

www.fosroc.com



constructive solutions



Fosroc Limited

Drayton Manor Business Park
Coleshill Road
Tamworth
Staffordshire
B78 3TL
United Kingdom
Tel: +44 (0) 1827 262222
Fax: +44 (0) 1827 262444
www.fosroc.com

Fosroc Midlands & South

Drayton Manor Business Park
Coleshill Road
Tamworth
Staffordshire
B78 3TL
Tel: 01827 262222
Fax: 01827 262444

Fosroc North

Unit 31
Salisbury Road
Haydock Industrial Estate
Haydock, Merseyside
WA11 9XG
Tel: 01942 717 534
Fax: 01942 718 942

Fosroc Scotland

28 Nurseries Road
Baillieston Distribution Centre
Garrowhill, Glasgow
G69 6UL
Tel: 0141 781 1878
Fax: 0141 781 0785

Fosroc Ireland

22 Trench Road
Mallusk, Newtownabbey
County Antrim
Northern Ireland
BT36 8TY
Tel: 028 90 848 315
Fax: 028 90 342 521

Unit 45

John F Kennedy Avenue
Bluebell
Dublin 12
Tel: +353 (0) 1450 151
Fax: +353 (0) 1450 5445



Concrete repair and remediation to BS EN 1504



Important Note

Fosroc products are guaranteed against defective materials and manufacture and are sold subject to its standard terms and conditions of sale, copies of which may be obtained on request. Whilst Fosroc endeavours to ensure that any advice, recommendation, specification or information it may give is accurate and correct, it cannot, because it has no direct or continuous control over where or how its products are applied, accept any liability either directly or indirectly arising from the use of its products, whether or not in accordance with any advice, specification, recommendation or information given by it.

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Welcome to Fosroc

■ Fosroc worldwide

Fosroc has over 70 years experience of supplying specialist chemicals to the construction industry.

 In 1991 Fosroc merged with Expandite, another successful chemical company, which was established in 1934. The two companies combined to become one of the largest suppliers of construction chemicals in the world.



Service support

■ CPD seminars

We can provide CPD approved seminars on:

- waterproofing below ground structures
- the new ISO11600 classification for joint sealants
- concrete repair, including the new EN1504 specification

Contact your local Fosroc office for further details on these informative 45 minute seminars, which demonstrate how our products meet construction industry requirements.



■ On site support

Internationally and locally, Fosroc has an enviable reputation for depth of expertise and quality of service. Our UK based Specification Managers and Area Sales Managers offer site visits where required to help solve problems, check applications and product performance.

Fosroc has gained a reputation for developing innovative products in sealants, waterproofing, concrete repair, grouts and anchors, concrete admixtures and coatings. By concentrating on innovation and customer service, Fosroc leads the way in specification selling into the construction chemicals market. For further information visit our interactive web site:

www.fosroc.com

Fosroc's wealth of experience is shared by our operations throughout the world, with group companies in over 15 countries and exports to a further 50 other countries.

■ Specification service

We offer direct assistance with specifications for individual projects; we can visit your site or office, arrange a meeting at our HQ in Staffordshire, or provide you with written specifications for Fosroc products, in NBS format.

■ Technical helpline

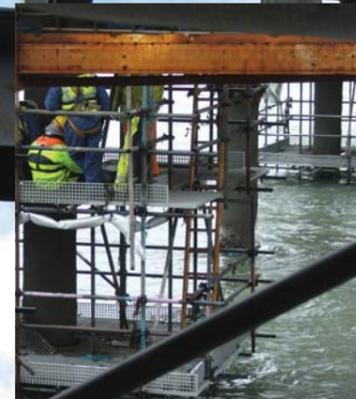
Fosroc's technical helpline is manned by an experienced team, committed to solving construction problems. Whatever technical enquiries you may have - from product selection and problem solving to health and safety issues - contact us for a fast and efficient service:

01827 262222
enquiryuk@fosroc.com



constructive solutions

worldwide success



how can we help you?



Fosroc is working with customers to meet the high requirements set out in BS EN 1504 - supplying products to meet the standards the construction industry demands.

Fosroc offers a comprehensive range of concrete repair and remediation products tested to European Standard methods and CE Marked; including our internationally proven specialist Renderoc repair mortars and Dekguard anti-carbonation coatings.

Whatever the structure - from bridges to car parks and commercial buildings to jetties, Fosroc's technical expertise in concrete repair technology can help guide you through the application of BS EN 1504, enabling you to develop a cost effective and highly beneficial solution for your concrete repair project.

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What is BS EN 1504?

European Standard BS EN 1504: *Products and systems for the protection and repair of concrete structures* replaces existing individual national standards, providing an integrated framework for the concrete repair industry throughout Europe.

The Standard covers all stages of the concrete repair process from assessing the initial problem to methods of remediation, recommended site practice and specifications for products to ensure the future integrity of the structure.

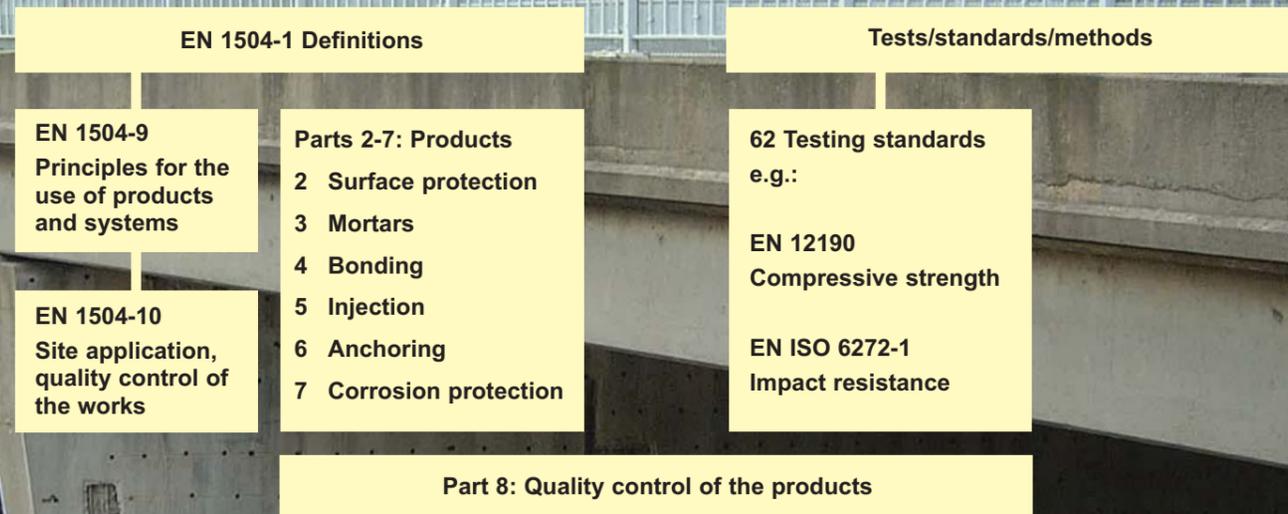
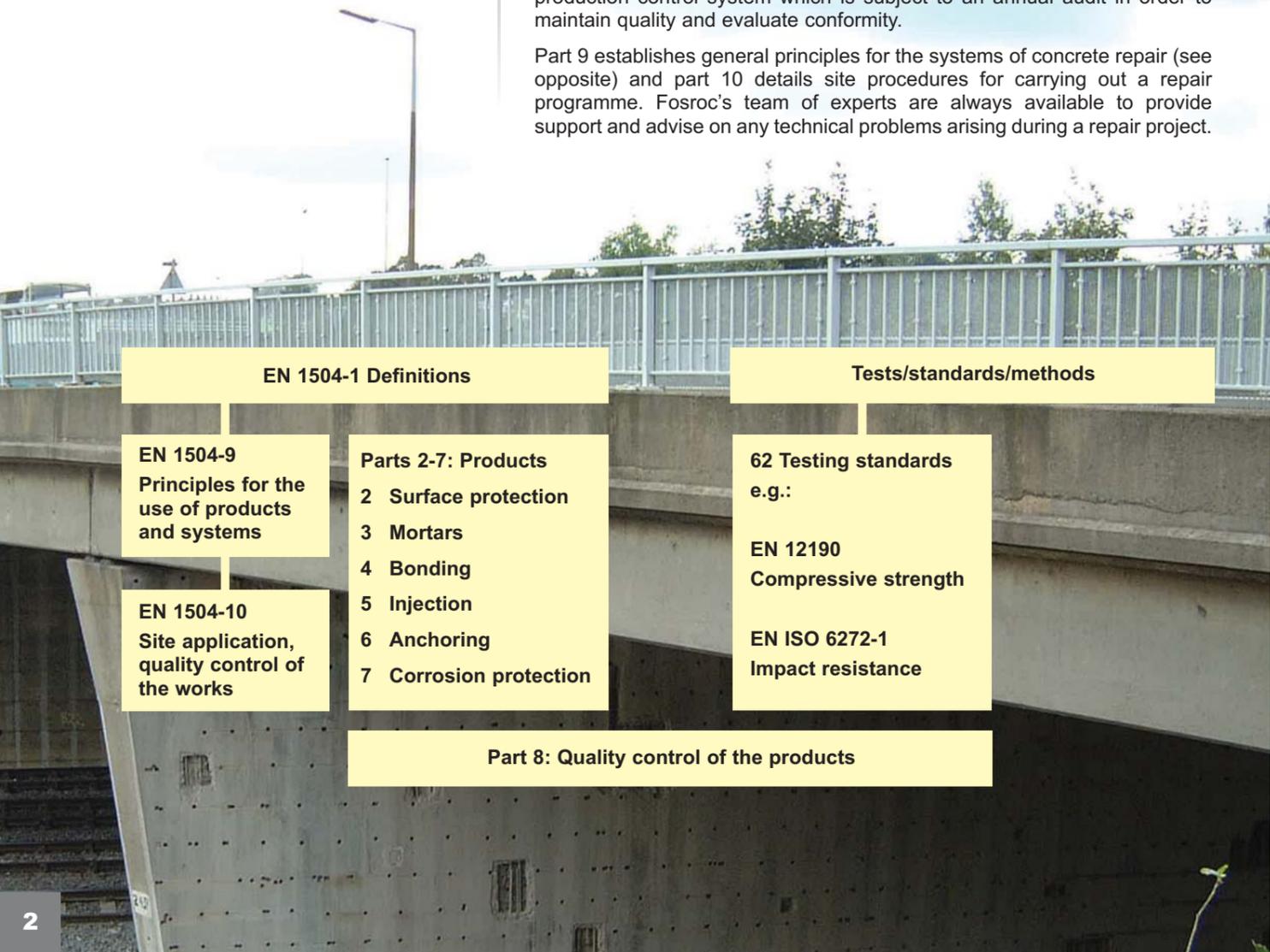
Fosroc experts can help specifiers, clients and contractors apply BS EN 1504, developing appropriate solutions as well as specifying and applying the best materials to ensure optimum concrete repair and protection.

EN 1504-1	General scope and definitions
EN 1504-2	Surface protection systems for concrete
EN 1504-3	Structural and non-structural repair
EN 1504-4	Structural bonding
EN 1504-5	Concrete injection
EN 1504-6	Anchoring of reinforcing steel bar
EN 1504-7	Reinforcement corrosion protection
EN 1504-8	Quality control and evaluation of conformity
EN 1504-9	Principles for the use of products and systems
EN 1504-10	Site application of products and systems and quality control of the works

Using the definitions set out in BS EN 1504-1, parts 2 -7 focus on product specification, classifying materials by their properties and relevant test methods. These sections not only provide the principles for manufacturers designing products, but also provide specifiers and designers with an exact profile of properties for comparing and selecting products.

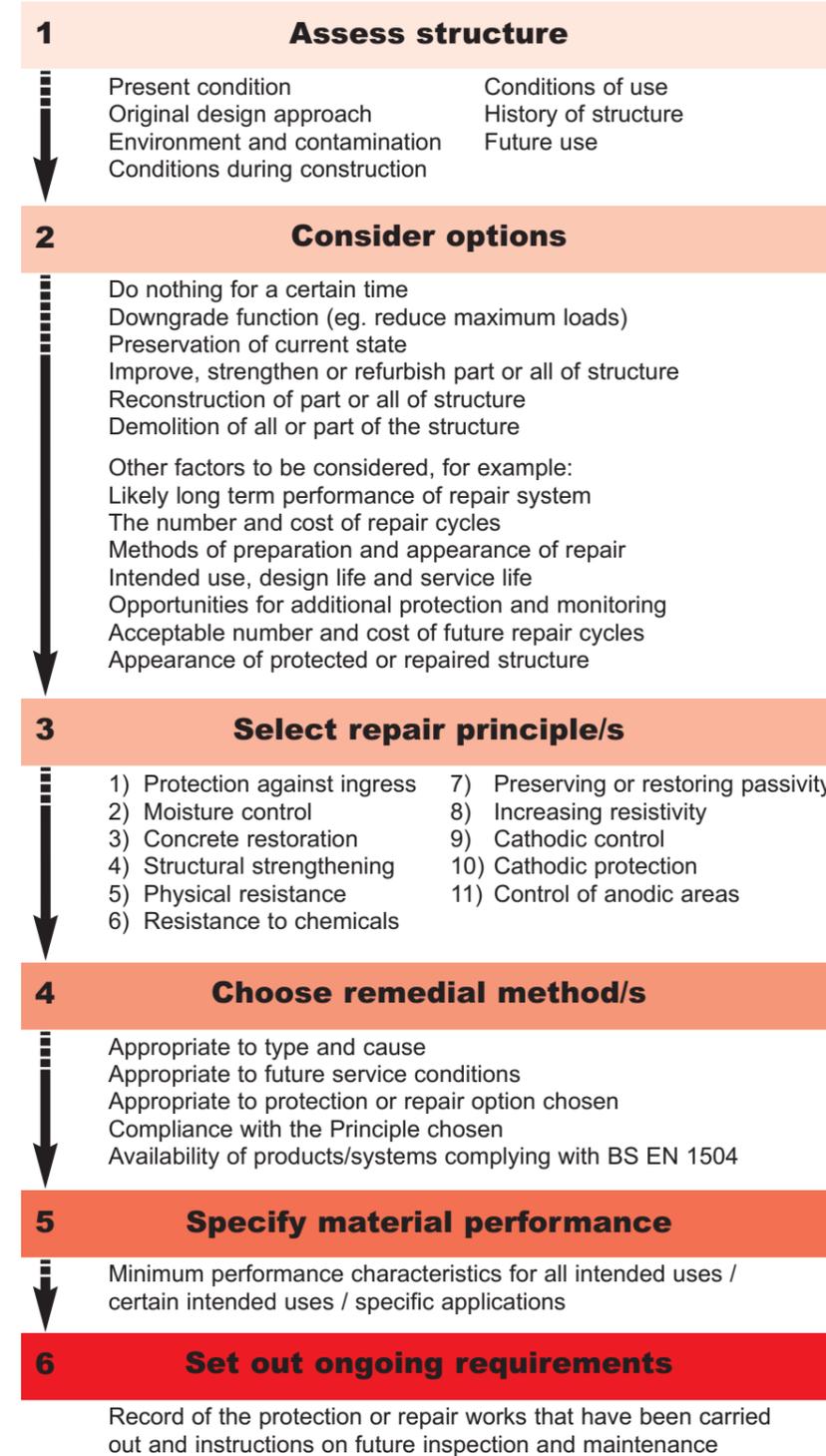
Part 8 describes how manufacturers must operate a permanent factory production control system which is subject to an annual audit in order to maintain quality and evaluate conformity.

Part 9 establishes general principles for the systems of concrete repair (see opposite) and part 10 details site procedures for carrying out a repair programme. Fosroc's team of experts are always available to provide support and advise on any technical problems arising during a repair project.



Design Philosophy - Specifying to BS EN 1504

Part 9 of BS EN 1504 outlines a structured approach to the investigation of the causes of defects in concrete and explains the 11 Principles of remedial action which clients and designer/specifiers should use to prepare their specification. The system of options, principles and methods is the basis for the selection of products and Fosroc can help designers make optimal use of the repair principles to find the most appropriate action taking into account health and safety, structural and environmental factors.



The 11 Principles for concrete repair and rehabilitation (BS EN 1504-9)

Defects in concrete

Principles 1 - 6 cover defects to concrete or the structure caused by:
 Mechanical actions, eg: impact
 Chemical and biological actions from environments
 Physical actions, eg: freeze thaw, thermal cracking.

Reinforcement corrosion

Principles 7 -11 cover reinforcement corrosion caused by:
 Physical loss of concrete cover
 Chemical loss of alkalinity in the protective concrete
 Contamination of the protective concrete cover with corrosive agents, eg: chloride ions
 Stray electrical currents conducted or induced in the reinforcement from neighbouring electrical installations

Principle no.	Principle	EN 1504 part	Methods for protecting or repairing structure	Fosroc products
Principle 1 (P)	Protect against ingress	2	1.1 Hydrophobic impregnation	Dekguard range/Renderoc ST 05 Expoband H45 Nitofil LV Proofex 3000 Nitoseal MS600/Thioflex 600
			1.2 Impregnation	
		2	1.3 Coating	
			1.4 Surface bandaging of cracks	
		5	1.5 Filling of cracks	
			1.6 Transferring cracks into joints	
			1.7 Erecting external panels*	
			1.8 Applying membranes*	
Principle 2 (MC)	Moisture control	2	2.1 Hydrophobic impregnation	Nitodek/Dekguard coatings
			2.2 Impregnation	
		2	2.3 Coating	
			2.4 Erecting external panels	
			2.5 Electrochemical treatment	
Principle 3 (CR)	Concrete restoration	3	3.1 Hand-applied mortar	Renderoc hand applied mortars Renderoc fluid mortars Renderoc spray applied mortars
			3.2 Recasting with concrete or mortar	
		3	3.3 Spraying concrete or mortar	
			3.4 Replacing elements	
Principle 4 (SS)	Structural strengthening	6	4.1 Adding or replacing embedded or external reinforcing bars	Conbextra grouts Lokfix Nitofil LV/TH
			4.2 Adding reinforcement anchored in pre-formed or drilled holes	
		4	4.3 Bonding plate reinforcement	
			4.4 Adding mortar or concrete	
		3,4	4.5 Injecting cracks, voids or interstices	
		5	4.6 Filling cracks, voids or interstices	
			4.7 Pre-stressing - (post tensioning)	
5	4.7 Pre-stressing - (post tensioning)			
Principle 5 (PR)	Increasing physical resistance	2	5.1 Coating	Nitocote/Dekguard coatings Renderoc range
		2	5.2 Impregnation	
		3	5.3 Adding mortar or concrete	
Principle 6 (RC)	Resistance to chemicals	2	6.1 Coating	Nitocote/Dekguard coatings
		2	6.2 Impregnation	
		3	6.3 Adding mortar or concrete	
Principle 7 (RP)	Preserving or restoring passivity	3	7.1 Increasing cover with additional mortar or concrete	Renderoc range
			7.2 Replacing contaminated or carbonated concrete	
		3	7.3 Electrochemical realkalisation of carbonated concrete	
			7.4 Realkalisation of carbonated concrete by diffusion	
			7.5 Electrochemical chloride extraction	
Principle 8 (IR)	Increasing resistivity	2	8.1 Hydrophobic impregnation	Nitocote/Dekguard coatings
			8.2 Impregnation	
		2	8.3 Coating	
Principle 9 (CC)	Cathodic control		9.1 Limiting oxygen content (at the cathode) by saturation or surface coating	Nitocote/Dekguard coatings
Principle 10 (CP)	Cathodic protection		10.1 Applying an electrical potential	
Principle 11 (CA)	Control of anodic areas	7	11.1 Active coating of the reinforcement	Nitocote coatings Renderoc Primer
			11.2 Barrier coating of the reinforcement	
		7	11.3 Applying corrosion inhibitors in or to the concrete	

* these methods also be applicable to other principles

Case Study - Bridge repair

The defective concrete was assessed as having been damaged by aggressive salts, requiring a solution that would ensure the integrity of the structure, enabling continued safe use as well as providing protection against future deterioration.

Applying Principle 3 Concrete Restoration, the damaged part of the structure was removed and the repair method selected was 3.3 spray applying concrete.

The product selected was Fosroc Renderoc DS, which is dry spray applied and has high resistance to carbon dioxide and chloride penetration which resulted not only in an effective repair but provided long-term protection to the steel.



Damage caused by aggressive agents is removed

Fosroc Renderoc DS spray applied

Completed repair

Quality (BS EN 1504-8)

BS EN 1504 as a product standard leads to CE marking of concrete repair products across Europe ensuring the use of products and systems to meet minimum performance requirements for a range of repair applications.

In line with Part 8 of BS EN 1504 - Quality control and evaluation of conformity, Fosroc's range of concrete repair products are manufactured to satisfy the repair principles and perform according to specification. They are independently tested and CE mark approved.

In addition to BS EN 1504 quality control guidelines, Fosroc concrete repair products are also backed by the ISO 9000 Standard for Quality control and many are BBA approved.

It is important to realise that CE marking is only the minimum requirement.

For example for a physical resistant coating the characteristics tested for all intended uses to gain CE marking are:

- Abrasion resistance
- Capillary absorption and permeability to water
- Impact resistance
- Adhesive bond

For BS EN 1504 compliance additional characteristics are also tested:

- Freeze thaw resistance
- Slip / skid resistance
- Anti-static behaviour
- Coefficient of thermal expansion
- Crack bridging ability
- Resistance to chemical attack
- Permeability to carbon dioxide



Structural and non-structural repair (BS EN 1504-3)

Fosroc world-renowned range of Renderoc mortars has been developed to provide appropriate solutions to the wide variety of problems resulting in defective concrete. These pre-bagged single component products are available in the 4 different classes specified in BS EN 1504 for structural and non structural concrete repair products:

Non-structural products

Class R1 \geq 10MPa

Class R2 \geq 15MPa

Structural products

Class R3 \geq 25MPa

Class R4 \geq 45MPa

This basic classification is by compressive strength, however additional test data is required for each product depending on the application for which it is being used. The BS EN 1504 Principles and Methods which apply to structural and non-structural repairs are:

Principle 3 [CR] Concrete restoration

- 3.1 Applying Mortar by hand
- 3.2 Recasting with concrete
- 3.3 Spraying mortar or concrete

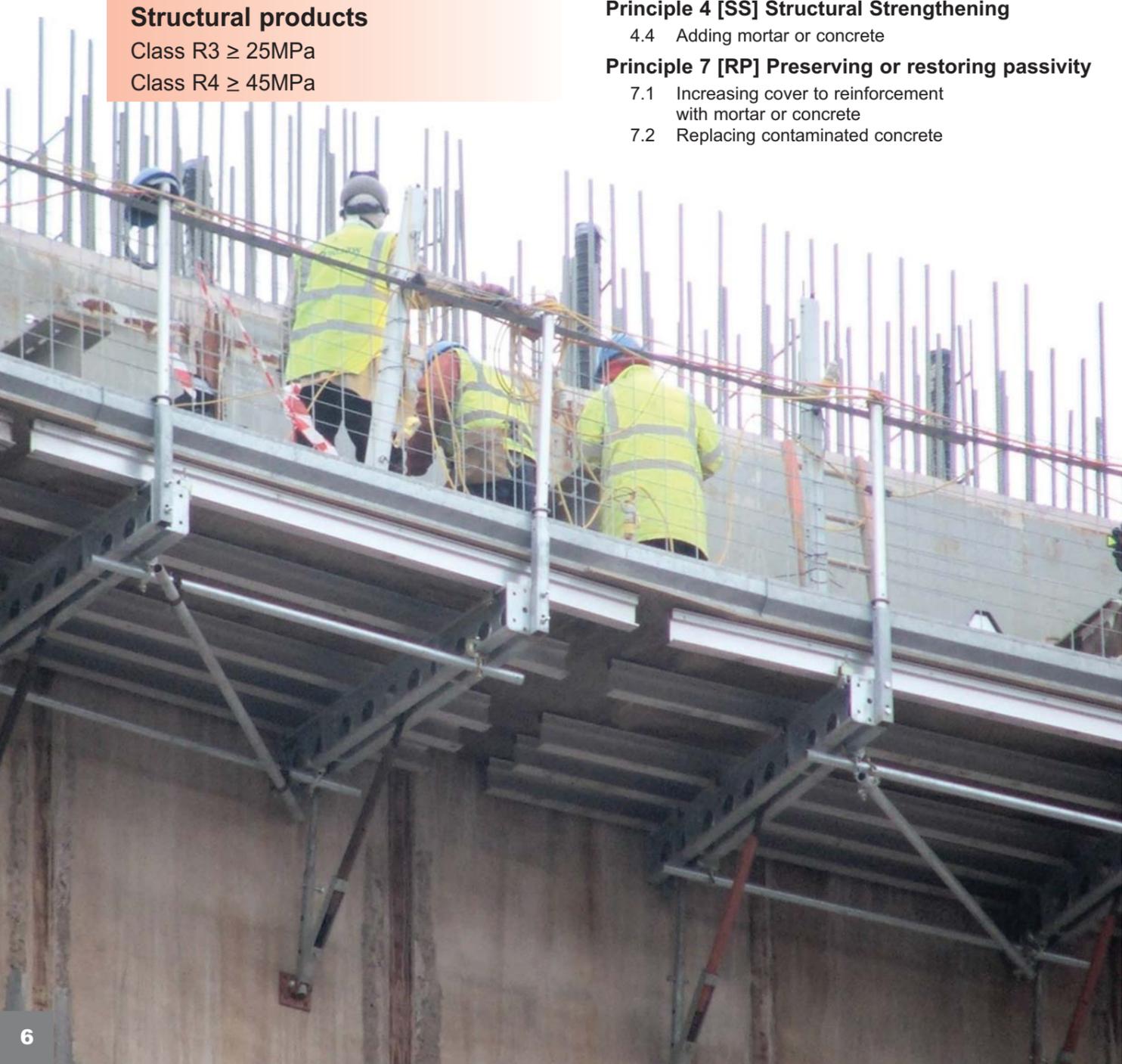
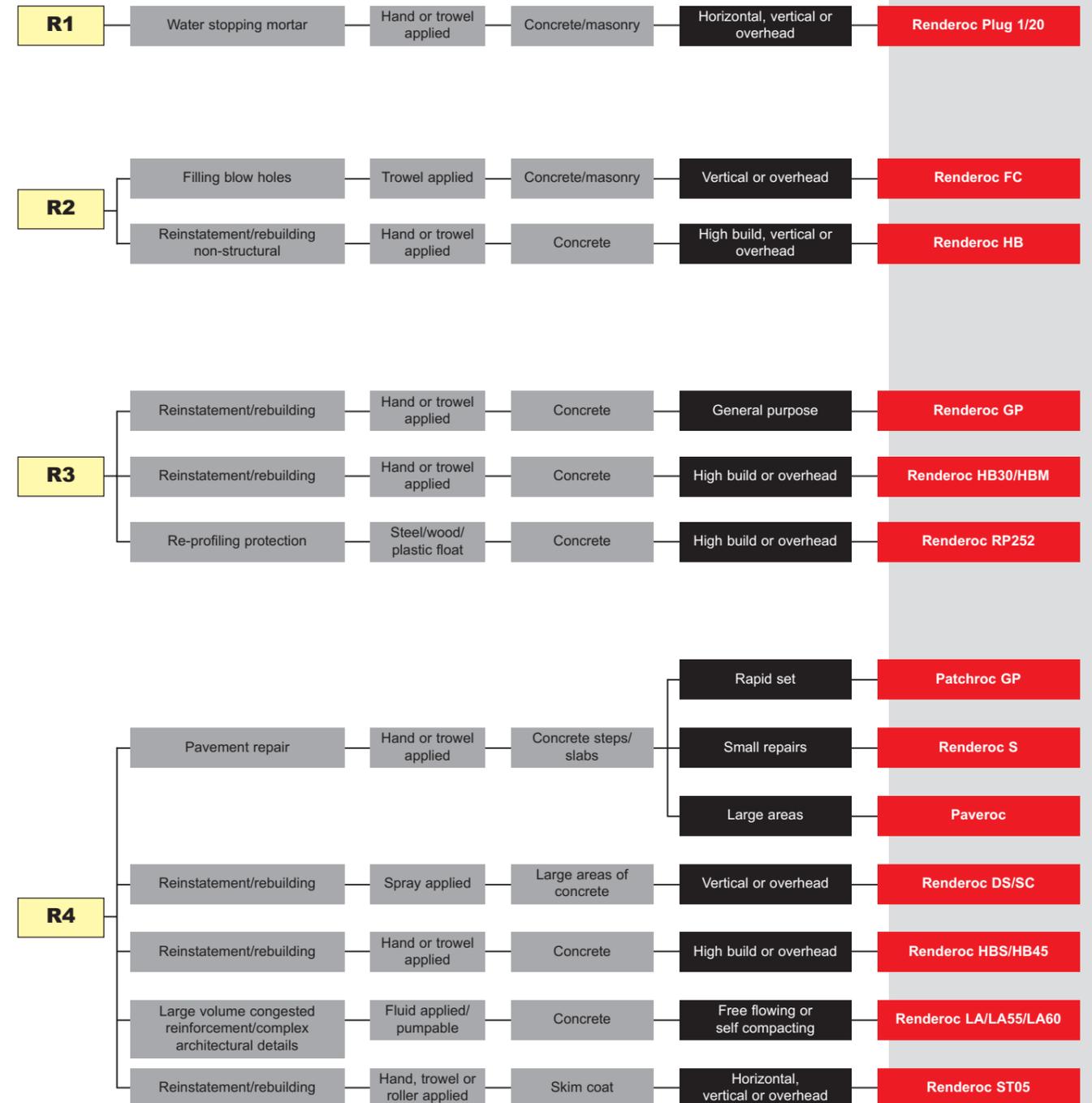
Principle 4 [SS] Structural Strengthening

- 4.4 Adding mortar or concrete

Principle 7 [RP] Preserving or restoring passivity

- 7.1 Increasing cover to reinforcement with mortar or concrete
- 7.2 Replacing contaminated concrete

Product selector



Non - structural repair products

R1

Renderoc Plug 1 / Plug 20 (Method 3.1)

Rapid setting cement based, waterstopping mortars

Emergency waterstopping capability

Single component - pre-bagged to overcome variations in site batching

Excellent bond to substrate

Low exotherm minimises thermal cracking

Chloride free

Renderoc Plug 20 DWi compliant

R2

Renderoc FC (Method 3.1, 7.1, 7.2)

Polymer modified fairing coat

Designed for application in thin layers to produce a fair-faced appearance to concrete or masonry surfaces in readiness to receive a protective coating

BBA approved

Renderoc HB (Method 3.1, 3.3, 7.1, 7.2)

High performance lightweight concrete reinstatement mortar

Used for vertical and overhead high build applications

BBA approved



Structural repair products

R3

Renderoc HB30 (Method 3.1, 3.3, 7.1, 7.2)

High performance fibre reinforced, lightweight concrete reinstatement mortar

Low permeability

Shrinkage compensated

Used for vertical and overhead repairs

Renderoc HBM (Method 3.1, 3.3, 7.1, 7.2)

Lightweight concrete reinstatement mortar

Used for vertical and overhead repairs

Renderoc GP (Method 3.1, 3.3, 4.4, 7.1, 7.2)

General purpose concrete reinstatement mortar

Used for patch repairs

Can be used as a render

BBA approved

Renderoc RP252 (Method 3.1, 7.1, 7.2)

Two component fibre and polymer modified cementitious mortar for re-profiling and protection

Wide range of application thickness

Excellent bond to the concrete substrate

Shrinkage compensated

R4

Renderoc HB45 (Method 3.1, 3.3, 4.4, 7.1, 7.2)

High performance fibre reinforced, medium weight concrete reinstatement mortar

Used for high build applications such as columns, beams and soffits

Renderoc HBS (Method 3.1, 3.3, 4.4, 7.1, 7.2)

Medium weight concrete reinstatement mortar

Used for repair of columns, beams and soffits

Renderoc DS / SC (Renderoc DS Method 3.3, 3.4) (Renderoc SC Method 3.3, 7.1, 7.2)

Dry spray repair mortar

Used for large area repairs such as bridges, tunnels, retaining walls, dams etc.

Polymer modified Renderoc DS conforms to Department of Transport requirements

Renderoc S (Method 3.1, 3.3, 4.4, 7.1, 7.2)

Structural grade polymer modified concrete reinstatement mortar

For reinstatement of large areas of concrete or small repairs

BBA approved



Patchroc GP (Method 3.3, 4.4, 7.1, 7.2)

Fast setting emergency patching mortar

Used for emergency reinstatement of localised patches in concrete pavements, airport aprons, access ramps, roadways and warehouse floors

Rapid strength gain. Will accept traffic in just 2 hours

High strength, abrasion and weather resistance

Paveroc (Method 3.1, 3.3, 4.4, 7.1, 7.2)

Reinstatement mortar for concrete pavements and floors

Rapid strength gain. Will accept pedestrian traffic after just 12 hours

High strength, abrasion and weather resistance

Renderoc LA range (Method 3.2, 4.4, 7.1, 7.2)

Range of free-flowing low alkali micro-concretes

Ideal for the reinstatement of large structural sections of concrete

Excellent chloride and carbon dioxide resistance

Can be used for repairs to concrete affected by alkali silica reaction

Can be pumped or poured

Self compacting - expels air without vibration

Renderoc LA60 and LA55 conform to Department of Transport requirements

Renderoc ST 05 (Method 3.1, 7.1, 7.2)

Protective cementitious coating and levelling mortar

Carbonation and chloride barrier

Suitable for vertical and horizontal applications

Scrape-coat, brush or trowel applied

Fosroc's technical experts can help guide you through the 11 principles to find the most appropriate concrete repair method. We can also identify the products and systems that will give you the best, cost-effective solution with real long-term improvements in the quality of the structure.

Fosroc also provide CPD seminars on concrete repair including the new BS EN 1504 specification.



Surface protection systems

BS EN 1504-2

Once damaged concrete has been repaired, consideration should be given to the protection of the structure against future attack from the surrounding environment.

Fosroc's range of protective and decorative Dekguard anti-carbonation, anti-chloride high performance coatings offer protection in line with BS EN 1504-2 and are compatible with Fosroc's range of Renderoc mortars, providing an effective and attractive repair and protection system.

Dekguard Range

Dekguard Elastic, Dekguard S, Dekguard W

- Anti-carbonation, anti-chloride higher performance coatings
- For use on atmospherically exposed concrete
- Highly UV resistant
- Flexible, crack bridging systems
- Wide colour range
- BBA approval for Dekguard Elastic and S

Nitocote Range

Chemical resistant cementitious and resin based coatings for use in aggressive environments or below ground

Nitocote EP403

Damp-tolerant, solvent free epoxy resin coating

Nitocote EP 405

Solvent-free epoxy resin coating for water retaining structures. WRAS approved

Nitocote EP410

Highly chemical resistant two pack epoxy system

Nitocote SN511

conforms to Department of Transport specifications
Hard wearing - durable, low maintenance costs
High chemical resistance
Hygienic - impervious finish provides easily cleaned substrate

(See page 4 for relevant method)

Anchoring and grout products

BS EN 1504-6 Anchoring of reinforcing steel bar

Where structural strengthening is required to increase the load bearing capacity of part of a concrete structure, Fosroc's range of Conbextra grouts or Lokfix anchors provide the appropriate solution in accordance with Repair Principle 4.



Fosroc Lokfix S25 and P25

Rapid curing polyester resin anchoring grouts

Compliant with the requirements of BS EN 1504-6, with a compressive strength of 100 MPa at 29 days

Suitable for anchoring steel bars into concrete, as well as brickwork, masonry and rock

Conbextra GP

General purpose grout for stanchion plates, bolt pockets and void filling

Conbextra HF

For filling around large stanchion base plates, bolt pockets

Conbextra EP10 & EPR

Where heavy dynamic or mobile loads are encountered and also in refineries and chemical plants where spillage may be encountered

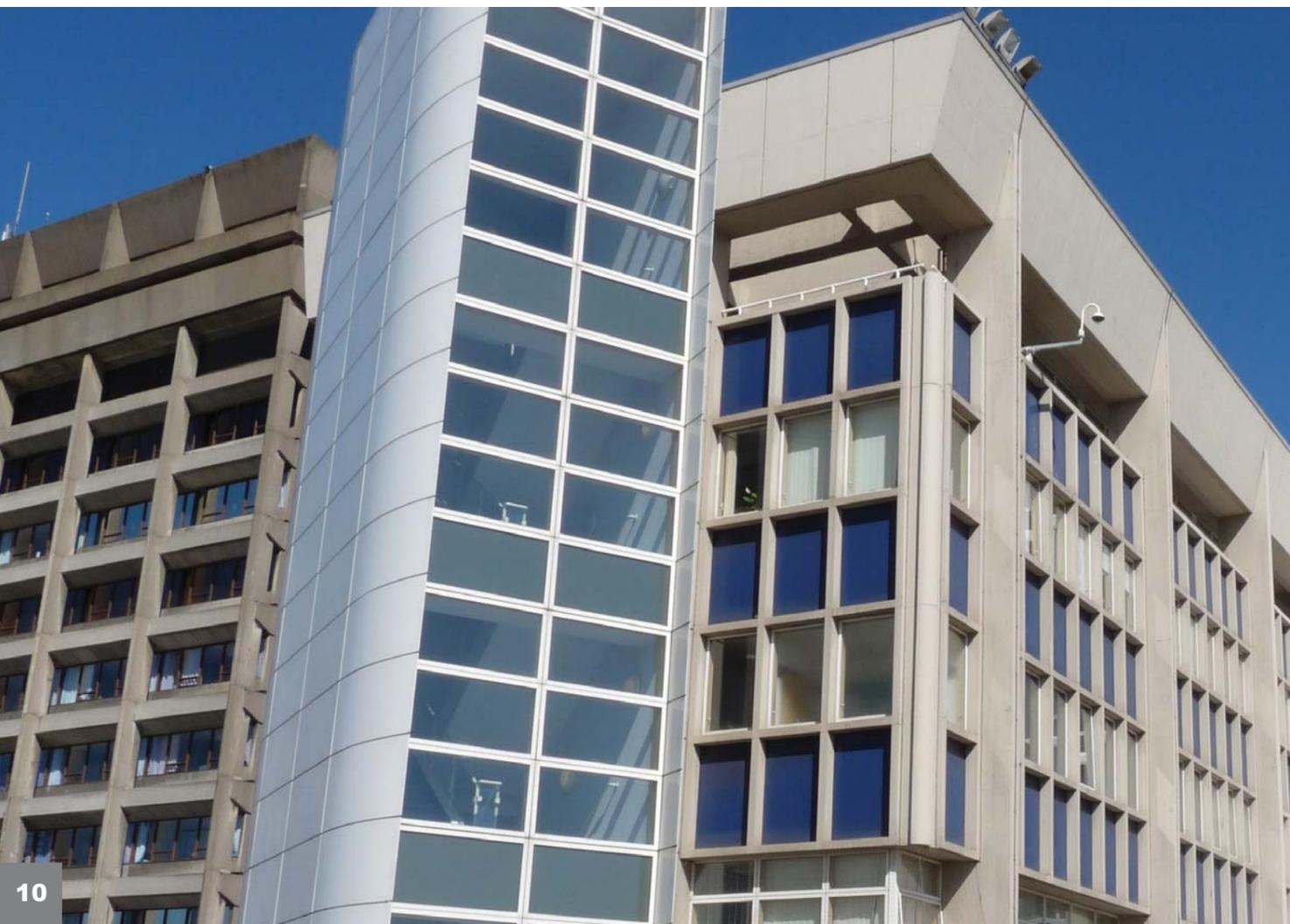
Conbextra TS

Ideally suited to grouting thick section voids beneath baseplates and voids around below ground tanks as well as large bolt pockets



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Fosroc also provide CPD seminars on concrete repair including the new BS EN 1504 specification.



Additional concrete repair products

Resins

Nitomortar Range

Range of epoxy reinstatement mortars, with high resistance to a wide range of chemicals, suitable for emergency repairs where fast strength gain is important.

Nitomortar S

Ideally suited for acid tanks, sea walls, industrial floors and as a bedding mortar

Nitomortar HB

Used for vertical and overhead locations

Nitomortar PE

Used for repairing and re-profiling of precast concrete units, damaged arisses and treads



Floor Coatings

Nitoflor FC130 /FC140

High performance epoxy resin floor coatings

- Hard wearing - durable, low maintenance costs
- High chemical resistance
- Hygienic - impervious finish provides easily cleaned surface



Crack Injection Resins

Nitofil LV /TH

Pre-packaged low viscosity or thixotropic epoxy resin injection grout.

- Achieve high strength bond to dry or wet concrete
- Material designed for low creep
- Non shrink - no loss of bond or surface contact
- High compressive, tensile and flexural strengths
- Excellent chemical resistance



Nitokit LV /TH

Pre-packaged low viscosity or thixotropic epoxy resin crack injection systems including everything necessary to complete crack injection.

Protective Coatings

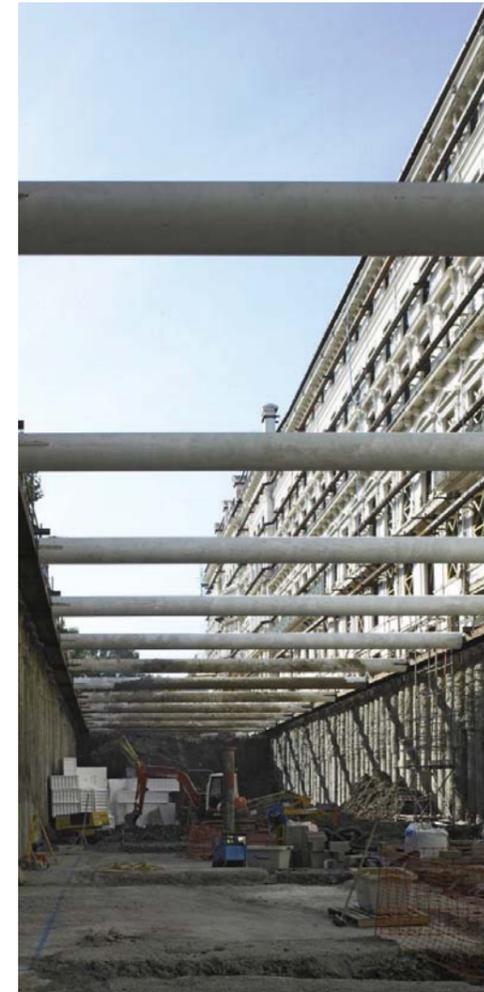
Fosroc Polyurea

Anti-corrosion, waterproof and protective coating for concrete and steel in a wide range of environmental conditions

- Fast setting, seamless coating
- Very long lifecycles and high durability



Fosroc solutions for structural improvement or reconstruction



Fosroc's comprehensive range of products means that not only can we provide solutions for maintaining structures, but where the damage to the concrete structure is severe we can offer solutions for improving or reconstructing all or part of the structure, such as

- Conplast and Structuro, Concrete admixtures
- Proofex waterproofing membranes.

Fosroc's technical experts can help guide you through the 11 principles to find the most appropriate concrete repair method.

We can also identify the products and systems that will give you the best, cost effective solution with real long-term improvements in the quality of the structure.

Fosroc's full product range includes:

- Joint sealants
- Concrete repair mortars
- Protective coatings
- Waterproofing membranes
- Waterstops
- Grouts and anchors

Contact Fosroc...

All the products featured in this brochure are available either direct from Fosroc or from one of our specialist construction chemical distributors.

If you require further information on any of our products, please contact us:

Tel: 01827 262222
 Fax: 01827 262444
 email: enquiryuk@fosroc.com

Alternatively, up-to-date technical information is available on our website at:

www.fosroc.com

up-to-date technical information

