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Method Statement

Goodenough College, Mecklenburgh Square

London, WC1N 2AB

December 2017

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Client Name: CBRE

Document Reference: Goodenough College - Mecklenburgh Square WC1N 2AB

Project Number: 17104

Quality Assurance

This document has been prepared and checked in accordance with CBP Architects IMS (ISO9001:2008)

Issue	Date	Prepared by	Checked by	Approved by
P01	08.12.17	TM	CP	CP
P02	22.12.17	TM	CP	CP

Revision	Comments
P01	First Issue
P02	Updated Drawing Revisions

Disclaimer

Contents

1. Introduction

This method statement relates to localised vehicle impact damage to external railings, coping stones to the perimeter of the external footpath. In addition. This vehicle damage extends to the stone mullions, and stone cill of an existing window opening formed in the external façade within the lightwell.

The existing metal central panel framed window and glazing has also been extensively damaged, taking the direct force and impact of the vehicle, after passing through the existing railings at speed.

A structural report has been carried out by Collins Hall Green dated November 2017, Rev A, on the extent of the damage. Recommendations have also been proposed, in conjunction with Prelude Stone – Stonework and Restoration Specialists, and these datails been included in this method statement.

These recommendations have been proposed in the form of the structural report, and detailed description of the specialist stone repairs with supporting information where applicable.

It is proposed to carry out the repairs with minimal intrusion and impact, reclaiming existing materials where possible as noted in the method statement and supporting drawings.

Masonry, coping, stone detail and railings to boundary:

- London House, Goodenough College - Mecklenburgh Square is a Grade II listed building.
- The external wall of the semi basement is constructed from random flint facing masonry up to ground floor level.
- There is a level difference from the pedestrian pavement into the lightwell of 1400mm approx.
- The top of the lightwell retaining wall is finished with Portland Stone Coping.
- The iron railings are embedded into the top of the Portland Stone Coping, with restraining cantilevered angle fixed into the lightwell retaining masonry structure.
- The railings are painted black.
- Part of the existing damaged railings can be reutilised – part of the railings are so badly damaged that these areas will be replicated and integrated into the repair works.
- There is evidence of stone damage where the restraining cantilevered angle has been pulled out of the lightwell side of the retaining wall.

Window detail:

- The window is highlighted with Portland stone quoins, lintol and cill.
- The window is formed from single glazed painted metal framed sections, beaded externally to match existing (Crittall or equal approved)
- The window is set and fixed behind the Portland stone mullions/ lintol, and pointed with material to match existing.

2. Strategy for Works

2.1 Strategy to be adopted for proposed remedial works to railings, boundary wall and window:

- Site investigations have been carried out to review the existing railings, coping, and window, its structural stability and proposals to remedy.
- The information is contained in the following report and detail drawings which should be read in conjunction with this method statement.
- Collins Hall Green Report on Structural Inspection of Vehicular damage dated November 2017, Rev A.
- 17104-A-0001- Elevations, Sections and Plan of Damaged Areas
- 17104-A-0002-Site Location Plan-Extent of Damaged Area
- Specialist support and survey has been carried out by Prelude Stone - Stonework and Restoration Specialists and their recommendations have been included in this method statement.
- All surfaces are to be fully protected by corex sheeting, ply boards and other suitable material during the works being carried out.

2.2 Existing Railings – proposed repair works:

- One section of the existing railings took the main impact of the vehicle and have been badly damaged. These railings have been put to one side for part re use.
- To allow work to be carried out effectively to the coping, retaining wall, and window area, the existing section of railings to the left hand, and right-hand side of the damaged area are to be carefully removed and set aside for re use and installation, as work proceeds.
- It is intended to utilise and reinstate a section of existing railings damaged via the impact beyond repair. A new section is to be provided to match existing, approximately 3560mm in length to replace this damaged section.
- The repaired railings will be re-set into the new Portland Stone coping (see below for detail)
- The existing railings either side of the damaged area will be replaced into the existing sockets formed within the Portland Stone. The new section will be installed and jointed to the existing railings, including fitting into new sockets formed into the Portland stone coping stones.
- The cantilevered angle bracket will be re fixed into the repaired retaining wall.
- The railings will then be carefully lightly rubbed down, and painted with 1 no primer coat, 1 no undercoat and 2 no coats black gloss to match exiting.

2.3 Coping Stone - proposed Repair Works:

- Carefully select and identify sections of existing coping stone for reuse.
- Localised removal of sections of stone is required to allow work to be carried out without causing further damage. The stone equates to 12 no. sections, average length 921mm. To be carefully recorded in situ and marked on the measured survey drawing prior to removal for later replacement in same location.
- Supply 2 no sections of new Portland Stone coping to replace damaged sections beyond repair - to match profile of existing –, each 1375 x 277 x 203mm approx.
- Form new sockets in the Portland Stone coping and grout supports into stone– centres to match the vertical fixings of the railings.
- Where existing coping stones are to be re used – secret fixed Stainless-Steel pins -front and back of the stone – bedded in epoxy resin, are to be utilised to re bed the stone to the retaining wall

- Repairs to the localised internal face of the ashlar retaining wall – rake out damaged stone by hand approx. 540mm. Install a new indent of reclaimed stone recovered from the existing coping – and repoint in lime sand mortar.
- Bed the new coping stones on lime sand mortar and point joints front and back to match existing.
- All raking out of joints and mortar to be carried out by hand. Use mechanical tools to a minimum.

2.4 Basement Windows - proposed stone repair works:

Stonework:

- Carefully cut out the surfaced damaged quoin stone to the extreme left-hand side jamb – to a depth not exceeding 20mm.
- Reform repair in Portland Stone specialist repair mortar – repair size approximately 280 x 380mm.
- Carefully cut out the surfaced damaged quoin stone to the left-hand vertical mullion – to a depth not exceeding 20mm.
- Reform repair in Portland Stone specialist repair mortar – repair size approximately 260 x 400mm
- Secret pin and point fracture to the stone to the inside of the vertical LHS mullion, with 2 no. stainless steel pins and epoxy resin.
- Secret pin and point fracture to the stone to the inside of the vertical mullion, with 2 no. stainless steel pins and epoxy resin.
- Point joints in lime mortar to match existing.
- Stonework repairs will be limited only to work that is necessary to replace existing stonework that is sufficiently damaged to be no longer structurally sound (for example where more than 15% of the face has been lost). Damaged stonework will not be replaced for purely aesthetic reasons.
- Rub down areas of stone by hand where surface paint is located, with a wet carborundum block to remove deposits.
- The cleaning of stonework for aesthetic reasons will generally not be permitted. Cleaning should only be undertaken with an approved system (DOFF or equal approved) to remove car paint where this has stained the stone if the above hand solution is not successful.

Proposed Mortar mixes:

- 3:1 Lime, mortar mix comprises: Lime NHL 3.5, with standard plastering sand.
- Portland Stone specialist repair mortar comprises: Jordans Base Bed mortar repair, pre-mixed, with Portland Stone dust.

2.5 Basement Windows - proposed metal window repair works:

- Carefully remove the middle-damaged metal casement frame, and damaged glazing from existing stone mullions.
- Check stonework around the exposed opening for damage. Record any damage and notify the Client with identified areas.
- Install new metal framed window, profile to match existing, with new single glazed apertures, and opening light.
- Fix metal frame into the exiting opening, utilising exiting fixing points if this can be achieved.
- Point perimeter of the frame within the stone opening.
- Ironmongery to match existing.
- Window to be galvanised, and either polyester powder coated, or painted, with 1 no metal primer, 1 no undercoat, and 2 coats gloss. Colour to match existing

2.6 Choice of Materials and Specification

- Any necessary stonework repairs will use new stone of a suitable provenance that matches as closely as possible the original, in terms of colour and appearance as well as physical and chemical characteristics. Artificial reclaimed stone will not be used.
- New stonework will be carefully matched and blended with the existing so as not to detract from the appearance of the building, but the repairs will be generally carried out without attempting to disguise or artificially age the new work. Consequently, replacement stone will not be distressed to match the finish of the existing.
- Where it is deemed necessary to repair any functional and/or decorative stonework, the replacement stone will be moulded to match the original form.
- Epoxy material utilised is Fosroc Conbextra EP or equal approved – Data Sheet attached

2.7 Repointing Stonework.

- Repointing of stonework will be limited only to work that is necessary to prevent damp and water ingress, or to repair the identified damage and surrounding areas in context, usually where sacrificial mortar has been lost, or when inappropriate cement based mortar can be removed by hand, without damaging surrounding stonework and brickwork.

2.8 Choice of Materials and Specification

- Re-pointing of stonework should be kept to the absolute minimum necessary and comprehensive re-pointing for cosmetic reasons is not acceptable. If inappropriate cement based mortar is identified, this should only be removed, by hand (i.e. no mechanical tools), if loose.
- Joints should be carefully raked out by hand to a depth of at least two times their width or a maximum of 18-25mm. No mechanical tools should be used for raking out: this must be undertaken with hand tools only.
- Joints should be flushed out and saturated with clean water, to limit suction.
- Stonework should be re-pointed or bedded in an appropriate mortar mix (that is weaker and more porous than the adjacent masonry and usually a lime based mortar).
- Mortar mixes should be designed for the location and exposure. The material, texture and colour of the existing or original construction mortar should be determined and matched.
- New mortar should be well pressed into joints, and struck to match existing.
- Proprietary coloured mixes or colouring additives should not be used. Mortar for repointing should be coloured using an appropriate sand to match the original joints before weathering.
- A sample of the proposed mortar mix should be approved by the local planning authority prior to the commencement of re-pointing works.
- Joints should be finished to match any specific original feature (for example, lined out or tuck-pointed mortar joints in brickwork).
- The use of putty lime, rather than hydrated lime, is preferred, as is the preparation of coarse joints. Samples of mortar mixes, finishing and surface texture should be agreed on site before undertaking the work. Where large areas of repointing are proposed, the local planning authority will require a sample panel or panels be undertaken using the proposed mortar prior to repointing. The agreed sample should be kept on site for reference until the works are complete and approved.
- The specification for repointing should take into consideration the time of year, provision of skilled crafts-persons, aftercare needed and be detailed enough on items such as placing, compaction and protection of mortars to ensure high quality work.
- Where stone is being pointed, joints should be filled with new mortar as far back as possible and finished flush, then brushed back with a bristle brush to expose both the aggregate and the edges of adjacent stone, compacting the joint and promoting carbonation.

- Joints should on no account be struck or finished proud of the masonry to form 'strap' or 'ribbon' pointing or feathered over the edge of eroded blocks. Care should be taken to finish the joints to match the surrounding work and the width of the original joints should not be increased.
- Where existing masonry is generally eroded, the face of the mortar should be kept back to the point at which the joint remains the original width. Repointing should not increase the width of the original joints.

2.9 Paintwork

- The careful specification of paint type and colour is essential to maintain the unity of the whole and should match the existing window and railings.

2.10 Choice of Materials and Specification

- Previously unpainted surfaces should not normally be painted over.
- All paint colours and specifications should be agreed by the local planning authority.
- Advice should be sought from the paint manufacturer prior to commencement of work.
- The removal of existing paint, by hand, should ensure the metal/ stonework is not damaged.
- A paint system for metal/ stonework must be compatible with the metalwork/ stone, and act as a protective barrier to the elements, including inhibiting corrosion.
- In general, it is advisable to use an oil-based paint system on cast iron, both for new castings and on existing ironwork. As oil-based primers are slow in drying, the corrosion inhibitors are better able to penetrate the small particles of rust or scale which will inevitably exist on the surface of historic ironwork. COSHH guidance sheets are to be reviewed.
- Three coats are required - primer, undercoat and finish coat. All three coatings must be mutually compatible.
- The optimum technique for applying paint to ironwork in situ is using traditional bristle brushes. Narrow rollers may be suitable for long, flat sections, but other systems such as spray guns do not compare with the effectiveness of brush application on intricate decorative patterns.
- Colour - the existing and adjoining metalwork is finished with black paint (railings) and off white (windows); therefore, this colour should be used to match existing.

2.11 Sample of Materials, Applications:

Paint systems to:

- New metalwork/ existing railings

Pointing to, including repairs:

Stonework

In-situ repairs to:

- Stonework

Reuse of existing Historic fabric/ materials:

- Where possible, any existing historic fabric when removed is to be re-used within the overall refurbishment strategy – e.g. stone repairs, and part railings. This has been identified within the body of this specification and method statement. The strategy is one of minimal intervention and repair.

Appendix A

Technical Data

22
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July 2016

Fosroc® Conbextra EP

FOSROC constructive solutions

Epoxy resin free-flow grouts conforming to the requirements of BS EN1504-3 Class R4 and BS EN 1504-6 Anchoring of reinforcing steel bar.

Uses

For grouting under baseplates, crane rails, turbines where heavy dynamic loads are encountered and areas where chemical spillage may occur.

Typical applications include:

- Reciprocating machinery
- Testing equipment
- Heavy crane and transporter rails
- High speed turbines
- Centrifuges
- Drop forges
- Electroplating and chemical plants
- Anchoring of steel bars

Advantages

- Low creep characteristics under sustained loading
- Resistant to repetitive dynamic loads
- Non-shrink, ensuring complete surface contact and bond
- High compressive, tensile and flexural strengths
- Fast, convenient installation with rapid strength gain
- Withstands a wide range of chemicals
- Two grades available for gap widths 0.25 - 10 mm and 10 - 120 mm

Description

Conbextra EP are epoxy resin based products designed for free-flow grouting of gap thicknesses from 0.25 to 120 mm. Two grades of product are available:

Conbextra EP10 for grouting gap thicknesses from 0.25 to 10 mm. Comprising of a two component, low viscosity unfilled epoxy resin system which is mixed and poured into the gap.

Conbextra EPR for grouting gap thicknesses from 10 to 120 mm. A three-component system consisting of base resin, liquid hardener and specially graded inert fillers, which are mixed and poured into the gap.

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Fosroc Ltd
Drayton Manor Business Park, Coleshill Road, Tamworth, B78 3XN, UK
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DoP: UK9-18
0370-CPR-0845

Conbextra EPR	
EN1504-3: Structural and non-structural repair methods 3 and 4 EN1504-6: Anchoring of reinforcing rebar	
Compressive strength	Class R4 (≥45 MPa)
Adhesion strength by pull-off test	≥ 2.0MPa
Chloride ion content	≤ 0.05 %
Determination of shrinkage and expansion	Shrinkage 2.9 MPa Expansion 2.8 MPa
Elastic modulus	22GPa
Testing of anchoring products by the pull-out method	≤ 0.6mm
Creep under tensile load	≤ 0.6mm
Glass transition temperature	56°C
Fire classification	Class C
Dangerous substances	Complies with 5.3 (EN1504-6) 5.4 (EN1504-3)
Carbonation resistance	Passes

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Conbextra EP10	
EN1504-3: Structural and non-structural repair methods 3 and 4 EN1504-6: Anchoring of reinforcing rebar	
Compressive strength	Class R4 (≥45 MPa)
Adhesion strength by pull-off test	≥ 2.0MPa
Chloride ion content	≤ 0.05 %
Determination of shrinkage and expansion	Shrinkage 3.1 MPa Expansion 3.1 MPa
Testing of anchoring products by the pull-out method	≤ 0.6mm at 75 kN
Creep under tensile load	≤ 0.6mm
Glass transition temperature	51°C
Fire classification	Class C
Dangerous substances	Complies with 5.3 (EN1504-6) 5.4 (EN1504-3
Carbonation resistance	Passes

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Fosroc® Conbextra EP

Properties

The following results were obtained at a temperature of 20°C unless otherwise stated.

Test method	Standard	EN 1504 Requirement	Test result		
			Conbextra EP10		Conbextra EPR
Compressive Strength	EN 2190:1999	Class R4 ≥ 45 MPa	- MPa 100MPa	@ 1 Day @ 7 Day	90 MPa 100 MPa
Bond strength by pull off:	EN 1542:1999	Class R4 ≥ 2.0 MPa	3.2 MPa		2.9 MPa
Chloride ion content:	EN 1015-17:2000	Class R4 ≤ 0.05 %	0.00 %		0.00 %
Determination of shrinkage and expansion:	EN 12617-4:2002	Class R4 > 2MPa	3.1 MPa 3.1 MPa	Shrinkage Expansion MPa	2.9 MPa 2.8 MPa
Elastic modulus in compression	EN 13412:2002	Class R4 ≥ 20 GPa	-		22 GPa
Testing of anchoring products by pull out method	EN 1881:2006	@ 75 KN load ≤ 0.6 mm	0.45 mm 0.51 mm	Dry test Wet test	0.30 mm 0.38 mm
Determination of creep under sustained load	EN 1544:2007	Displacement ≤ 0.6 mm @ 3 months	0.36 mm		0.43 mm
Glass transition temperature	EN 12614:2006	> 45 or 20°C above max ambient temperature	51°C		56°C
Fire rating	EN 13501-1	-	Class C1 s1 dO		
Flexural strength	BS 6319 Pt 3:1990	-	81 MPa		37 MPa
Flexural modulus	BS 6319 Pt 3 1990	-	3.6 GPa		15.5 GPa
Tensile strength	BS 6319 Pt 3:1985	-	29 MPa		14 MPa
Pot life	-		40 min 20 min 10 min	@ 10°C @ 20°C @ 30°C	60 min 30min 15 min
Minimum thickness Maximum thickness	- -		0.25 mm 10 mm		10 mm 120 mm

Clarification of property values: The typical properties given above are derived from laboratory testing. Results derived from field applied samples may vary.

Flow characteristics

The maximum distance of flow is governed by the gap thickness, the head of grout applied and the ambient temperature. The following table gives typical data for flow design.

	Temperature °C	Gap thickness(mm)	Hydrostatic head (mm)	Maximum flow (mm)
EPR:	5	12	100	450
	5	35	100	900
	20	12	100	900
	20	35	100	2000
EP10:			Flow determined by gap thickness and pressure applied	

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Fosroc® Conbextra EP

Specification Clause

The epoxy grout shall be Conbextra EP, a multi-component resin grout conforming to the requirements of BS EN 1504-3 Class R4 and BS EN 1504-4. For gaps between 0.25 and 10 mm Conbextra EP10 should be used and for gaps between 10 and 120 mm Conbextra EPR should be used.

Conbextra EPR: The hardened grout shall have a compressive strength in excess of 95 MPa at 7 days and a flexural strength in excess of 37 MPa at 7 days.

Conbextra EP10: The hardened grout shall have a compressive strength in excess of 95 MPa at 7 days and a flexural strength in excess of 80 MPa at 7 days.

The storage handling and placement of the grout shall be in strict accordance with the manufacturer's instructions.

Standard Compliance

Conbextra EP10 and Conbextra EPR complies with the classification R4 according to BS EN 1504-3.

Conbextra EP10 and Conbextra EPR complies with the requirements of BS EN 1504 -6: Anchoring of reinforced steel .

Application instructions

Preparation

Foundation surface

All contact surfaces must be free from oil, grease, free-standing water or any loosely adherent material. Concrete surfaces should be cut back to a sound base either by a grit blast or light scabble. All dust must be removed and bolt holes or fixing pockets blown clean of any dirt or debris.

Steel surfaces

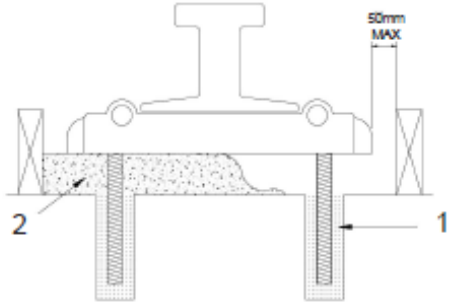
All steel surfaces should be shot blasted to SA2.5, free of rust and mill scale. Cleaned surfaces may be protected by the application of Nitoprime 28.

Formwork

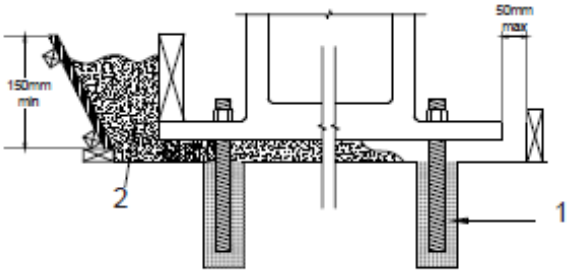
The formwork should be constructed to be leakproof as Conbextra EP products are free-flowing grouts. Loss of grout once the material is placed but not hardened, will result in incomplete filling of the gap.

For free-flow grout conditions it is essential to provide a hydrostatic head of grout. To achieve this a feeding hopper system should be used.

Example of Conbextra EP grout to individual rail baseplate:



Example of Conbextra EP grout to machinery baseplate:



1 *Lokfix resin anchor
2 Conbextra EP grout
* Also available from Fosroc.

Mixing

Pour all the contents of the hardener pack into the base container. Mix using a slow speed power drill and paddle until homogeneous.

Conbextra EPR: Pour all the resultant liquid into a container with a capacity of 15 to 25 litres. Add all the filler provided. Mix using a slow speed power drill and Conbextra (MR3) mixing paddle for 2 minutes or until a uniform colour is achieved in the grout.

16 litre pack resin and hardener must be poured into a container of 25 litres capacity before mixing. Once mixed add filler component and mix with a slow speed drill and Conbextra (MR3) mixing paddle for 2 minutes until a uniform colour and consistency.

22
CI/SfB: Yq4
July 2016

Fosroc® Conbextra EP

Placing

The mixed grout should be poured steadily from one side only to eliminate the entrapment of air.

Continuous grout flow is essential.

Sufficient grout must be available prior to starting.

The time taken to pour a batch should be regulated to the time taken to prepare the next batch.

After curing the unrestrained grout should be cut back below the bottom of the baseplate using a skill saw.

Cleaning

All tools and equipment should be cleaned immediately after use with Fosroc Solvent 102. Spillages should be absorbed with sand or sawdust and disposed in accordance with local regulations.

Estimating

Supply

EP10:	3 litre packs, containing liquid base and hardener. 2 x 1.5 litre units
EPR:	8 and 16 litre packs, containing base, hardener and filler
Fosroc Solvent 102:	5 and 25 litre containers

Limitations

Temperature

During application:

For both products grouting may be carried out without special precautions at ambient temperatures from 5°C to 25°C. Where ambient temperatures exceed 20°C note the pot life will be reduced.

Cure temperatures below 15°C will result in slower strength build up; at 5 °C cure will stop until the material warms.

Exotherm: All epoxy systems will develop a temperature rise on mixing. Its extent will be a function of the volume to surface ratio, the ambient temperature as well as the mass and thermal conductivity of the surrounding materials. Mixed Conbextra EP10 will in quantities above approximately 200 grams exotherm producing vapour. Ensure good ventilation and do not breath fumes Contact Fosroc Technical Services for specific advice.

In service:

The cured grouts, which are completely resistant to frost and sub-zero temperatures, are suitable for use up to 45°C. Contact Fosroc Technical Services for advice.

Storage

Conbextra EP products have a shelf life of 18 months if kept in dry conditions at 20°C.

Precautions

Health and safety

For further information refer to appropriate Product Safety Data Sheet available at www.fosroc.com

Fire

Fosroc Solvent 102 is flammable. In the event of fire extinguish with CO_2 or foam.

Flash point

Fosroc Solvent 102:	33°C

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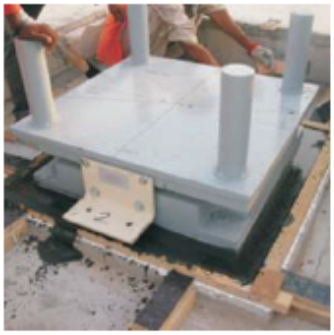
ABOUT
FOSROC INTERNATIONAL

Since the company's beginnings over 50 years ago, Fosroc has developed into an International leader in delivering Constructive Solutions for projects across a broad range of market segments including transport, utilities, industrial and general buildings.

Fosroc's commitment to customer service and technical support is second to none. We work closely with architects, structural engineers, contractors and owners to best understand their requirements. Together we can develop a bespoke solution for a construction project, adding value and becoming more than just a materials supplier, but a solution provider.

Fosroc has an extensive network of offices and manufacturing locations across Europe, the Middle East, India, North and South Asia, and is further represented in other regions across the world by distributor and licensee partners.

Selecting from the full portfolio of Fosroc products and services and integrating expert technical support, world class customer service and innovation, Fosroc goes beyond just product selling to ensure that we partner with our customers to deliver complete constructive solutions.



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FOSROC GROUTS THE BASIS FOR SUCCESS

There is a wide range of structural grouts available from Fosroc. That is because we know that each solution needs to be perfectly matched to its challenge. Our team is on hand to understand the project requirements and select the right answer.

Stability is the key to structural integrity. Fosroc has all the grout solutions that you could need to create a total, solid support. Whatever you are putting in place, we have the product to give it the best connection and foundation for success.

Through decades of experience, we know that effective grouting and anchoring relies on more than strength alone. The flow and workability of Fosroc's Conbextra range ensures that the best possible contact is achieved for your application, meaning you will achieve all the strength that you need, exactly where you need it.

With exceptional flow, stability and strength characteristics, our grouts provide the best solution for high precision applications, combined with a wide range of cement and resin based anchoring systems. They are tested and outperform industry laid norms and standards. For many years, our grouts have been supporting some of the world's most demanding projects, such as the King Fahad Causeway between Saudi Arabia and Bahrain, the Paradip Oil Refinery in India and the Emirates Cable Car in London. Fosroc Conbextra Grouts are chosen for their ability to deal with dynamic loads, chemical exposure, extremes of heat and harsh natural exposure, making them the industry's number one choice in critical load-bearing situations.

GROUTING SOLUTIONS FOR VARIOUS SECTORS

Industry & Power Generation

Commercial & Residential Buildings

Civil Structures

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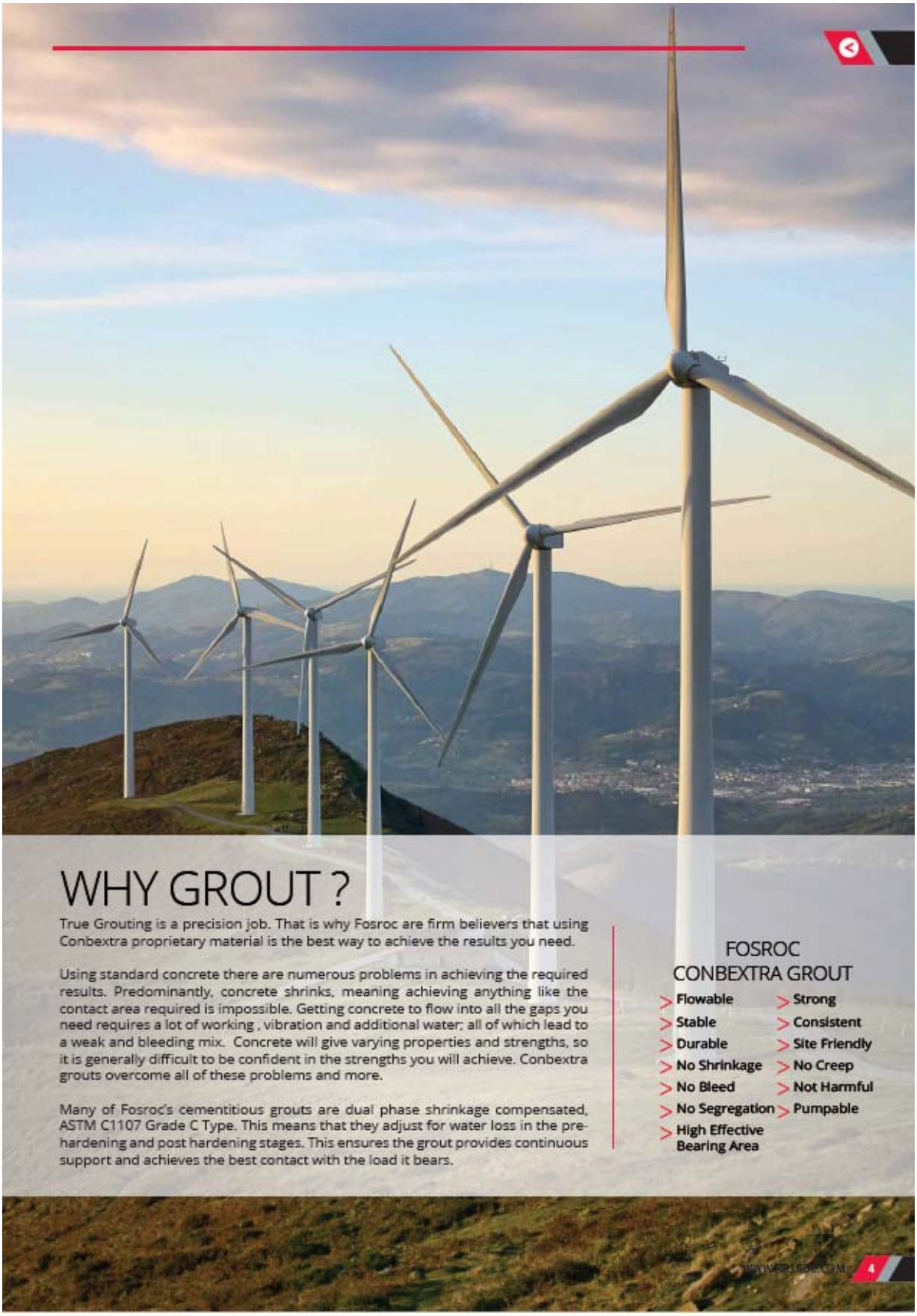

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Ver:	2
ISD:	01/02/17

GROUTING SOLUTIONS FOR INDUSTRY & POWER GENERATION

Fosroc has a wide range of precision grouts ensuring the smooth running of plant and factory facilities, from petrochemical processing to food and beverage manufacture. We understand the strains placed upon machinery and the importance of minimising downtime, and have the solutions to achieve these aims

1. **Conbextra GP** and **Conbextra HF** – Cementitious grout for supporting columns, stanchions and bases
2. **Lokfix** – Polyester and epoxy resin anchors for bolts, starter bars and fixings
3. **Conbextra HF or TS** – Cementious grout for static base plates
4. **Conbextra HT** – High early strength and service temperature up to 400°C
5. **Conbextra EP** for dynamic loads such as rails and machine plates
6. **Conbextra Cable Grout** – For post tensioned cables and fine slots

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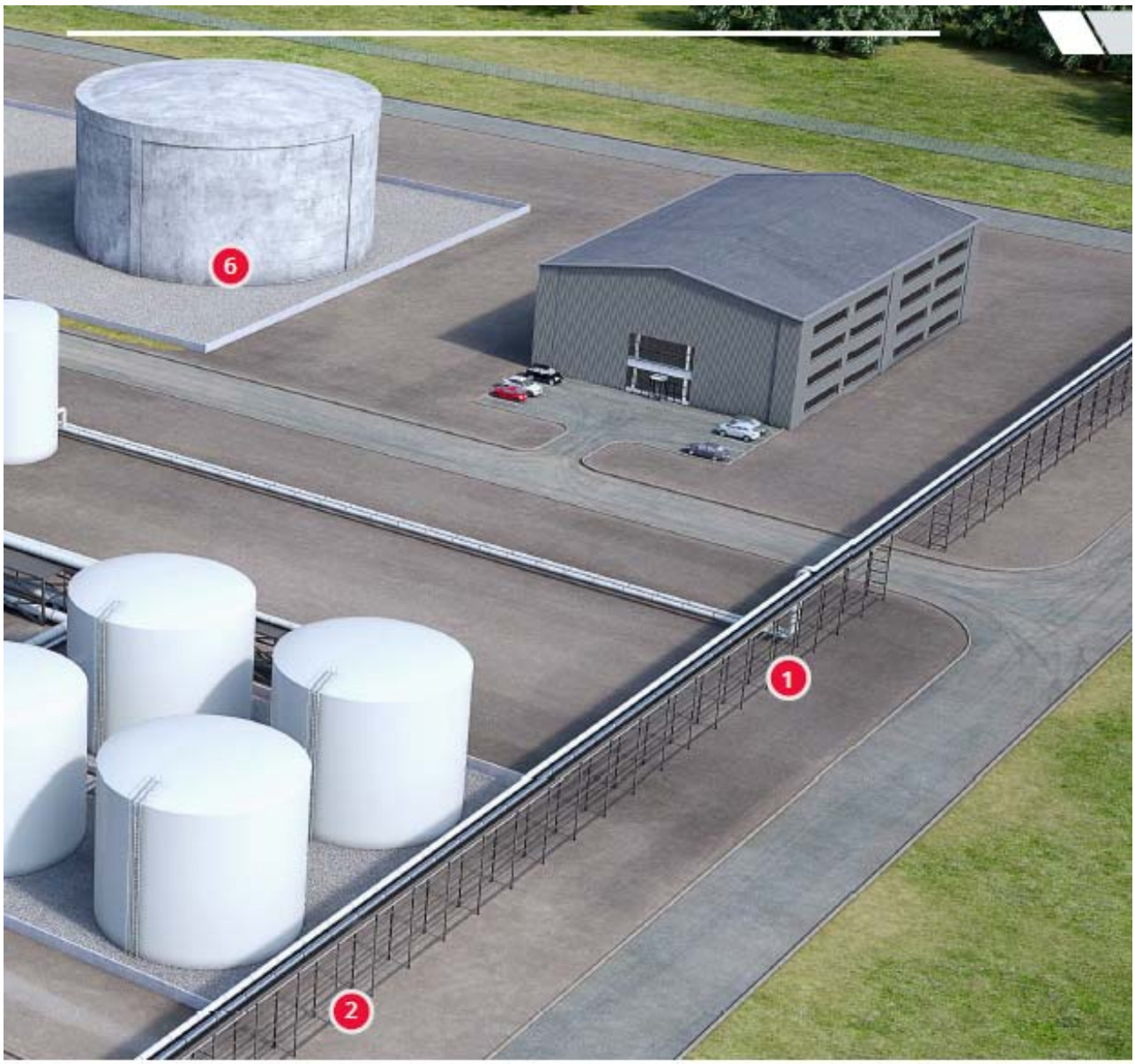
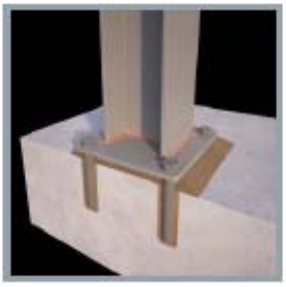


Conbextra HF has excellent flow properties, high strength and dual shrinkage compensation.

Lokfix resin anchor is fast curing and ideal for setting holding down bolts and starter bars.



Conbextra GP is excellent for static load bearing, ideal for stanchions and precast recesses.

Conbextra EP range of epoxy grouts are ideal for dynamic loading, with a fast cure and chemical resistance.

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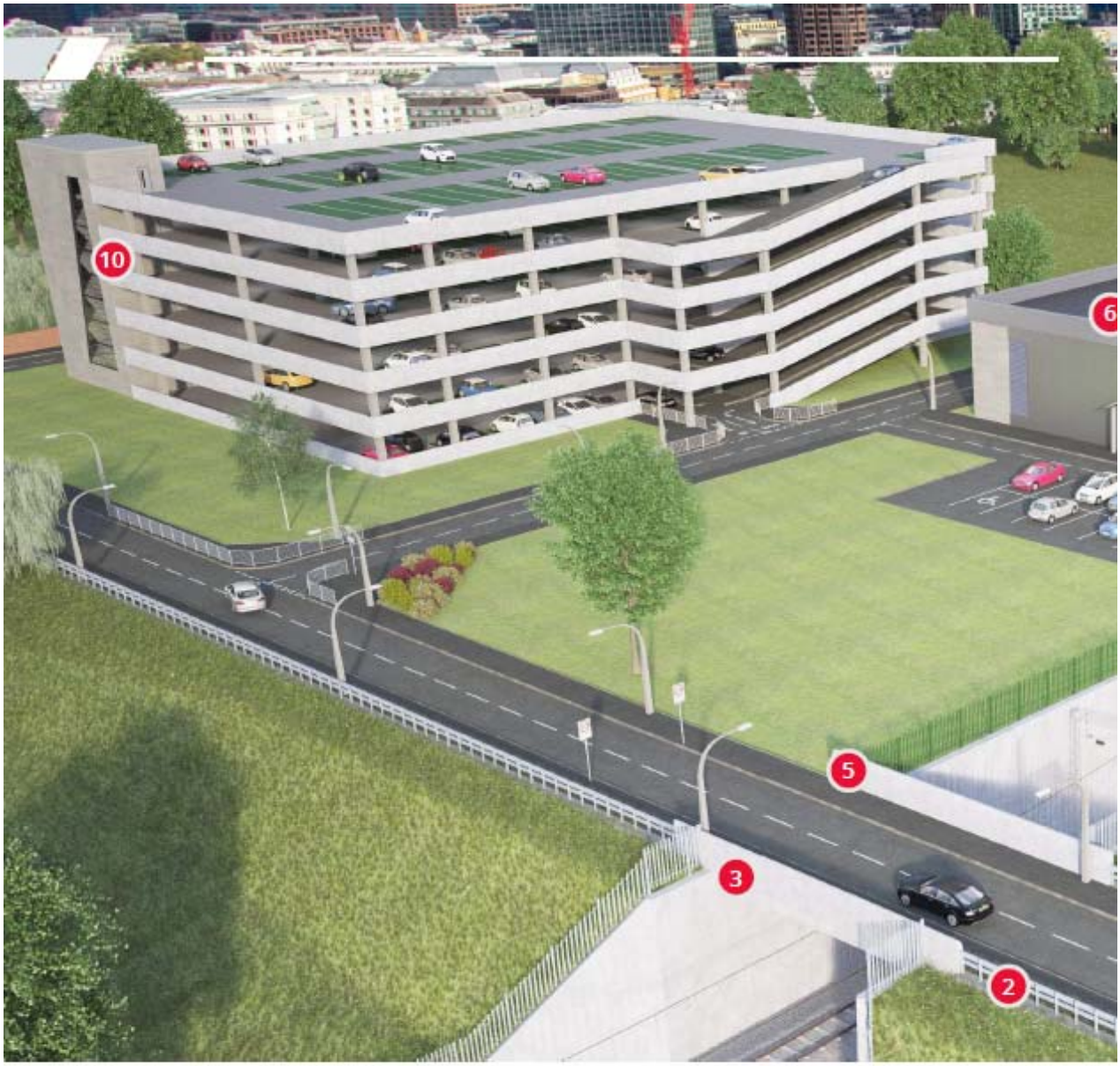

GROUTING SOLUTIONS FOR CIVIL STRUCTURES

Fosrocs Grout Range is ideal for high intensity and high quality construction. With experience in installations such as power stations, wind turbines, railways, bridges, harbours and tunnelling to name a few, the durability and dependability of Fosroc's grouts is one of the reasons we are selected to support the worlds infrastructure.

1. **Conbextra GP** and **Conbextra HF**- Cementitious grout for supporting columns, stanchions and bases
2. **Lokfix** – Polyester resin anchors for bolts, starter bars and fixings
3. **Conbextra BB** – Cementitious grout for bridge bearings
4. **Conbextra EP** for dynamic loads such as rails
5. **Nitomortar TS** – Epoxy bedding for bridge joints
6. **Conbextra Cable Grout** – For post tensioned cables
7. **Cebex 653** – Concrete grout admixture for void filling in tunnel annulus
8. **Nitofil LV** – epoxy grout injection for structural cracks
9. **Nitofil UR60 WS63** – Swelling polyurethane leak sealing grout
10. **Conbextra PM** – pumpable mortar for precast construction

Conbextra BB is compliant with transport approvals and has excellent elastic stability and chloride resistance.

Conbextra UW has been specially formulated with anti-wash out agents for work in flowing water and tidal zones.

Conbextra EP range of epoxy grouts are ideal for dynamic loading, with a fast cure and chemical resistance.

Cebex Tunnel annulus grout admixtures are excellent for controlling site batched mixes and preventing wash-out.

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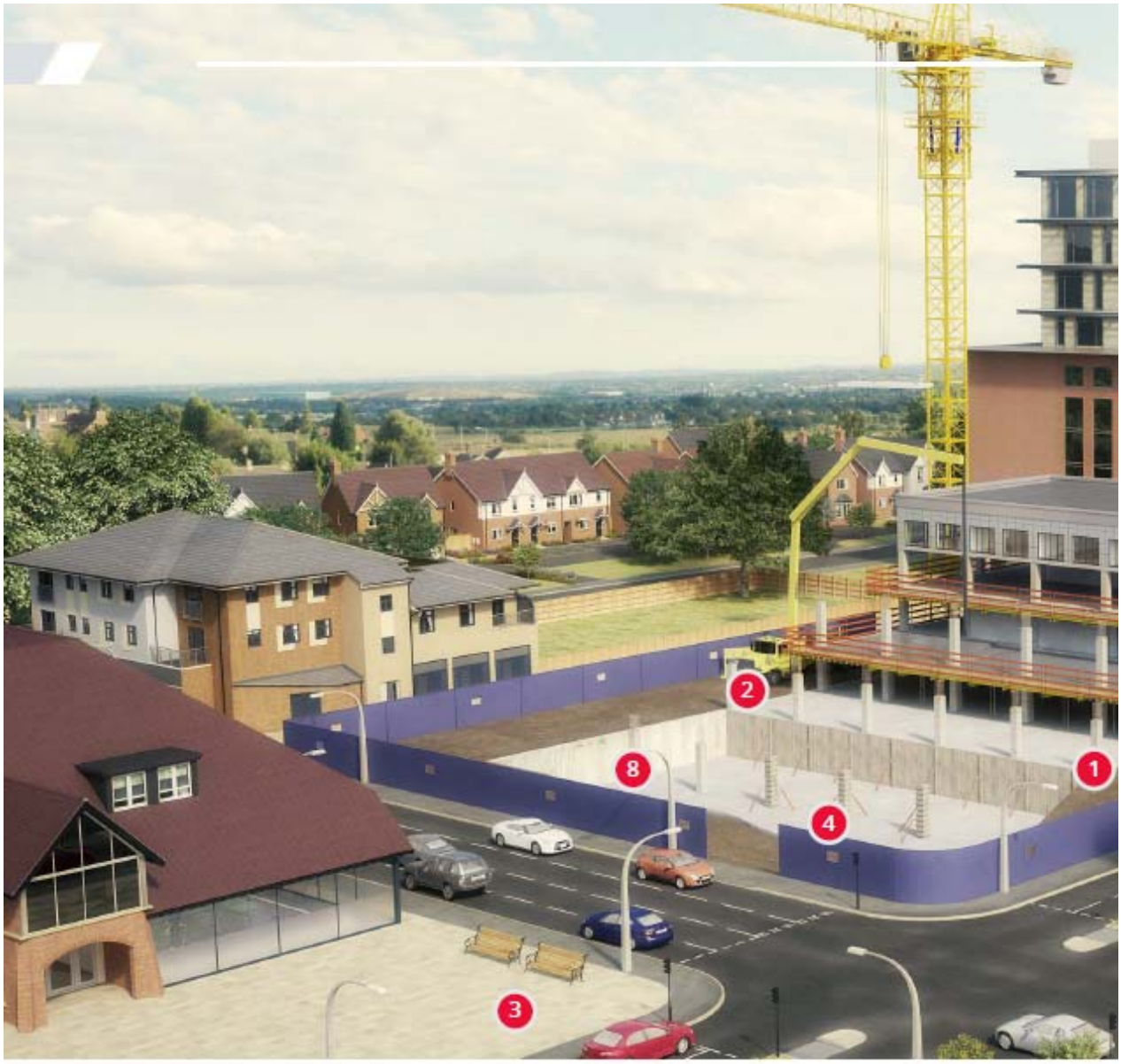

GROUTING SOLUTIONS FOR COMMERCIAL & RESIDENTIAL BUILDINGS

Fosroc Conbextra grouts add precision to both site cast and precast concrete structures. Class leading handling and dependable results have seen our products used in mega projects as well as small scale construction.

1. **Conbextra GP** and **Conbextra HF** – Cementitious grout for supporting columns, stanchions and bases
2. **Conbextra HF** – For casting round congested steel and penetrations
3. **Lokfix** – Polyester and epoxy resin anchors for bolts, starter bars and fixings
4. **Proofex WG** – Waterproof Capping of Piles
5. **Conbextra PM** – pumpable mortar for precast construction
6. **Conbextra Cable Grout** – For post tensioned Cables
7. **Nitofil LV** – epoxy grout injection for structural cracks
8. **Nitofil UR60 WS63** – Swelling Polyurethane leak sealing grout

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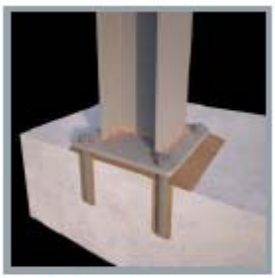
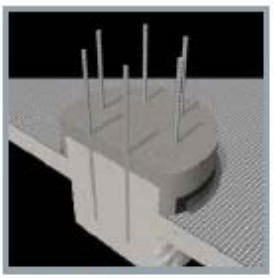


Conbextra GP is excellent for static load bearing, ideal for stanchions and precast recesses.



Proofex WG provides strong watertight capping of construction piles, ideal for below ground construction.

Lokfix resin anchor is fast curing and ideal for setting holding down bolts and starter bars.

Conbextra BM is ideal for bedding precast panels, with fast strength gain and excellent workability.

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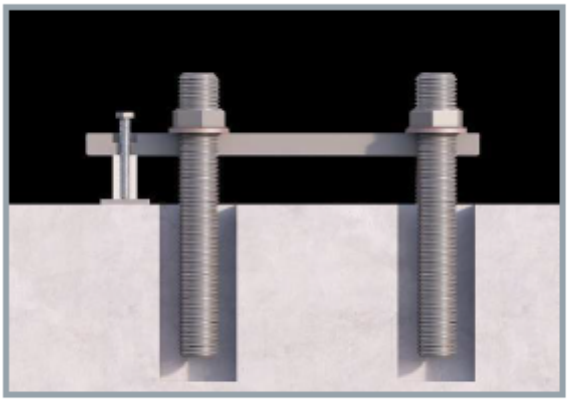
GUIDE TO SITE APPLICATION

The following procedure is designed to provide guidance to achieving the best grout pour results

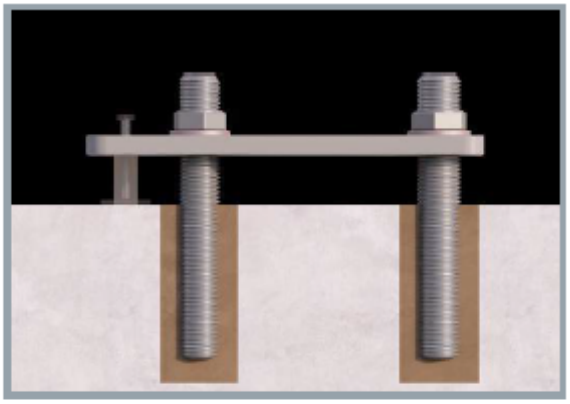
1. Planning

Correct planning is essential. Calculate the correct material consumption factoring water addition and including material wastage. Ensure that the correct head/flow/distance has been calculated. Ensure the correct equipment is available including strapping or rods as well as sufficient mixing teams to undertake a continuous pour. Plan the correct amount of time that will be needed for the work. Ensure the correct working temperatures are achieved.



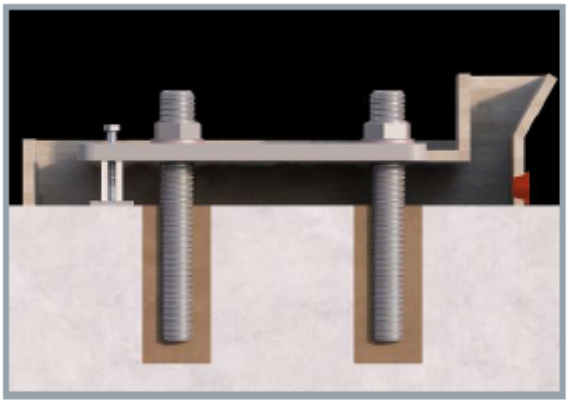
2. Preparation & Setting

Remove laitance, damage or contaminants from the slab conducting repairs if necessary. Ensure all corrosion deposits have been removed from the baseplate. Identify any high spots in the baseplate and drill through to prevent air entrapment. When setting the plate, using a threaded bolt to level is often the best technique, providing maximum adjustability before, during and after the pour. Levelling shims may also be used, but must be removed after the pour.



3. Fixing

Make sure the bolts and bolt holes are clean and dry, with sufficient mechanical key. Apply Lokfix or Lokfix DUR resin anchors into the hole. Immediately place the holding bolts into the resin, applying in a twisting motion until the required depth is reached and some resin protrudes slightly above the line of the floor. Ensure the bolts are straight and centred and allow the material to set.

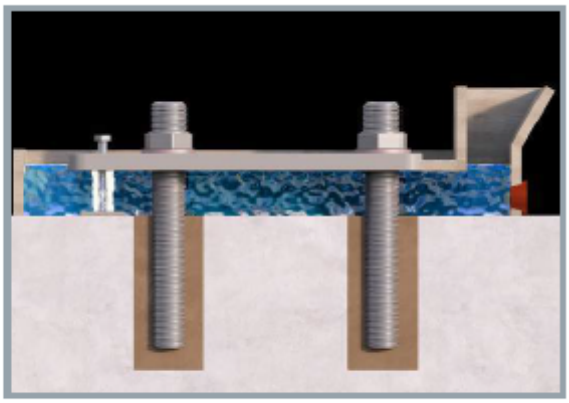


4. Formwork

Using timber fix the shuttering around the baseplate. Gaps at the pouring end should not exceed 150mm and at the free end no more than 50mm. All shuttering should be watertight and supported sufficiently to be able to withstand the pressures of the grouting process. The shuttering should be designed to allow water release or removal. The grout box shall provide sufficient head of pressure in relation to the viscosity of the grout and the length of the pour. A smooth wood should be used and, where necessary, carefully applied Reebol mould release oil may be used.

OF CONBEXTRA PRODUCTS

ısing Conbextra Cementitious Grouts. Consult your local Fosroc team for specific site guidance.



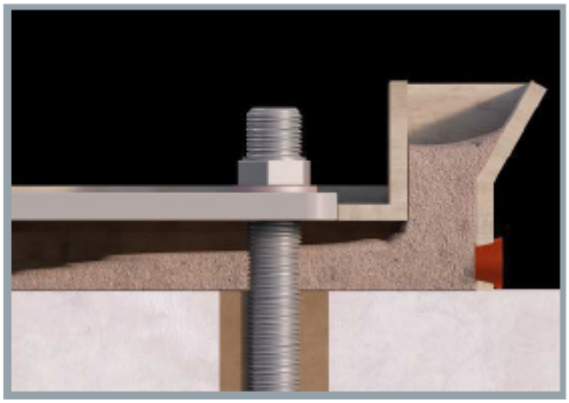
5. Saturation

Fill the formwork with clean water and allow it to stand for a minimum of 2 hours. Check formwork for leaks and plug where necessary. After saturation, drain water and remove any standing water in low spots using sponges or vacuum. Begin the grouting process immediately after completion of the saturation process.

Do Not saturate concrete when using Conbextra epoxy resin grouts!

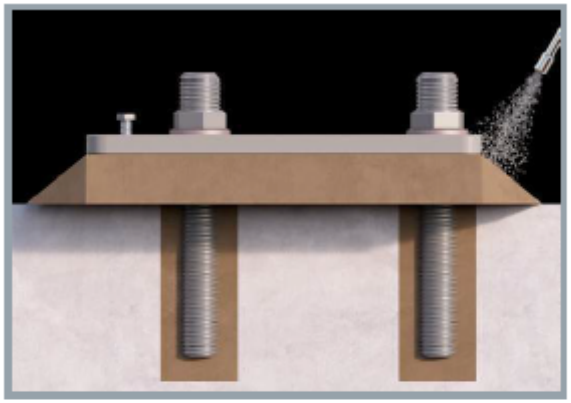
6. Mixing

Use a slow speed drill (appx 500rpm) with Mixer Paddle MR3, for large quantities a shear vane mixer may be used. Slowly add powder to a pre-measured amount of water, ensure consistency of water/powder ratio. Do not allow material to stand for more than 15 minutes. Material mixing process should ensure that a constant pour is achieved with no time gaps.



7. Pouring

Using the header box pour the grout continuously through the area, keeping gaps between pours to an absolute minimum and maintaining head of pressure. Check that material flows correctly beneath the plate, and any air vents are plugged as they become full. Pour only from one side to avoid entrapping air. Do not vibrate or agitate Conbextra grout when it is in its plastic state. For large area pours consider using a grout pump.



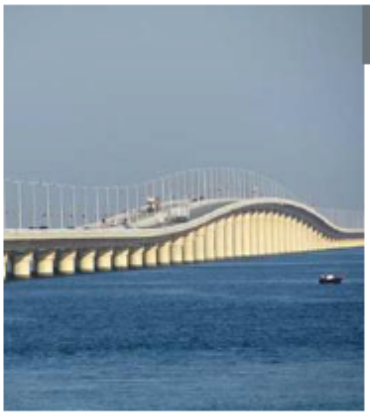
8. Finishing

Exposed edges of the material should be cured using Concure WB. The edges of the pour should not project above the bottom level of the baseplate, especially if movement is anticipated. 45° chamfers may be achieved by formwork, cutting the grout, or by using a Rederoc mortar. Observe material strength gain information prior to loading.

CONSTRUCTIVE SOLUTIONS IN ACTION

Selecting the correct grout requires more than looking at compressive strength. That is why Fosroc provides a wide array of grouting products and complimentary ancillaries. We design our materials to exhibit 'best in class' properties, always looking at the critical issues such as material stability, flowability and ease of application, compressive, flexural and tensile strengths. Perhaps most critically, Fosroc design our grouts to stand the test of time.

Here is a selection of some some of our projects from around the world:

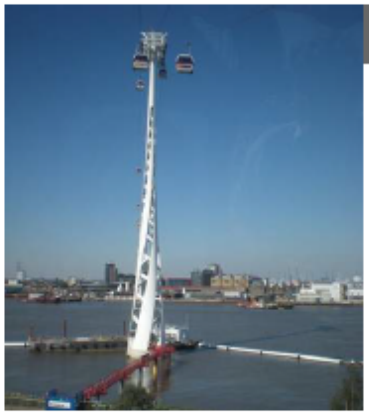


King Fahad Causeway — Saudi Arabia

The 25km King Fahad Causeway, linking Bahrain to Saudi Arabia, is used by over 19 million passengers a year. Reducing maintenance cycles is a key aim of all designers, this critical piece of infrastructure is no different. This enormous structure has been supported by Fosroc's **Conbextra HF** since its construction began in 1981.
The product was pumped under pressure between the segmental rings of the precast piles that support the bridge as they were lifted into place. The grout was selected for its flowability at high temperatures, stability under pumping pressure and dual shrinkage compensation. The speed of its set allowed rapid erection of the piles. Conbextra HF has weathered the elements and exposure, proving Fosroc is the supplier of choice for critical and durable applications.

Paradip Oil Refinery — India

Construction at the massive Paradip refinery for the Indian Oil Corporation presented a challenge to the Fosroc team. The processing units for crude oil required varying depths in application and base plate sizes were very large. To add to the difficulty, ambient temperatures during application frequently rose above 40°C. Of course, the grouts also had to exhibit resistance to a number of very aggressive chemicals and excellent flexural strength and creep resistance. The team worked to produce special product formulations to meet the application procedures ensuring high contact, high strength and crack free grouting beneath the machines. Our ability to produce bespoke solutions and a variety of products including **Conbextra EP75**, **Conbextra EP300**, **Conbextra GP** & **Conbextra BB92** to meet application needs meant Fosroc were the only company selected to supply the refinery's grouting.



Emirates Airline Cable Car — UK

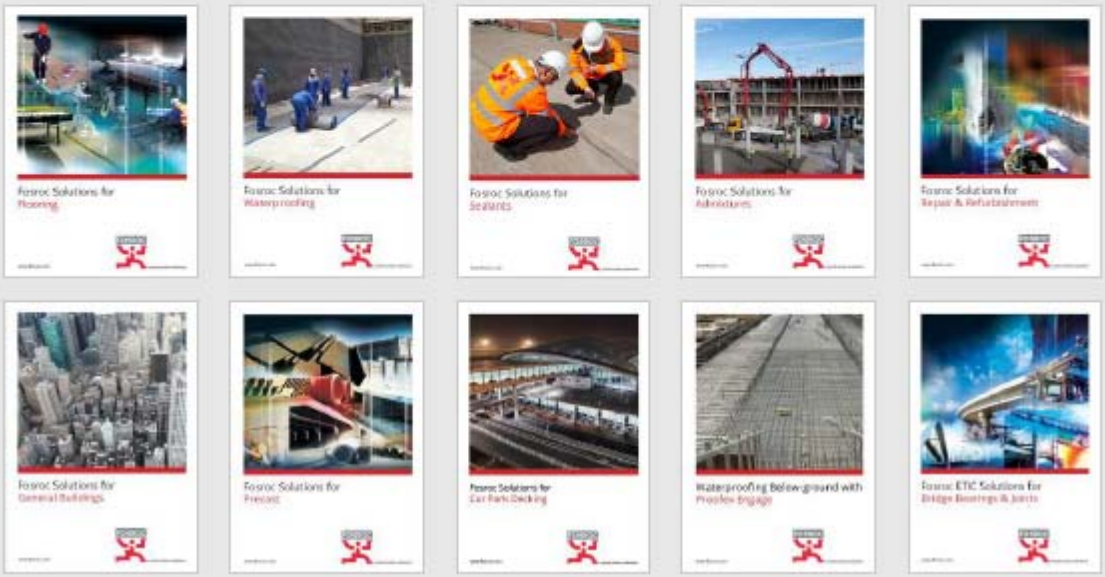
A novel piling technique was used to cast the supporting columns in the brisk tidal zone of London's River Thames. The use of **Conbextra UW** enabled a very high quality of concrete to be cast even under water. Once the piles were in place the initial skirt of the tower was set onto them almost immediately, meaning the early age compressive strength of **Conbextra UW** was another critical requirement.
Initially the proposed construction method and programme meant that the cable car would not be operational until the end of the summer. Fosroc's Conbextra UW was an integral part of the success of the new innovative piling technique adopted due to its very high strength and anti-wash out characteristics. This innovative approach took 6 weeks off the completion time of the project; ensuring that it finished well ahead of schedule and was in place to assist in the logistics of staging the London 2012 Olympic Games.

PRODUCT RANGE SELECTOR

A selection of common Fosroc Grouting and Fixing Products and their application. More products are available, consult your local Fosroc Company.

Epoxy Resin Grouts			
Typical Application	**Material Characteristices**	**Fosroc Products**	**Usuage Requirements**
High compressive and dynamic loads such as bridge bearings, rail bedding, vibrating machinery, chemical or wet-process areas.	Free flowing materials with fast development of strengths. High early and ultimate compressive, tensile and flexural Strengths. Adheres to most building materials. Electrically isolating, water and chemical resistant. Non-shrink. High Effiective Bearing Area.	Conbextra EP10	Thin-section grouting.
		Conbextra EPHT	Tolerates service teamperatures up to 160°C
		Conbextra EP150	Mid-section free flowing grout with high creep resistance.
		Conbextra EP300	Thick-section grout with low exothermic reaction
		Proofex WG	Watertight Grout for pile caps
Pre-bagged Cementitious Grouts			
Typical Application	**Material Characteristices**	**Fosroc Products**	**Usuage Requirements**
High compressive strengths and consistent strength development. Machinery bases, bridge bearings, precast concrete construction, columns and stanchion supports. May also be used for low criticality bolt anchoring.	High flowability and adjustable consistency. Medium to high compressive strengths. Shrinkage compensated in plastic and hardened state. High Effective Bearing Area. Final material characteristics sympathetic to concrete. Negligible chloride content. No iron content.	Conbextra GP	General purpose grout for most standard applications
		Conbextra HF	Dual shrinkage compensated, high flow, precision grout. Ideal for challenging applications
		Conbextra TS	Thick section grout with low exothermic reaction
		Conbextra UW	Grout for underwater application
		Conbextra BB	Bridge Bearing grout with rapid strength development
		Conbextra Cable Grout	Fine section grout for pre and post tensioned cabling, eliminates voids, segregation and bleeding
Concrete Additive Grouts			
Typical Application	**Material Characteristices**	**Fosroc Products**	**Usuage Requirements**
High volume, low criticality applications such as tunnel annulus voids, soil stabilisation	Largely dependent upon concrete mix design.	Cebex 100	General purpose shrinkage compensation admixture.
		Cebex 250	Under water grouting.
		Cebex 653	Tunnel annulus grouting admixture.
Resin Anchors			
Typical Application	**Material Characteristices**	**Fosroc Products**	**Usuage Requirements**
Adhering starter bars, holding down bolts, structural tie bars. Substrate stabilisation anchors. Fixings close to edges.	Rapid strength gain, high adhesion values to most building materials. Non-expansive. Electrically insulating, non-corrosive, waterproof, chemical resistant.	Lokfix P	Rapid set polyester resin anchor with low slump for horizontal fixings.
		Lokfix S	Rapid set pourable polyester resin anchor.
		Lokfix DUR	Epoxy - Acrylate resin cartridge system for ease of application

Fosroc offers a full range of construction chemical solutions, helping to protect structures throughout the world. Please refer to our brochures, which include:



Details of your local Fosroc office can be found at
www.fosroc.com

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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constructive solutions