

Structural Calculations



Relating to:

Back Stair Landing Repair at:

Reddam House

Bearwood Rd

Sindlesham

Wokingham

RG41 5BG

Project Preface

Client name:	Inspired Education
Client address:	Sixth Floor 3 Burlington Gardens London W1S 3EP

Senior Partner:	Timothy Allcott
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Document prepared by:	James Bodicoat MEng (Hons), CEng, MICE, MIStructE

Job reference:	24543
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Issue 01	20/04/2026	First Issue
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1 Notes Specific to the design

1. The Building Contractors will need to and must check all dimensions of openings on site prior to ordering steel, as we will not be held responsible for any incorrect lengths that are ordered.
2. Beams are designed to be the most economical size for the loading imposed in most cases, not for the thickness of wall above. It is therefore the contractor's responsibility to ensure that the load is correctly supported above the beam with a plate or other method.
3. The design is for the support Beam only and we are not responsible for ensuring the adequacy of any foundations beneath the supporting wall. This will generally be the responsibility of the Building Contractor to open up areas for the Building Inspector to verify. If we have to confirm foundation adequacy which is over and above the design an extra charge will be levied.
4. Should the length of the beams be revised by the client or the Building Contractor after we have completed our design which results in a redesign we reserve the right to charge again for all redesign works.
5. All dimensions used for design are clear openings only. Add a minimum 150mm bearing length to each end of beam unless otherwise stated for actual beam length when ordering beams
6. The designs are based on domestic loads only unless otherwise stated.
7. Changes to all drawings are at client's instructions. All drawings should be checked for accuracy and should not be scaled from. Any discrepancy should be immediately informed to Allcott Associates.
8. The design is for the steel beams only, not the foundation or additional width support on the beam for the wall or other above the beam.
9. This design does not mean that any other part of the building or than the beam itself complies with current building regulations and this should be checked with the Local Authority prior to commencement of the works.
10. We are not obligated to check any other area within the Building and advise at to whether other areas fall under the Building Regulations. Our design will specifically pertain to the support beam required only
11. We take no responsibility for any design if the works are started before the necessary Building Regulation permission approval has been obtained from the local authority. If any works are started before the Local Authority Approval has been obtained, then then these works will be specifically at the risk of the owner.
12. Unless otherwise stated pad stones should be proprietary precast C35 concrete 450mm long by 225 deep and 100mm wide.
13. Designs are based on client's instructions. If these are given incorrectly by the client and the design beam is not correct for the opening, this will not be the responsibility of this company. We reserve the right to charge again for any re-inspection and subsequent re-design.
14. The design will be based on the information including any drawings provided. Any opening up of areas will be the responsibility of the client. Any areas that are not opened up and are subsequently found not be as informed to us by the Client and requires either a re-visit or re-calculation will be charged again.
15. The scope and any limitations to miscellaneous services will be agreed with you before commencing.
16. Should the configuration of the building change after the design of the beams which subsequently affect Part A of the Building regulations, which requires re-calculation and a revisit then this will be charged again.
17. It is the responsibility of the Building Contractors to ensure that all walls for the support of the beams are adequate for the correct support of the beams.
18. These calculations are for the sole use of the person instructing the design and cannot be passed to a third party without the consent of Allcott Associates as the content will not be guaranteed to be correct as to when the report was transferred.
19. These calculations are only valid for 6 months from the date of the survey as codes of practice change. If the practical works are commenced within that period, you should check that the calculations are still valid.
20. All beams to be finished with red oxide paint and correctly fire protected as required under the current Building Regulations.
21. We are not responsible for advising on any fire precautions within other areas of the Building as a result of any wall removal. This should be addressed to either the Local Authority Fire Officer or Local Authority Building Inspector prior to commencement of works.

2 Calculations Sheet:- Specific to Scheme

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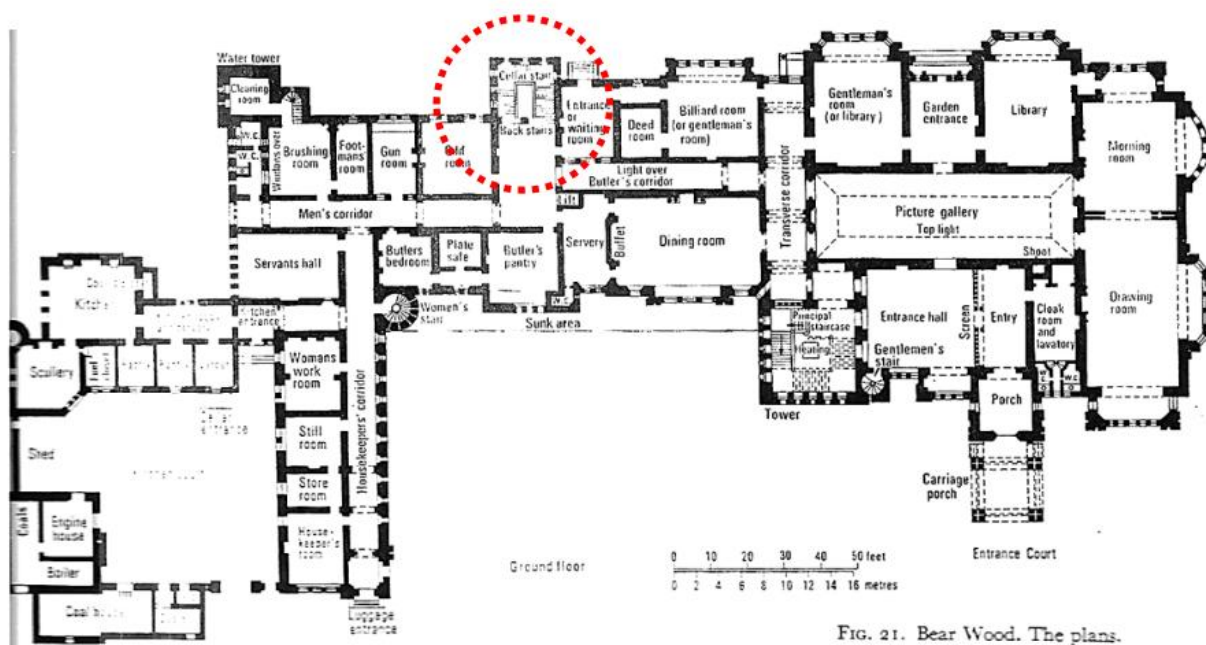
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1. Introduction:

Allcott Commercial were instructed by the Inspired Education Group to provide structural design input to repairs required to the back stairs at Reddam House School, Bearwood Rd, Sindlesham, Wokingham RG41 5BG.

The back stairs is located in the Victorian mansion building on the site, as indicated on the following extract of Robert Davies Architects planning statement:



Extract of Planning and Heritage statement by Robert Davies Architects showing the location of the back stairs

The property dates from 1865-74 by John Walter III, owner of The Times newspaper, and is Grade: II* listed. It has operated as a school since 1921, formerly known as Bearwood College.

2. The Issue and Scope:

A full depth crack is present to one of the landings of the back staircase, at first floor level. As a temporary measure the landing is currently propped with a pair of Acrow props down to the ground floor landing, and in turn this is back propped down to basement floor level.

A previous remedial design incorporating a pair of shaped steel brackets and bolted back plates has been proposed by others, however the feedback from the conservation officer is that they would like other design options to be explored that minimize/avoid damage to historic decorative elements.

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As a result, the structural design scope of work is understood to be as follows:

- Undertake an inspection of the staircase to establish the existing structural arrangement of the landing, inspect the extent of the cracking and also inspect other landings on the staircase for signs of similar damage;
- Consider options for sympathetic repair;
- Prepare structural details and accompanying calculations for remedial works to the landing slabs, to enable the temporary propping to be removed.

3. **Basis of information:**

All structural information to be read in conjunction with the following Architectural documents prepared by Robert Davies Architects:

- *Heritage Statement In Support Of Listed Building Consent Application Of Proposed Structural Remedial Works To Stairwell At The Reddam House, Bearwood Road, Sindlesham, Wokingham, RG41 5BG, dated 17th October 2025*
- *Reddam House Location and Site Plans, drawing 24004-EX-001 (no revision), dated October 2025*

The following documents for the previous scheme, prepared by Gawn Associates Consulting Civil and Structural Engineers have been referred to for information only:

- *Rear Staircase At Reddam House - Ex. Plans On Stairwell, drawing no. 223/1816/01, revision P1 dated January 2024*
- *Rear Staircase At Reddam House - Proposed Remedial Works To Stairwell, drawing no. 223/1816/02, revision P1 dated January 2024*
- *Rear Staircase At Reddam House - Photos On Rear Staircase/ Landing, drawing no. 223/1816/02, revision P1 dated January 2024*
- *Outline Method Statement for Proposed Repairs to Cracked Section of First Floor Landing to Rear Staircase at Reddam House, document reference LJG/223/1816 dated January 2024*

As part of our assessment, reference has also been made to the following publications:

- *Stone Cantilevered Stairs article - The Building Conservation Directory, by Russell Taylor (2006)*
- *Conservation compendium. Part 5: Inspection and repair of cantilever stone staircases - The Structural Engineer, Volume 93, Issue 4, 2015, Page(s) 44-46, by Clive Richardson*

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4. Observations

A visual inspection of the staircase was carried out by Allcott Commercial on Tuesday 17th February 2026 with Robert Davies Architects.

No intrusive inspections were carried out, and all observations were made from, safe, permanent points of access.

The construction of the stair was found to vary; at basement to ground, and 2nd to 3rd floors, it appears to be of some form of early concrete construction, whilst the flights and landings between ground floor to 2nd floor appear to be of sandstone construction.

When viewed from below looking up, it is also apparent that the length of the landings at each floor level varies, which is a function of the different floor to floor heights between each floor level. As a result, the landing at first floor level is the largest sandstone landing that is only supported on 3 sides.



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2no. Acrow props have been installed beneath the first floor landing, directly beneath the crack.



Back propping has been installed beneath the ground floor landing to transfer the propping loads down to ground level, to avoid putting additional loading into the ground floor slab. The propping was noted to be secure.



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Timber packs have been provided at the head of each prop against the underside of the painted landing slab.



The crack in the first floor landing slab was noted to pass through the full thickness of the slab. It is not known when the soffit of the stair was last painted, however the paint has been worked into the crack indicating that it was present prior to the last decoration. There is little evidence of further movement since the stair was last painted.



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When viewed from above, it is apparent that significant wear has occurred to the top of the stone stair treads and landings. Historically this has been repaired with a granolithic screed or similar which appears to be harder than the original stone. There is evidence of some wear to the grano finish, and we estimate that it has been in place for at least 50 years.



The crack to the first floor landing was noted to run the full width.



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The landing is approximately 1.6 x 1.6m on plan, and the crack is located approximately 1.0m from the edge of the top step, or 0.6m from the edge of the first floor. The first floor beyond the stair appears to be of timber joist construction.

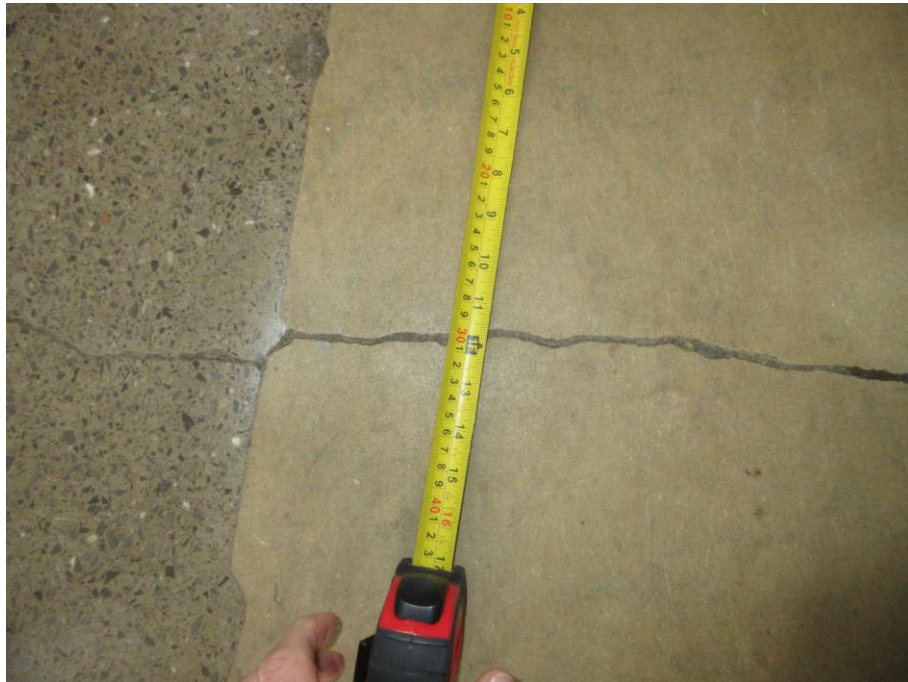


The slab is in the order of 145mm thick.



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At the top surface the crack is approximately 5.0mm maximum width, whilst the width is approximately 2.0mm on the soffit. The edges of the crack are worn, and the crack itself is filled with an accumulation of dirt and dust, suggesting that it has been present for a long time.

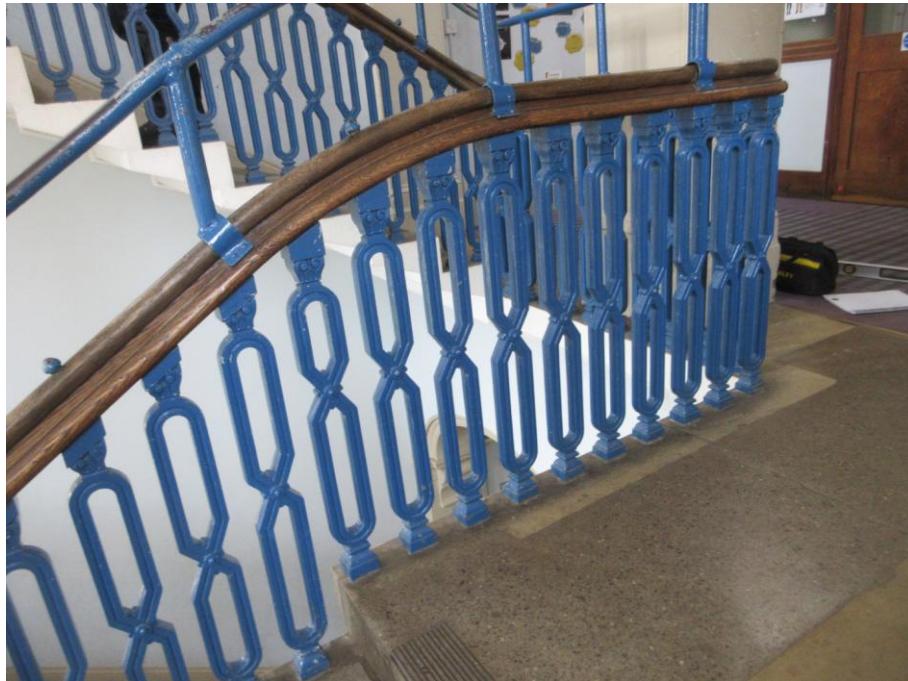


There is a small step to either side of the crack - in the order of 2mm – which again does not appear to be recent, but suggests that the out part of the landing (further away from the main landing area) has dropped historically.



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The wrought iron balustrade is original, and is continuous to the full height of the stair. It has a timber top rail, which has been extended vertically in the past with a tubular steel rail. The balustrade connections into the stone stair appear robust at the first floor landing, with no signs of movement or pulling out in the stone. At the underside of the top rail, slight downwards movement reflects that seen in the slab, circa 2mm.



At the underside of the top rail, slight downwards movement reflects that seen in the slab, circa 2mm.



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Summary of observations

Based on our observations noted above, we would summarise as follows:

- we believe that the crack to the first floor landing is longstanding, and has been present for a number of decades.
- There is little evidence of significant recent movement, albeit there is a small vertical displacement of the slab to either side of the crack of approximately 2mm at the slab edge. There was no evidence of cracking or failure in the top surface of the landing slab at the supported edges parallel to the wall or the first floor, which would be of greater concern.
- We are satisfied that the first floor slab is stable and safe in the current state; obviously due to the temporary Acrow props that have been installed below, but also the substantial balustrade to the edge of the landing and stair provides some redundancy [ref. Conservation compendium. Part 5: Inspection and repair of cantilever stone staircases - The Structural Engineer, Volume 93, Issue 4, 2015: *'Wrought-iron balustrades complete the stairs, their balusters being set into pockets in the treads, and caulked with lead. The balustrade acts as a safety belt if anything goes wrong, distributing the load from one tread to those adjacent. The balustrade is therefore of paramount importance to the safety of the stairs in the limit state'*].
- We reviewed the other landings on the stair and noted that the 1st floor landing with the crack projects further from the edge of the floor than other landings. This is due to the differing floor-to-floor height between each floor. Furthermore, the nature of the stair construction from basement to ground, and 2nd to 3rd floor is different to that between ground and 2nd floors.
- As a result, the only other landing of similar construction is that at 2nd floor level, but this is approximately 300-400mm shorter than that at 1st floor. The 2nd floor landing was inspected and showed no evidence of movement or cracking, nor did any of the other landings. **On this basis, we are satisfied that repair is only required to the first-floor landing.** No works are proposed to the other landings.
- To enable the props to be removed, rather than installing any brackets or supports below the landing we proposed to repair landing using a combination of structural resin crack injection and installation of stainless steel bars (or 'dog cramps') set into the soffit of the slab across the crack.

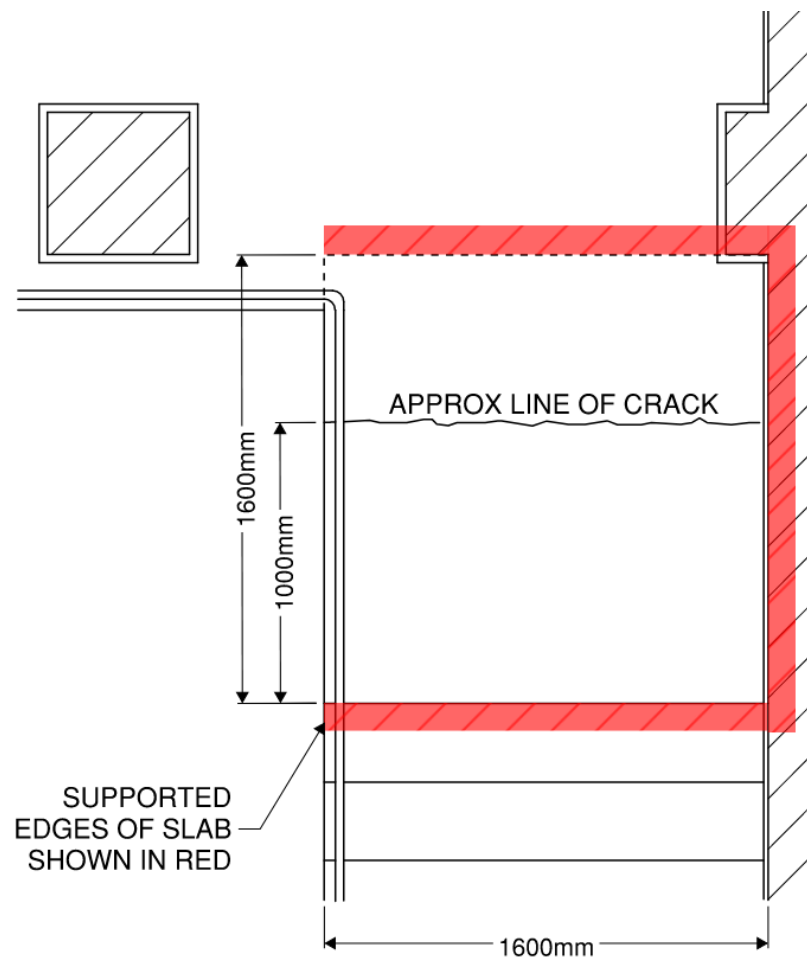
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5. Slab Loads and Forces Assessment

Calculate bending moments in a 1.6 x 1.6m slab which is simply supported on 3 sides and unsupported on one side as shown below:



- As a result of the above arrangement, the one free edge will behave more like a cantilevered slab strip along the unsupported side rather than a standard simply supported slab.
- Consider the two-way action of the slab; Moments in each directions of the slab are calculated from $M = \alpha wL^2$

Where α = coefficient depending on:

- Support conditions
- Aspect ratio (L_x/L_y)
- Load type

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These are obtained from numerical plate solutions at tabulated in design codes (e.g. Eurocode 2).

- Approximate coefficients (from design tables for 3-edge supported slabs):
 - $\alpha_x \approx 0.10$
 - $\alpha_y \approx 0.04$

These are simplified, safe approximations for practical design.

- Main moment (cantilever direction): $M_x \approx 0.10\omega L^2$
- Secondary moment (parallel to free edge): $M_y \approx 0.04\omega L^2$

So:

- $M_x = 0.10 \times \omega \times 1.6^2 = 0.256\omega \text{ kNm / m width}$
- $M_y = 0.04 \times \omega \times 1.6^2 = 0.102\omega \text{ kNm / m width}$

Loading:

- Dead load of sandstone slab = $25 \times 0.145 = 3.625 \text{ kN/m}^2$
- Imposed load of sandstone slab (Category C32) = 3.0 kN/m^2

Therefore the total loading on the slab at the ultimate limit state:

- $\omega_{\text{Total ULS}} = (1.35 \times 3.625) + (1.5 \times 3.0) = 9.4 \text{ kN/m}^2$

Inserting this loading in the above moment calculations gives:

- $M_x = 0.256\omega = 0.256 \times 9.4 = \mathbf{2.4 \text{ kNm / m width}}$
- $M_y = 0.102\omega = 0.102 \times 9.4 = \mathbf{0.96 \text{ kNm / m width}}$

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The crack has occurred perpendicular to the free edge, therefore consider the flexural stress in the slab in the y-y direction (e.g. parallel to the free edge):

Flexural stress in the slab, $\sigma = \frac{My}{I}$, where

- M = bending moment (kNm/m)
- $y = \frac{h}{2}$
- $I = \frac{bh^3}{12}$

Take the slab width, b = 1.0m. Therefore the equation simplifies as follows:

$$\sigma_t = \frac{6M}{h^2}$$

Where:

- σ_t = Tensile stress at bottom (MPa if units consistent)
- M = moment (kNm/m)
- h = slab thickness (m)

Therefore the tensile stress in the bottom of the slab due to bending is as follows:

- $\sigma_t = 6 \times 0.96 / 0.145^2 = 0.27 \text{ MPa}$

Compare the above with sandstone tensile strength:

Typical tensile strength of sandstone:

- Sandstone tensile strength range ≈ 0.5 to 5 MPa
- Most commonly strength is in the range of ≈ 1 to 3 MPa

In the absence of specific information on the type of sandstone, assume a bottom of the range strength of 0.5 MPa

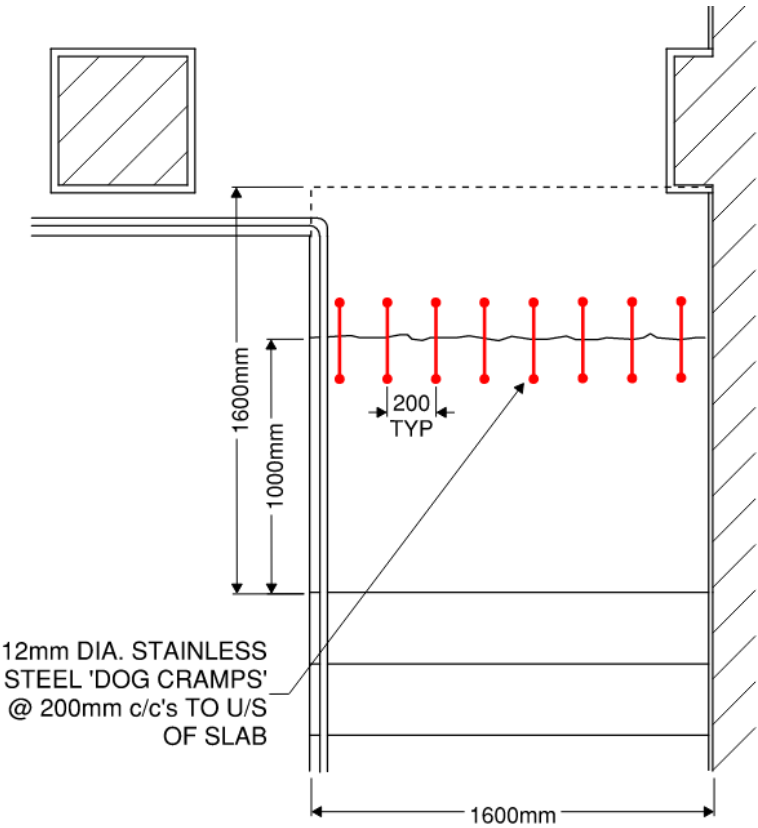
- **0.27 MPa < 0.50 MPa, therefore the tensile stresses in the base of the slab in the y-y direction are calculated to be below the tensile capacity of the sandstone**

This indicates that no cracking would be expected in this direction.

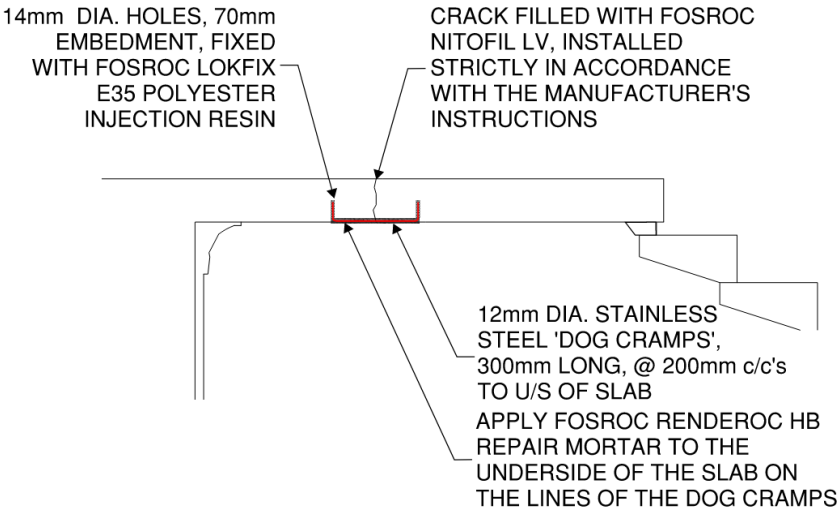
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6. Slab Repair Details

Plan on Landing Slab (not to scale):



Section Through Landing Slab (not to scale):



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Proposed Crack Resin Injection Grout:

To reconnect the two sides of the slab, the crack shall be injected with a low viscosity epoxy resin injection grout.

It is proposed to use **Fosroc Nitofil LV**, which is a low viscosity system for the injection of cracks between 0.3mm and 9 mm wide in concrete and masonry, where both sides of the crack can be sealed to prevent resin drainage.

Nitofil LV has the following advantages:

- Low viscosity: Permits maximum resin penetration
- Adhesion: Achieves high strength bond to dry or wet substrates
- Minimum creep: Material designed for low creep
- Non-shrink: No loss of bond or surface contact
- High strength: High compressive, tensile and flexural strengths
- Chemical resistance: Withstands most chemicals, acids and alkalis, also water and frost

Resin Injection grout strength:

- The manufacturer's datasheets show that the tensile strength development is $> 3 \text{ N/mm}^2$ (3 MPa) within 72 hours, and at 7 days the full tensile strength is quoted as 47MPa in accordance with EN ISO 527.
- Therefore this is much greater than the tensile strength of the natural sandstone (≈ 0.5 to 5 MPa, as quoted above)
- The adhesion strength of the Fosroc Nitofil LV is quoted as being $> 2.0 \text{ N/mm}^2$ (2.0 MPa), which is greater than the calculated maximum tensile stress of 0.27 MPa in the slab across the crack.

Therefore Fosroc Nitofil LV epoxy resin injection grout is adequate to provide a structural bond across the crack in the slab.

Installation shall be strictly in accordance with the manufacturer's instructions. Refer also to the outline methodology and the manufacturer's datasheets in Appendix A of this document.

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In particular note that:

- The underside and edge of the slab shall be sealed on the line of the crack to prevent resin drainage.
- Crack to be thoroughly cleaned out prior to resin injection to allow maximum penetration of the resin.
- Mix kiln dried sand into the rein at the top of the repair to provide a closer visual match to the existing sandstone.

Design of 'Dog Cramps' in the underside of the slab:

- In addition to the resin crack injection above, provide a mechanical connection between the two sides of the cracked slab by installing bent stainless steel bars, or 'dog cramps' to the underside of the slab.
- Consider the requirements of the dog cramps to resist the tensile stresses in the base of the slab, ignoring the contribution from the Nitofil Injection Resin.
- The dowel capacity is usually dictated by sandstone splitting, not steel strength. Therefore calculate the shear resistance of a steel dowel in a sandstone slab subject to a horizontal load near an edge.
- To calculate the shear resistance of a steel dowel embedded in sandstone under a horizontal edge load, check the following two possible failure modes:
 - Bearing / crushing of sandstone around the dowel
 - Splitting / edge breakout of sandstone around the dowel

Bearing failure (crushing at contact):

- $V_{\text{bearing}} = f_{c,\text{stone}} \times d \times t$
- Where:

$f_{c,\text{stone}}$	= compressive strength of sandstone (e.g. 20–80 MPa)
d	= dowel diameter
t	= embedment depth
- Assuming 20MPa for the stone, 12mm bars and 70mm embedment gives:

$$V_{\text{bearing}} = 20 \times 12 \times 70 \times 10^{-3} = \mathbf{16.8 \text{ kN per dowel}}$$

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Splitting / edge breakout:

- If near an edge, stone may fail by splitting, which is calculated using the following simplified empirical form:
- $V_{\text{edge}} = k \times f_t \times d \times e$
- Where:

f_t	= tensile strength of stone (conservatively take as 0.5 MPa)
d	= dowel diameter
e	= edge distance
k	≈ 2 to 4 depending on confinement (conservatively take as 2)
- Assuming 150mm edge distance gives:

$$V_{\text{edge}} = 2.0 \times 0.5 \times 12 \times 150 \times 10^{-3} = \mathbf{1.8 \text{ kN per dowel}}$$

Therefore splitting / edge breakout is the governing mechanism.

From previous calculations, the moment in the y-y direction of the slab is 0.97 kNm / m width at the ultimate limit state.

- Assuming 15mm cover, the depth the centre of the bars is approximately $145 - 15 - (12/2) = 124\text{mm}$, say 120mm.
- Therefore, the tension at the centreline of the bars = $0.97 / 0.12 = 8.08 \text{ kN / m width}$.
- No. of dog cramps required = $8.08 / 1.8 = 4.5$

Therefore provide 12mm diameter x 300mm long stainless steel bars at 200mm c/c's (i.e. 5no. per metre width), with 70mm upstands / embedment into the slab as per the details on sheet no. 15.

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7. Outline Methodology

The following methodology is not intended to be a substitute for the contractor's detailed RAMS, however it provides a summarise of the envisaged repair sequence and assumptions made in our design and specification.

This shall be read in conjunction with the manufacturer's instructions for all resin adhesives and grouts / mortars to be used. Where specific products are identified, equivalent alternative products may be used subject to prior submission and agreement with Allcott Commercial. All products shall be compatible with the natural sandstone slab.

All works shall be carried out by competent contractors, with demonstrable experience of undertaking similar repair works and use of the specified repair materials.

General Preparation:

- To provide access to the crack on the slab soffit, in the first instance the existing props are to be relocated, with a clearance of 250mm minimum from the line of the crack. Install a pair of Acrow props beneath the slab to each side of the crack (i.e. 4no. total), at both basement and ground floor levels. Install the props from basement to ground floor first, then those from ground to underside of first floor in the same positions on plan. Install all new props before removing the existing.
- Staircase to be taken out of use during the works; this may require out of hours working, depending on logistics and fire escape strategy. To be agreed with the contractor.

Crack Repair:

- Thoroughly rake clean the crack and remove all loose material within the crack as far as is practical. Care must be taken to provide a bond surface which is dry and free from any contamination.

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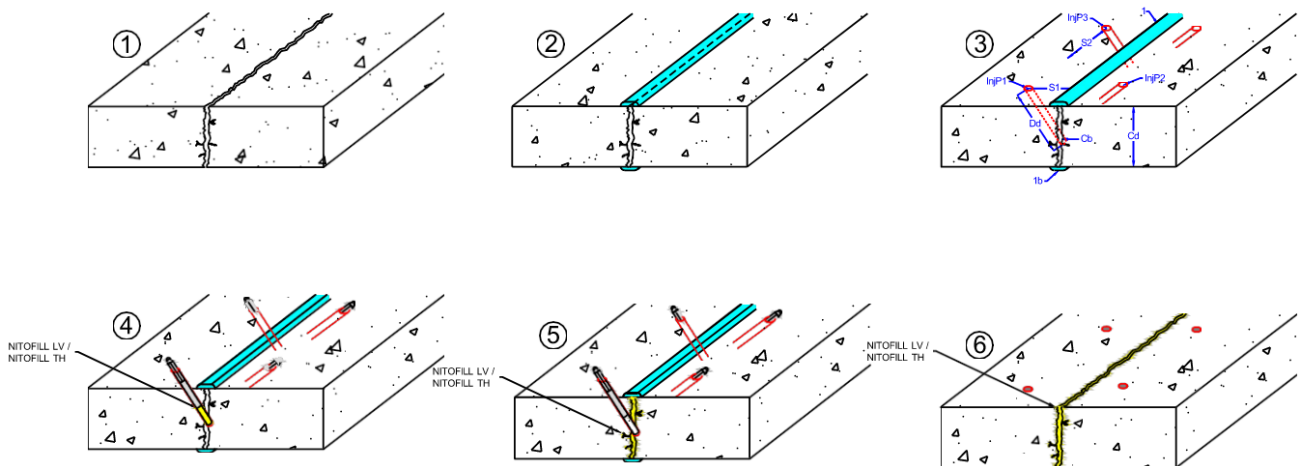
- All surfaces of the crack are to be sealed using the Fosroc Nitokit Surface Sealant, which is designed to retain the injection system under pressure. Care must be taken to provide a bond surface which is dry and free from any contamination.
- Mixing the surface sealant, but only mix enough sealant that can be applied within the usable pot life. Pour a small quantity of the resin into the mixing bucket provided and slowly add the powder. Stir until a smooth thick cream consistency is obtained.
- Application of the surface sealant:
 - a) Immediately after mixing, apply a small amount of sealant to the back of each nipple ensuring that the valve will not be blocked, then place the nipple to ensure the valve (centre) is firmly over the crack. Nipples should be placed between 200 and 500 mm apart dependent on crack size. Additional sealant should be applied to the flange of the nipple to ensure a resin- tight seal to the substrate. Nitokit Surface Sealant should be knifed into the crack between nipples to ensure a resin-tight seal.
 - b) Where cracks can be sealed on one side only, nipples should be placed at centres which are 80% of the depth to which the resin is required to penetrate.
- Application of the injection resin may commence as soon as the Nitokit Surface Sealant has fully hardened (at least 1 hour at 20°C or 2 hours at 10°C).
- Mixing Nitofill:
 - a) Pour all the contents of Hardener pack into Base container. Mix for 2 minutes or more until homogeneous. At extreme temperatures refer to gel time information to enable required handling procedures to be adopted.
 - b) Mechanical mixing is preferable (i.e. Jiffy mixer in slow speed drill) ensuring that the sides and bottom of the container are repeatedly scraped.
 - c) Note: any unused mixed material in quantities above 200g will generate heat and release vapour. Move container to an exterior location and do not breath fumes.

Job title Reddam House, Bearwood Rd, Sindlesham, RG41 5BG			Job no. 24543		
Made by JCB	Checked by JCB	Date 15/04/2026	Sheet no. 21	Rev --	
Details Introduction					

- Nitofil LV Injection:

- The product may be pumped into place using a standard 'grease gun' technique. The size of the injection pump should be related to the job in hand. For small-scale jobs a Fosroc 'G' Gun may be used. Where greater rates of injection are required a hand pump may be used, or bulk supplies of Nitofil LV and Nitofil TH may be used with twin metering/mixing machines.
- Connect the pump to the injection port using nylon reinforced PVC hose and Unex clips. Injection should commence at the widest part of the crack, or at the lower end if crack is uniform, closing that port and transferring injection to the next when the resin is seen to have reached it.
- The resin can be mixed with kiln dried sand near the top surface of the top of the crack to give an appearance closer to that of the surrounding sandstone if required, however the repair will be visible on the top of the slab, similar in appearance to the existing crack.
- 12 to 18 hours after injection, the injection tubes should be broken off and any damage made good using Nitokit Surface Sealant.

The following diagrams indicative show the process for sealing and filling the crack (not to scale):



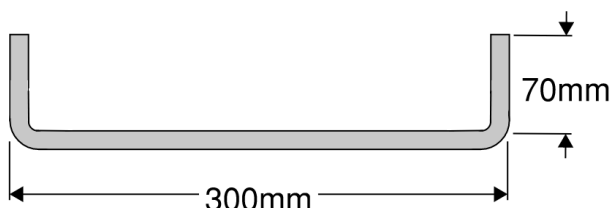
Job title Reddam House, Bearwood Rd, Sindlesham, RG41 5BG			Job no. 24543		
Made by JCB	Checked by JCB	Date 15/04/2026	Sheet no. 22	Rev --	
Details Introduction					

- Cleaning

- a) Tools and application equipment should be cleaned using Fosroc Solvent 102 for Nitofill LV and Nitofill TH and Fosroc Solvent 105 for Nitokit Surface Sealant immediately after use. Cured material can only be removed mechanically. Spillages should be absorbed with sand or sawdust and disposed of in accordance with local regulations.

Installation of Dog Cramps:

- Allow the Nitofil LV resin injection repair to cure for a minimum of 3 days before commencing installation of the dog cramps.
- Procure 8no. stainless steel 12mm diameter dog cramps with the following dimensions:



- The dog cramps are to be grade 304 or 316 stainless steel defromed bars
- Dog cramps to be installed at 200mm centres, with the first and last being no less than 100mm from the slab edges.
- Drill minimum 14mm diameter holes to a depth of 100mm in the slab soffit using non-percussive means. Holes to be 150mm to either side of the crack.
- Between each pair of holes, provide a 20mm wide by 30mm deep chase in the soffit of the slab.
- Prepare and apply the Fosroc Lokfix E35 in accordance with the manufacturer's instructions (see the datasheet in Appendix A), and insert the dog cramps into each hole, providing 15mm cover to the bars on the slab soffit. Ensure there are no voids in the resin within the holes (note that if the hole is too deep for the nozzle to reach the back, use a nozzle extender).
- Allow for the minimum curing time in accordance with the manufacturer's instructions.
- Once the Lokfix resin has cured, applied Fosroc Renderoc HB in accordance with the manufacturer's instructions (see the datasheet in Appendix A).

Job title Reddam House, Bearwood Rd, Sindlesham, RG41 5BG			Job no. 24543		
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Details Introduction					

After installation:

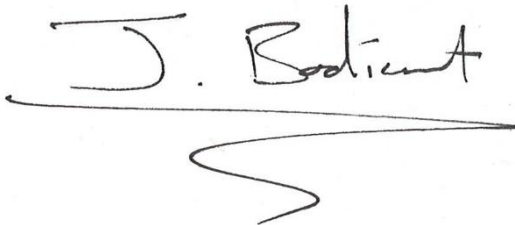
- Allow for all materials to fully cure before removing the temporary propping (7 days recommended);
- Slab can receive foot traffic 18 hours after crack injection, following removal of the injection tubes and surface sealant.
- Soffit and face of slab to be redecorated following propping removal.

3 Rights of Originator

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END OF REPORT

Prepared by:

A handwritten signature in black ink, appearing to read 'J. Bodicoat', is written over a horizontal line. Below the line is a large, stylized, wavy flourish.

James Bodicoat MEng (Hons), CEng, MICE, MStructE
Partner

For and on behalf of **Allcott Associates LLP**

Appendix A:- Fosroc Material Data Sheets

Low viscosity or thixotropic epoxy resin injection grout

Uses

Nitofill LV

A low viscosity system for the injection of cracks between 0.3mm and 9 mm wide in concrete and masonry, where both sides of the crack can be sealed to prevent resin drainage.

Nitofill TH

Developed for the injection of cracks between 0.5mm and 9 mm wide in concrete and masonry, and has been specially formulated to minimise the drainage of resin from cracks which are incompletely sealed.

Advantages

Nitofill LV

- Low viscosity: Permits maximum resin penetration

Nitofill TH

- Thixotropic: Permits injection of open-ended cracks

Nitofill LV and Nitofill TH

- Adhesion: Achieves high strength bond to dry or wet concrete
- Minimum creep: Material designed for low creep
- Non-shrink: No loss of bond or surface contact
- High strength: High compressive, tensile and flexural strengths
- Chemical resistance: Withstands most chemicals, acids and alkalis, also water and frost

Description

Nitofill LV

A two pack low viscosity epoxy resin product for the repair of cracked concrete and masonry by the injection process.

Nitofill TH

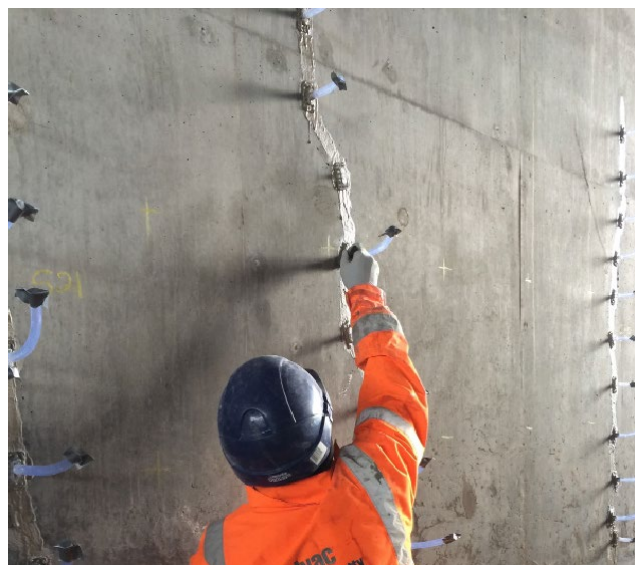
A two pack thixotropic epoxy resin product for the repair of cracked concrete and masonry by the injection process.

Nitokit Surface Sealant

This is a polyester resin compound which combines the dual function of sealing the surface of the crack and bonding on the injection points.

It is supplied as a liquid resin together with a powder hardener, which are mixed together to give a stiff paste.

Nitokit Surface Sealant has the added advantage that it can be rubbed down with suitable hand or power tools to give a smooth finish which readily blends with surrounding concrete, minimising the visual impact of the repaired crack.



Usable life at 20°C: 15 to 35 minutes dependent on mix ratio and quantities

Set time at 20°C: 1 to 2 hours dependent on mix ratio

 0370 09 0370-CPR-0845	
DOP: 9-44 Nitofill LV DOP: 9-45 Nitofill TH	
Fosroc International Limited Drayton Manor Business Park, Coleshill Road, Tamworth, B78 3XN, UK	
EN1504-5: Concrete Injection Nitofill LV: U(F2) W(3)(1/2/3)(5/30)(0) Nitofill TH: U(F2) W(5)(1/2/3)(5/30)(0)	
Determination of adhesion of injection products	$f' > 2.0 \text{ Nmm}^{-2}$ with and without cycles
Adhesion by slant shear	Monolithic failure
Non-volatile content	>95%
Determination of injectability Nitofill LV: Nitofill TH:	Moisture state wet or dry Crack width from 0.3mm: class P3 Crack width from 0.5mm: Class P5
Glass transition temperature	>40°C
Corrosion behaviour	Deemed to have no corrosive effect
Dangerous substances	Complies with section 5.4
Tensile strength development for polymers	>3 N/mm ² within 72 hours at 10°C, 20°C, 30°C

Fosroc® Nitofill LV /TH

Specification Clauses

Low Viscosity Crack Injection

The crack(s) shall be structurally reinstated with Nitofill LV low viscosity epoxy injection resin that conforms to BS EN 1504 Part 5. It shall be injected in accordance with the manufacturer's written instructions using the recommended injection equipment and ancillaries.

Thixotropic Crack Injection

The crack(s) shall be structurally reinstated with Nitofill TH thixotropic epoxy injection resin that conforms to BS EN 1504 Part 5. It shall be injected in accordance with the manufacturer's written instructions using the recommended injection equipment and ancillaries.

Properties

The following properties were obtained for Nitofill LV and Nitofill TH at a temperature of 20°C:

	Nitofill LV	Nitofill TH
Compressive strength EN ISO 12190:1999 (adapted):	93MPa	88 MPa @ 7 days
Tensile strength EN ISO 527:	47MPa	29MPa @7days

Pot life

The time for which bulk mixed material remains fluid will vary with temperature. Typical values in minutes are:

	10°C	20°C	30°C
Nitofill LV:	40 minutes	20 minutes	10 minutes
Nitofill TH:	40 minutes	20 minutes	10 minutes

Chemical resistance

Nitofill LV and Nitofill TH are resistant to oil, grease, fats, most chemicals, mild acids and alkalis, fresh and sea water. Where constant contact with specific concentrated chemicals or solvent is anticipated the Fosroc Customer Services Department should be consulted for advice.

Temperature limitations

During application: Injection can 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.

In service: The cured grout is completely resistant to frost and extreme sub-zero temperatures, and is suitable for continuous use up to 35°C.

Application instructions

Surface preparation

Nitokit Surface Sealant has to retain the injection system under pressure. Care must be taken to provide a bond surface which is dry and free from any contamination.

Mixing the surface sealant

Only mix enough sealant that can be applied within the usable pot-life. Pour a small quantity of the resin into the mixing bucket provided and slowly add the powder. Stir until a smooth thick cream consistency is obtained.

Application of the surface sealant

Immediately after mixing, apply a small amount of sealant to the back of each nipple ensuring that the valve will not be blocked, then place the nipple to ensure the valve (centre) is firmly over the crack. Nipples should be placed between 200 and 500 mm apart dependent on crack size. Additional sealant should be applied to the flange of the nipple to ensure a resin-tight seal to the substrate. Nitokit Surface Sealant should be knifed into the crack between nipples to ensure a resin-tight seal.

Where cracks can be sealed on one side only, nipples should be placed at centres which are 80% of the depth to which the resin is required to penetrate.

Application of the injection resin may commence as soon as the Nitokit Surface Sealant has fully hardened (at least 1 hour at 20°C or 2 hours at 10°C).

Mixing Nitofill

Pour all the contents of Hardener pack into Base container. Mix for 2 minutes or more until homogeneous. At extreme temperatures refer to gel time information to enable required handling procedures to be adopted.

Mechanical mixing is preferable (i.e. Jiffy mixer in slow speed drill) ensuring that the sides and bottom of the container are repeatedly scraped.

Note: any un-used mixed material in quantities above 200g will generate heat and release vapour. Move container to an exterior location and do not breath fumes.

Injection

The product may be pumped into place using a standard 'grease gun' technique. The size of the injection pump should be related to the job in hand. For small-scale jobs a Fosroc 'G' Gun may be used. Where greater rates of injection are required a hand pump may be used, or bulk supplies of Nitofill LV and Nitofill TH may be used with twin metering/mixing machines.



Fosroc® Nitofill LV /TH

Connect the pump to the injection port using nylon reinforced PVC hose and Unex clips. Injection should commence at the widest part of the crack, or at the lower end if crack is uniform, closing that port and transferring injection to the next when the resin is seen to have reached it.

12 to 18 hours after injection, the injection tubes should be broken off and any damage made good using Nitokit Surface Sealant.

Cleaning

Tools and application equipment should be cleaned using Fosroc Solvent 102 for Nitofill LV and Nitofill TH and Fosroc Solvent 105 for Nitokit Surface Sealant immediately after use. Cured material can only be removed mechanically. Spillages should be absorbed with sand or sawdust and disposed of in accordance with local regulations.

Estimating

Packaging

Nitofill LV:	3 litre pack (2 x 1.5 litre units each consisting of base & hardener)
Nitofill TH:	1 litre pack
Nitokit Surface Sealant:	5.5 litre pack
Fosroc Solvent 102:	5 and 25 litre tins
Fosroc Solvent 105:	5 litre tin

Storage

Nitofill LV and Nitofill TH have a shelf life of 18 months, if stored in dry conditions at 20°C.

Nitokit Surface Sealant has a shelf life of 12 months if stored in dry conditions at 20°C.

Nitokit Surface Sealant should be stored in accordance with the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972.

Precautions

Health and safety

For further information refer to appropriate Product Safety Data Sheet.

Disposal

To eliminate risk of exotherm, this product should only be mixed when ready for use and then applied without delay. Any unused residue should be poured on to a disposable impervious surface to allow cure before disposal.

Fire

Nitofill LV and Nitofill TH are non-flammable.

Fosroc Solvent 102, Fosroc Solvent 105 and Nitokit Surface Sealant are flammable. Do Not use near naked flames. No Smoking during use.

In the event of fire, extinguish with CO₂ or foam.

Flash points

Nitokit Surface Sealant:	29°C
Fosroc Solvent 102:	33°C
Fosroc Solvent 105:	43°C

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Fosroc International Limited

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www.fosroc.com

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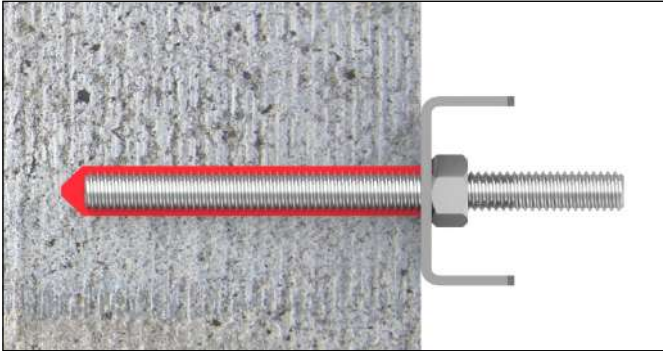
telephone:
+44 (0) 1827 262222

email:
enquiryuk@fosroc.com



Fosroc® Lokfix E35

Styrene free polyester resin based cartridge system, for anchoring reinforcement and lightweight fixings into a variety of substrates.



Uses

For concrete (solid, porous and light), masonry, natural stone and hollow bricks.

- Cost effective alternative for the anchoring of threaded rods, reinforcing bars, profiled rod, steel section with undercuts and internal threaded rod sleeves
- Safe application in hollow bricks using a Hollow Block Sleeve
- For horizontal, vertical and overhead application
- Bonding and surface crack sealing applications
- Suitable for dry, wet and flooded concrete

Advantages

- Fast return to service
- May be used with a good quality skeleton gun (300ml size)
- No additional mixing equipment required
- Does not apply expansive force to the substrate
- Enables fixings closer to edges than mechanical anchors
- Resistant to a variety of chemicals
- Low VOC
- Re-usable by replacing the static mixer
- Waterproof, protecting the fixing from corrosion
- Performs over a wide variety of temperatures

Description

Lokfix E35 is a two component Polyester anchoring material, supplied in single component cartridges with a static mixer nozzle. When applied it sets and cures rapidly to firmly secure a variety of steel fixings into concrete and masonry substrates.

Three grades of Lokfix E35 are available, selection is normally based upon the substrate installation temperature :

Lokfix E35S: Standard temperature grade, optimised for substrate installation temperatures between -5 to +40°C.

Lokfix E35L: Low temperature grade, optimised for substrate installation temperatures between -10 to +30°C.

Lokfix E35T: Tropical temperature grade, optimised for substrate installation temperatures between +10 to +45°C.

Other grades of Lokfix are also available

Lokfix E55 Resin anchor cartridge system based on styrene free vinyl-ester for medium to heavy duty anchoring.

Lokfix E75 Resin anchor cartridge system based on pure epoxy for heavy duty fixings.

Specification Clause

The anchor grout shall be Fosroc Lokfix E35 cartridge system. The Anchoring grout shall comply with European Technical Assessments, ETA 18/0553 and ETA 18/0552.

Standards Compliance

Lokfix E35S, E35L & E35T comply with the following:

- European approval acc. to EAD 330076-00-0604 product area code: 33 Injection Anchors for use in Masonry (supersedes ETAG TR029)
- European approval acc. to EAD 330499-00-0601 product area code: 33 Injection Anchors for use in uncracked concrete (supersedes ETAG 001 option 5)
- Émissions dans l'air Intérieur : A+
- LEED compliant VOC Level



Fosroc® Lokfix E35

	
1343	1343
Fosroc Limited Factory RC1 18 1343- CPR-M 672-1	
ETA-18/0553 EAD-330499-00-0601 Option 7 M8-M24 For use in un-cracked concrete	

	
1343	1343
Fosroc Limited Factory RC1 18 1343- CPR-M 672-2	
ETA-18/0552 EAD-330076-00-0604 M8-M16 For use in masonry	

Table 1—Material Properties

Compressive Strength (EN196)	70MPa
Flexural Strength (EN196)	30 MPa
E Modulus (EN196)	4000 MPa
Density	1.74kg/L
Max permanent service temperature	-40 to +50°C
Max temporary service temperature	-40 to +80°C

Chemical resistance

Lokfix E35 has resistance to a wide variety of chemicals. Consult Fosroc technical department for specific data.

Table 2—Lokfix E35S Gel & *Dry Curing Times

Substrate Temp.	Gel Time (mins)	*Dry Curing Time (mins)
-5°C	90	360
0 °C	45	180
+5°C	25	120
+10 °C	20	100
+15 °C	15	80
+20 °C	6	45
+30 °C	4	25
+35 to 40 °C	2	20

Table 3—Lokfix E35L Gel & *Dry Curing Times

Substrate Temp.	Gel Time (mins)	*Dry Curing Time (mins)
-10 °C	60	240
-5°C	45	120
0 °C	25	80
+5 °C	10	45
+10 °C	4	25
+15 °C	3	20
+20 to 30 °C	2	15

Table 4—Lokfix E35T Gel & *Dry Curing Times

Substrate Temp.	Gel Time (mins)	*Dry Curing Time (mins)
+10 °C	30	300
+15 °C	20	210
+20 °C	15	145
+30 °C	10	80
+35 °C	6	45
+40 °C	4	25
+45 °C	2	20

Note for Lokfix E35 grades the cartridge temperature should be between +15 to +30°C for optimal use. The substrate temperature can vary significantly from the ambient temperature.

*The tables are for dry conditions. If the substrate is wet double the curing time e.g. for 120 mins dry then 240 mins wet.

Design Criteria

Note table 5, overleaf, is for dry un-cracked concrete only. For all other conditions including fixings into solid and hollow masonry types, refer to the relevant method statement, or EAD document available through your local technical office.

Fosroc® Lokfix E35

Design Criteria

Table 5 - Setting Parameters – details below

Un-cracked Concrete Threaded Rod				M8	M10	M12	M16	M20	M24
Anchor Size									
Edge Distance	$1 \times h_{ef}$	$C_{cr,N}$	mm	80	90	110	125	170	210
Min. Edge Distance	$5 \times d$	C_{min}		40	50	60	80	100	120
Axial Distance	$2 \times h_{ef}$	$S_{cr,N}$		160	180	220	250	340	420
Min. Axial Distance	$5 \times d$	S_{min}		40	50	60	80	100	120
Embedment Depth		H_{ef}		80	90	110	125	170	210
Min. part thickness		H_{min}		$H_{ef} + 30mm$			$H_{ef} + 3d_0$		
Drill Diameter		d_0		10	12	14	18	24	28
Brush Diameter		d_b		12	14	16	20	26	27
Installation Torque		T_{inst}	Nm	10	20	40	60	120	150
Material Consumption			ml	3	4	5	7	24	35

Assistance and qualification

Design of fixings and reinforcement must be undertaken by suitably qualified personnel with understanding of the construction and use of the structure, the use of the fixing, as well as being in compliance with local legislation.

In applications where fixings must be designed and applied in compliance with the requirements of the ETA, designers should consult the relevant Fosroc accreditation documents.

Product Installation

The following methodology is for installation into solid substrates such as reinforced concrete. For hollow substrates please request a separate method statement.

Full details are available in the application method statement, a copy of which may be obtained from your local Fosroc technical department.

Hole Formation and Preparation

Drill hole with percussive drill ensuring sides of the concrete are rough.

If rebar is struck immediately stop drilling and seek the advice of the designing engineer.

Clean holes immediately prior to installation of fixings to avoid them becoming re-contaminated. Standing water in the hole shall be removed prior to preparation.

Using a hand pump or oil free compressed air insert the nozzle to the back of the hole and blow out 4 times.

Insert a wire cleaning brush to the bottom of the hole and brush out 4 times

Using a hand pump or oil free compressed air insert the nozzle to the back of the hole and blow out an additional 4 times.

If dust is still present, repeat the process until no further dust is visible.

Ensure the drill bit and the cleaning brush are of suitable diameter for the fixing used.

Threaded rod:

Drill bit $\varnothing$ = rod diameter +2mm

Wire brush $\varnothing$ = rod diameter +4mm

Fixings Preparation

Fixings shall be free from rust, paint, grease and contaminants which will interfere with the bond.

Fosroc® Lokfix E35

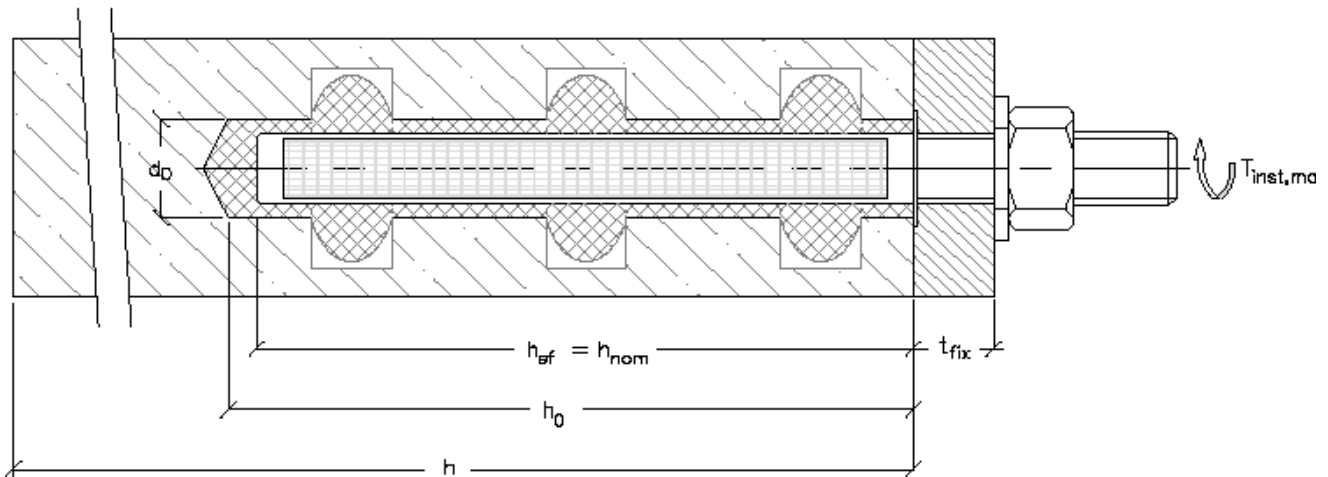


Figure 1: Use of masonry sleeve in hollow block

Installation

Unscrew the fixing cap. Pull the plastic within the tube slightly upwards so that the steel collar is exposed, cut the plastic tube competently removing the metal clip and discard.

Screw the static mixer nozzle onto the cartridge. Place the cartridge into the application gun. Pull the trigger to extrude the Lokfix E35. **Important:** extrude the initial material until the colour becomes grey and consistent. This typically takes two or three full squeezes. Discard material that is streaky in colour. Insert the nozzle to the back of the hole and pump the Lokfix material gently pulling back until the hole is $\frac{3}{4}$ full. Ensure there are no voids in the resin. If the hole is too deep for the nozzle to reach the back, use a nozzle extender.

In deep, wide or overhead holes a piston plug with a nozzle extender will help reduce slump and ensure a void free application. Mark the required depth on your fixing. Observing the product gel time, insert the fixing into the hole using a gentle twisting motion. Ensure the fixing is inserted to the required depth and is held straight until the resin sets. There should be some extrusion of the Lokfix material from the hole which indicates that there is full embedment.

Do not load or apply tension to the fixing until the product fixing time has been observed, see tables 2, 3 & 4.

Do not over-tighten fixings. Observe maximum installation torque as stated in table 5. If the cartridge is to be re-used, remove the mixing nozzle and re-apply the cap. When using again a new mixing nozzle will be required.

Cleaning

Wet resin should be removed from tools and equipment using Fosroc Solvent 102 immediately after use.

Estimating

Supply

Lokfix E35S E35T and E35L are supplied in boxes of 12 no. 300ml cartridges, each supplied with a single mixer nozzle.

Fosroc may also supply:

- Steel brushes, in various diameters to clean the hole.
- Dust blower pump, one size, hand held to clean the hole.
- Hollow block sleeves, in a variety of diameters and embedded lengths for hollow bricks and blocks.
- Extension nozzle, essential where the embedment depth is greater than 190mm. In various lengths.
- Piston plugs, required where the hole diameter is >20mm or where embedment depth is >240mm. Must be used with an extension nozzle.
- Application guns, hand held for cartridge application.
- Spare mixer nozzles, required if re-using a cartridge.

Yield

Standard yield estimation is provided in table 5 based on the hole diameter, fixing size and embedded length. For non-standard consumption the calculation below may be used. Factors such as over-drilling, extrusion from bolt hole, initial gun extrusion and wastage to be considered

Fosroc® Lokfix E35

$(\pi \text{ radius cm hole}^2 - \pi \text{ radius cm bolt}^2) \times \text{hole length cm} =$
consumption ml.

Limitations

Load calculations to be undertaken by a qualified engineer.

When embedding into hollow masonry it is normally necessary to use hollow block sleeves. Consult separate method statement.

Attention natural or decorative stone can discolour, check suitability in advance.

Lokfix E35 is not recommended for the following conditions: seismic; cracked concrete and fire rated, consider Lokfix E55 or Lokfix E75. after referring to the respective technical datasheets.

Storage

300ml cartridges have a maximum shelf life of 12 months when kept in a dry warehouse at between +5 to +25°C.

Precautions

Health & Safety

Observe the information provided on the relevant SDS.

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High performance lightweight concrete reinstatement mortar conforming to the requirements of BS EN 1504-3 Class R2

Uses

For the reinstatement of concrete where low permeability characteristics are required but where high compressive strength is not the most important consideration. If high compressive strengths and low permeability characteristics are required, Renderoc HB45 should be used.

Renderoc HB has been specifically developed for vertical and overhead repair work where its lightweight nature and high build characteristics makes it ideal.

Renderoc HB is suitable for repair methods 3.1, 3.3, 7.1, 7.2 as defined by BS EN 1504-3.

Advantages

- Compatibility with non-structural concrete of compressive strength 15 - 25 N/mm²
- Lightweight formulation enables extra high-build — fewer cold joints
- Frequently obviates the need for formwork
- Polymer-modification provides extremely low permeability to water, carbon dioxide and chlorides
- Exceptional system of shrinkage compensation provides long-term dimensional stability
- Can be applied quickly and efficiently by wet spraying
- One component, pre-bagged to overcome site-batched variations
- Contains no chloride admixtures
- Shade can be varied with Renderoc Lightener / Darkener*

Description

Renderoc HB is supplied as a ready to use blend of dry powders requiring only the site addition of clean water to produce a highly consistent, lightweight repair mortar.

It is based on Portland cements, graded aggregates, lightweight fillers and chemical additives which provide a mortar with good handling characteristics while minimising water demand. The low water requirement ensures good strength gain and long-term durability.

Renderoc HB has been specifically engineered for vertical and overhead repair work. It can be applied in sections up to 100 mm thickness in vertical locations and up to 60 mm thickness in overhead locations in a single application and without the use of formwork. Thicker sections can be achieved by the use of formwork or can be built up in layers. Deep pockets can sometimes be filled in a single application dependent on the configuration of the pocket and the volume of exposed reinforcing steel.

Renderoc HB can be quickly and efficiently applied by the wet spray technique. Consult the local Fosroc office for further information.

The material should not be applied at less than 10 mm thickness.



Standards compliance

Renderoc HB complies with the class R2 according to EN1504-3, repair methods 3.1, 3.3, 7.1 and 7.2.

Renderoc HB complies with LU Standard 1-085 'Fire Safety Performance of Materials'.

CE 0370 09 0370-CPR-0845 UK CA 0836 22 UK 0836-CPR-22/F6049	
DOP: UK9-90	
Fosroc International Limited Drayton Manor Business Park, Coleshill Road, Tamworth, B78 3XN, UK	
Fosroc® Renderoc HB	
EN 1504-3: Non-structural concrete repair mortar Non-structural repair methods 3.1, 7.1 and 7.2	
Compressive strength	≥ 15 MPa
Chloride ion content	≤ 0.05%
Adhesion strength by pull-off test	≥ 0.8 MPa
Thermal compatibility: freeze-thaw cycling with immersion	≥ 0.8 MPa
Carbonation resistance	DK ≤ reference concrete
Capillary absorption (water permeability)	< 0.5kg/(m ² .h ^{0.5})
Reaction to fire	Class A2 s1 d0
Dangerous substances	Complies with 5.4

*Refer to separate datasheet

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Properties

The following results were obtained at a water : powder ratio of 0.18 and at a temperature of 20°C unless otherwise stated.

Test Method	Standard	EN 1504 R2 Requirement	Test Result
Compressive strength	EN 12190:1999	≥ 15 MPa	@ 1 Day 10 MPa @ 28 Days 22 MPa
Bond strength by pull off:	EN 1542:1999	≥ 0.8 MPa	1.9 MPa
Chloride ion content:	EN 1015-17:2000	≤ 0.05 %	0.02%
Freeze thaw cycling:	EN 13687-1:2002	≥ 0.8 MPa	0.8 MPa
Fire rating	EN 13501-1	-	Class A2 s1 d0 Non-Combustible
Setting time	BS4551:2005+A2:2013	-	Initial set: 3.5 hours Final set: 5.5 hours
Fresh wet density	-	-	Nominally 1430 kg/m ³
Shrinkage 25 x 25 x 285 prisms, 27 °C, 55% RH	-	-	< 300 microstrain @ 7days
Chemical resistance	-	-	The low permeability of Renderoc HB severely retards chemical attack in aggressive environments. The cured mortar is impermeable to acid gases, waterborne chloride ions and oxygen.
Build Characteristics (hand applied) Minimum thickness: Overhead: Vertical:	- - -	- - -	10 mm Up to 60 mm Up to 100 mm

Clarification of property values: The typical properties given above are derived from laboratory testing. Results derived from field applied samples may vary. Maximum build thickness is dependent on location of repair, water content and application technique.

Application instructions

Preparation

Form a square edge perimeter to the repair area using appropriate methods (feather edging must be avoided), break out the complete repair area up to a minimum depth of 10mm up to the square edge.

Clean the surface and remove any dust, unsound or contaminated material, plaster, oil, paint, grease, corrosion deposits or algae. Where breaking out is not required, roughen the surface and remove any laitance by light scabbling or abrasive-blasting.

Oil and grease deposits should be removed by steam cleaning, detergent scrubbing or the use of a proprietary degreaser. The effectiveness of decontamination should then be assessed by a pull-off test.

Expose fully any corroded steel in the repair area and remove all loose scale and corrosion deposits. Steel should be cleaned to a bright condition paying particular attention to the back of exposed steel bars. Abrasive blasting, hydrodem equipment, powered mechanical scraping or other suitable means is recommended for this process.

Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water immediately after abrasive-blasting to remove corrosion products from pits and imperfections within its surface.

Refer to HSE information sheet CIS36 regarding control of exposure to construction dust, available at www.hse.gov.uk.

Reinforcing steel priming

Apply one full coat of Nitoprime Zincrich Plus and allow to dry before continuing. If any doubt exists about having achieved an unbroken coating, a second application should be made and, again, allowed to dry before continuing.



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Concrete Priming

The concrete substrate should be saturated surface dry immediately before the application of the primer i.e. it should be thoroughly saturated with clean water and any residual surface water removed prior to applying Nitobond HAR.

Under severe drying conditions repeated soaking may be necessary to ensure the substrate is still saturated at the time of application of the primer.

Scrub Nitobond HAR into the surface.

Renderoc HB can be applied as soon as the primer becomes tacky. If the Nitobond HAR is too wet, overhead and vertical build-up of the Renderoc HB may be difficult.

In exceptional circumstances, e.g. where a substrate/repair barrier is required or where the substrate is water immersed or likely to remain permanently damp, Nitobond EP bonding aid should be used. Contact the local Fosroc office for further information.

Mixing

Care should be taken to ensure that Renderoc HB is thoroughly mixed. A forced-action mixer is essential. Mixing in a suitably sized drum using an approved Renderoc Mixing Paddle (MR4) with a slow speed (400/500 rpm) heavy-duty drill is acceptable for the occasional one-bag mix.

Free-fall mixers must not be used. Mixing of part bags should never be attempted.

For normal applications, place 3.1 to 3.4 litres of drinking quality water into the mixer.

With the machine in operation, add one full bag of Renderoc HB and mix, for a minimum of 3 minutes and a maximum of 5 minutes, until fully homogeneous.

The consistency may be adjusted by the addition of small amounts of water up to the maximum total water content of 3.4 litres.

Note that the powder must always be added to the water.

Mixing warning

As with other 'one pack' repair mortars, Renderoc HB may exhibit satisfactory handling characteristics even though inadequately mixed. This will result in a significantly lower level of performance or possible failure. It is therefore essential that mixing instructions are strictly adhered to with particular emphasis on the quantity of water used and the time of the mixing operation.

Application

Exposed steel reinforcing bars should be firmly secured to prevent movement during application.

Apply the mixed Renderoc HB by gloved hand or trowel, thoroughly compacting onto the primed substrate and around exposed reinforcement.

If sagging or slumping occurs Renderoc HB should be completely removed and reapplied at a reduced thickness to a correctly primed substrate.

Build-up

Additional build-up can be achieved by application of multiple layers.

The surface of the intermediate layers should be comb scratch-keyed and cured with Nitobond AR. Repriming with Nitobond HAR and a further application of Renderoc HB may proceed as soon as this layer has set.

Spray application

Renderoc HB can be quickly and efficiently applied by the wet spray technique. In circumstances where large areas of repair are required, the rapid placement and higher build attainable by this method offer economic advantages over hand-trowelling. The resultant repair also offers a generally more dense compound with enhanced mortar/substrate bond characteristics.

For further details on wet spray techniques contact the local Fosroc office.

Finishing

Renderoc HB is finished by striking off with a straight edge and closing with a steel float. Wooden or plastic floats, or damp sponges, may be used to achieve the desired surface texture. The completed surface should not be overworked. After spray application, the mortar may need to be 'cut back' to the required profile using a steel float and then finished with damp sponges as described above.

Low temperature working

In cold conditions down to 3°C, the use of warm mixing water (up to 30°C) is advisable to accelerate strength development. Normal precautions for winter working with cementitious materials should then be adopted. The material should not be applied when the substrate and/or air temperature is 3°C and falling. At 3°C static temperature or at 3°C and rising, the application may proceed.

High temperature working

At ambient temperatures above 35°C, the material should be stored in the shade and cool water used for mixing.

Curing

Renderoc HB is a cement-based repair mortar. In common with all cementitious materials, it must be cured immediately after finishing in accordance with good concrete practice. The use of Nitobond AR, sprayed on to the surface of the finished mortar in a continuous film, is recommended. A low pressure atomising sprayer is essential for applying the Nitobond AR. Any excessive run-off on verticals or drips on soffits should be removed by brush before they harden.

Large areas should be cured as trowelling progresses (0.5 m² at a time) without waiting for completion of the entire area.



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In fast drying conditions, supplementary curing with polythene sheeting taped down at the edges must be used. In cold conditions, the finished repair must be protected from freezing.

Overcoating with protective decorative finishes

Renderoc HB is extremely durable and will provide long-term protection to the embedded steel reinforcement within the repaired locations. The surrounding parts of the structure will benefit from the application of a barrier/decorative coating to limit the advance of chlorides and carbon dioxide, bringing them to the same protective standard as the repair itself. Fosroc recommend the use of the Dekguard range of protective, anti-carbonation coatings. These products provide a decorative and uniform appearance as well as protecting areas of the structure which might otherwise be at risk from the environment. Dekguard products may be applied over the repair area without prior removal of the Nitobond AR curing membrane. Other curing membranes must be removed prior to the application of Dekguard products.

Cleaning

Renderoc HB and Nitobond HAR should be removed from tools, equipment and mixers with clean water immediately after use. Cured material can only be removed mechanically.

Clean tools used with Nitoprime Zincrich Plus and Nitobond EP before material cures using Fosroc Solvent 102.

Estimating

Supply

Renderoc HB:	18 kg bags
Nitoprime Zincrich Plus:	1.9 litre and 800 ml cans
Nitobond HAR	5 litre drums
Nitobond AR:	5 litre drums
Fosroc Solvent 102:	5 and 25 litre tins

Coverage and yield

Renderoc HB:	Approximately 14.5 -15.0 litres / 18 kg bag (approximately 1.5 m ² at 10 mm thickness)
Nitoprime Zincrich Plus:	8 m ² /litre
Nitobond AR:	6 - 8 m ² / litre
Nitoprime HAR	3 - 4 m ² / litre

Notes: the actual yield per bag of Renderoc HB will depend on the consistency used. The yield will be reduced if the material is applied by a spray technique.

Limitations

Renderoc HB should not be used when the temperature is below 3°C and falling. Do not mix part bags. Due to the lightweight nature of Renderoc HB, the product should not be used in areas subjected to traffic (in these circumstances, Renderoc S should be considered).

Renderoc HB should not be exposed to moving water during application. Exposure to heavy rainfall prior to the final set may result in surface scour.

If any doubts arise concerning temperature or substrate conditions, consult the local Fosroc office.

Storage

The product has a shelf life of 12 months from the date of manufacture if kept in dry storage in the original, unopened bags. If stored at high temperatures and/or high humidity the shelf life may be reduced to less than 6 months.

Nitobond AR and Nitobond HAR should be protected from frost.

Precautions

Health and safety

For further information refer to the appropriate Safety Data Sheets available at www.fosroc.com

Fire

Renderoc HB is non-flammable.

Nitoprime Zincrich Plus and Fosroc Solvent 102: are flammable. Keep away from sources of ignition. No Smoking. In the event of fire, extinguish with CO₂ or foam. Do not use a water jet

Flash points

Nitoprime Zincrich Plus:	41°C
Fosroc Solvent 102:	33°C

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