REPAIR REFERENCE GUIDE

 **MEDICRETE**

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ENGINEERING LED CONCRETE DIAGNOSTICS

MEDICRETE

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STRENGTH  
CONCRETE

# ABOUT US





**Medicrete was founded with a clear purpose: to close the gap between practical construction work and the engineering science behind concrete rehabilitation and strengthening.**

What began as a contractor's pursuit of better workmanship has evolved into a specialist service dedicated to engineering-led solutions for diagnostics, repair, rehabilitation, and modification of concrete structures.

Our approach is rooted in both practical experience and technical expertise, enabling us to deliver clarity, quality, and confidence on every project. By combining advanced concrete diagnostics with proven rehabilitation techniques, we ensure solutions that are precise, durable, and tailored to the demands of each structure.

Today, Medicrete partners with clients across diverse sectors, from power stations and bridges to mining, agriculture, private developments, and civil engineering projects – delivering specialist services that enhance structural performance and extend service life.

Behind every project stands a team of skilled professionals, artisans, and operators who share a single commitment: To deliver trusted quality, from assessment through to completion.

## **ENGINEERING-LED SOLUTIONS FOR CONCRETE REHABILITATION.**



*This guide is a collaboration by Medicrete & Solvcore.*

# SERVICE LIFE EXTENSION

Concrete-related problems can arise from various factors such as poor workmanship, environmental conditions, or structural movement. Understanding the signs of deterioration is the first step in determining the right repair approach.

## BENEFITS OF SERVICE LIFE EXTENSION:

1

### ECONOMIC ADVANTAGES

Repairing and reinforcing concrete is significantly cheaper than full reconstruction, reducing capital expenditure.

2

### STRUCTURAL SAFETY

Preventing deterioration ensures structural integrity, reducing risks of failure or collapse. Most industries require ongoing inspections and maintenance.

3

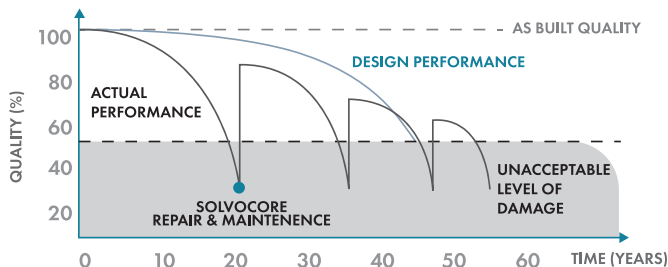
### ENVIRONMENTAL RESPONSIBILITY

Extending service life reduces material waste and lowers the carbon footprint associated with concrete production.

4

### OPERATIONAL EFFICIENCY

Maintained infrastructure reduces downtime and disruptions, avoiding costly delays and drops in productivity and turnover.



**RC Structures exposed to severe environments often need repair in 15-25 years, usually from corrosion damage.**

As seen in the diagram from Beushausen, H (University of Cape Town), the performance of reinforced concrete (RC) structures degrades over time due to environmental exposure and mechanical stress.

Without intervention, the quality of the structure declines beyond an acceptable level, often within 15-25 years in severe environments due to corrosion. Medicaret's repair and maintenance solutions restore and extend performance, reducing long-term costs and preventing failure.

**LONGER SERVICE LIFE CAN BE ACHIEVED:**

- ✓ Regular inspections and condition monitoring of your structures.
- ✓ Early detection and intervention using scanning technology.
- ✓ Preventative maintenance with coatings, sealers, and corrosion inhibitors.
- ✓ Strengthening techniques to extend durability and capacity.



*Visible lines or fractures on the concrete surface. Structural cracks may be deeper and cause displacement of the concrete.*



# CRACKING

Cracks in concrete may occur due to a variety of reasons, including shrinkage during curing, thermal stress from temperature changes, structural overloading, and foundational settlement. Cracks can be surface-level or penetrate deeply, compromising the durability and appearance of the concrete. Without proper repair, they may widen over time and lead to further structural deterioration.

## SOLUTION

Address cracks by employing techniques such as epoxy or polyurethane injection for deep, structural cracks, routing and sealing for surface-level cracks, or applying surface coatings for protective measures.

**EN 1504 provides 3 methods to close cracks for avoiding ingress.**

### Alternative Methods

**Surface Bandaging of Cracks**

**External panels**

**Filling of cracks**

**Membranes**

**Transferring cracks to joints**

# SPALLING

Spalling is the flaking or chipping away of concrete surfaces, typically caused by the corrosion of embedded steel reinforcement, freeze-thaw cycles, or mechanical impact. This issue may expose the underlying reinforcement to corrosive elements, accelerating the degradation process. If left untreated, spalling can severely compromise the structural integrity of the affected area.

## SOLUTION

**Remove loose concrete, clean the area including any exposed rebar.**

**Apply rust inhibitor to the exposed steel rods.**

**Apply a bonding agent.**

**Fill the spalled area with a suitable repair mortar or patching compound.**

**Larger areas or severe damage might require concrete replacement.**



*Noticeable chips, flakes, or pieces of concrete breaking away from the surface. May also reveal rusting reinforcement.*



*Uneven surface texture resembling a honeycomb, gaps and aggregate visible on the top surface, or a porous concrete texture.*



# HONEYCOMBING

Honeycombing refers to the formation of voids or cavities within the concrete structure resembling a honeycomb pattern, often resulting from improper mixing, inadequate vibration during placement, improper compaction, too much water and improperly designed formwork and incomplete filling of formwork.

Honeycomb can significantly weaken the concrete and make it more vulnerable to damage or failure. The voids created allow water to penetrate the concrete, leading to corrosion of reinforcement and other durability issues. In terms of Aesthetics, honeycomb can create a rough and “stony” surface, impacting the look of the concrete structure.

## SOLUTION

**Patch repairs with thixotropic for shallow repairs.**

**Patch repairs with a high flow grout and formwork for deeper sections.**

**Pressure grouting for very deep sections.**

**If necessary, clean corroded reinforcement steel and apply rust inhibitor.**

# WATER INGRESS

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Water ingress refers to the unwanted entry of water into concrete structures. Leaks often appear during extended periods of rainfall, with water exploiting previously unnoticed cracks and crevices to infiltrate the building. This poses a significant problem that can lead to structural damage, corrosion of reinforcing steel, and the growth of mould and mildew.

## SOLUTION

Apply waterproofing membranes, hydrophobic coatings, or injection systems to seal cracks and prevent further ingress.

## PROTECTION

Prevention is key when dealing with water exposure. Ingress protection is a important factor when considering concrete longevity and plant hygiene. Various contaminants such as oils, acids, process water, etc. Can affect the concrete appearance and integrity when in contact with the concrete in cyclic or extensive periods. Applications may range from a spray applied invisible performance enhancer, to various epoxy and polyurea coatings each tailored to the specific needs of the site.



*Moisture stains, dampness, or dripping water.*



*Surface hardness reduction and rebar corrosion.*



# CARBONATION

Concrete carbonation is the result of an electrochemical reaction between carbon dioxide, moisture and calcium hydroxide that is present in cement, producing calcium carbonate - this process slowly changes the pH in the concrete, starting at the outer layers moving inwards. If the carbonation reaches steel reinforcement it can cause corrosion, which has up to 6 times larger volume than the original steel, so as the steel reinforcements rust, the expansion causes the concrete to crack and spall.

Carbonation can advance at a rate of 1mm to 5mm per year dependent on the concrete's porosity and permeability. Concrete carbonation is assessed using an alkalinity indicator.

## SOLUTION

**Apply anti-carbonation coating.**

**Apply rust inhibitor to the exposed steel reinforcement.**

**If necessary, repair protective layers over exposed steel.**

# CHLORIDE INGRESS

Chloride ingress, the penetration of chloride ions into concrete, is a major cause of reinforced concrete deterioration, leading to corrosion of steel reinforcement, and ultimately, structural failure. Cracking and spalling is detrimental to concrete durability as it provides easy ingress points which accelerates the deterioration process. This process is particularly problematic in marine, industrial processes or de-icing salt environments.

## SOLUTION

**Removal of all loose concrete cover sections.**

**Clean corroded reinforcement steel and apply rust inhibitor.**

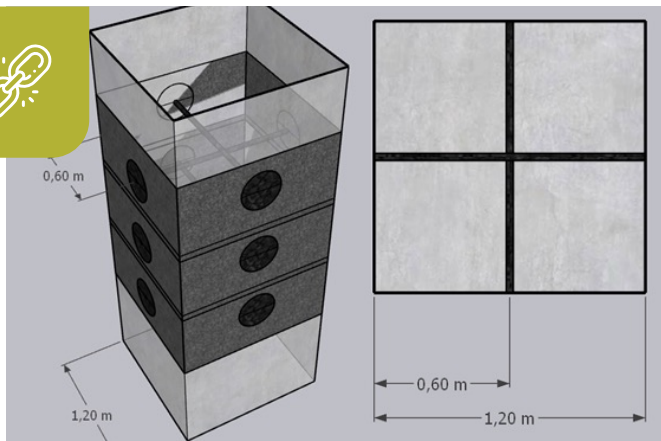
**Patch repairs with a high flow grout and formwork for deeper sections.**

**Pressure grouting for very deep sections.**

**Apply water repellent coating system to entire structure.**



*Cracks, spalling and uneven surface texture. Gaps and voids visible on the top surface, or a porous concrete texture.*



# CARBON FIBRE TECHNOLOGY

Carbon fibre, typically in the form of CFRP (Carbon Fibre Reinforced Polymer), is used in concrete structures to strengthen and repair elements by increasing load capacity, improving flexural and shear strength, and enhancing ductility, especially when accommodating additional loads or creating openings.

It is commonly applied to beams, slabs, columns, and walls to restore or enhance structural integrity after damage, design shortfalls, or changes in use. Its advantages include high strength-to-weight ratio, corrosion resistance, minimal added thickness, and fast, non-intrusive installation, making it ideal for structural upgrades without major demolition or disruption.

## **SOLUTION**

### **System Selection**

Choose the appropriate carbon fibre system (fabric, plates, or rods) based on structural strengthening needs.

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### **Engineering Design**

Ensure a qualified engineer provides a detailed design (locations, orientation, number of layers).

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### **Surface Preparation**

Grind the concrete surface to remove laitance, contaminants, and weak material, exposing sound concrete.

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### **Surface Cleaning**

Clean thoroughly with vacuum or compressed air to remove all dust & debris.

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### **Primer Application**

Apply epoxy primer to the prepared surface to improve bonding (if required).

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### **Epoxy Saturation/Adhesive**

Mix and apply epoxy adhesive to the surface; saturate carbon fibre if using wet-lay fabric.

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### **Carbon Fibre Placement**

Position and apply the carbon fibre as per design; ensure alignment and remove air pockets using rollers or hand pressure.

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### **Curing**

Allow proper curing as per manufacturer's instructions, maintaining temperature and humidity conditions.

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### **Quality Control**

Inspect for voids, poor bonding, or misalignment. If required, conduct tap or pull-off testing.

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### **Protection (Optional)**

Apply protective coating for UV or chemical exposure if needed.

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# CONCRETE DIAGNOSTICS

Medicrete offers various ways of assessing the condition of concrete structures using various methods to identify potential problems, including damage, corrosion, and material quality issues, using both destructive and non-destructive testing techniques.

**Ground Penetrating Radar (GPR) Scanning**

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**Ultrasonic Pulse Velocity (UPV) Testing**

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**Pull-Off and Pull-Out Testing**

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**Chloride Detection Testing**

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**Carbonation Depth Testing**

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**Core Sampling**

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**Rebar Size Verification**

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**Surface Hardness**

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**Reinforcement Identification**

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