TENDER DOCUMENT

FOR

STRUCTURAL STRENGTHENING WORKS OF THE EXISTING BUILDINGS OF DAKSHINAYAN DELHI EPDP CGHS LTD.AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078

LETTER INVITING TENDER

No: GH/SSW/2022-23 Dated 18.05.2022

M/s_____

SUBJECT : STRUCTURAL STRENGTHENING WORKS OF THE EXISTING BUILDINGS OF DAKSHINAYAN Delhi EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078

Sir,

1. The Management Committee of the DAKSHINAYAN DELHI EPDP CGHS desires to strengthen existing building blocks DAKSHINAYAN DELHI EPDP CGHS AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078. It requires the services of a professional agency to do the strengthening work of RCC elements of the said existing building.

2. Bids are invited from eligible and experienced bidders as per eligibility criteria indicated in tender document to take up the structural strengthening works of the existing buildings. Interested bidders may obtain Tender documents in respect of the above-mentioned works on payment of Rs. 500/- in cash or through demand draft in favour of DELHI EPDP CGHS Ltd. Payable at New Delhi or request for soft copy of document by email sent at delhiepdp@gmail.com

3. Bidding will be conducted as single envelope bidding procedure as indicated in the tender document. The Tender should be signed on each page, dated and witnessed including stamp of the Tenderer. The person, signing the tender on behalf of company/firm or on behalf of another person shall attach with tender a certified copy of proper authority/power of attorney on a non-judicial stamp paper of requisite value duly executed in his favour by such person, company/firm and must state specifically that he has authority to sign such tenders for and on behalf of such person or company/firm as the case may be, and in all matters pertaining to the contract including arbitration clause.

DAKSHINAYAN
Plot No. 19, Sector - 4, Dwarka, New Delhi - 110078 | Ph. Nos. 25096521 Extn. No. 2155 & 2700 & 011-40110547
E-mail : delhiepdp@gmail.com | Website : delhiepdp-cghs.in

4. **Please note that sealed tender is to be delivered at Society's Office of DAKSHINAYAN DELHI EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078 on or before 1500 hrs. on 11.06.2022 as per instructions in tender document.** The tender should be accompanied by Earnest Money Deposit (EMD) of Rs. 50,000/- (Rupees Fifty Thousand only) in the form of demand draft drawn in favour of **Delhi EPDP CGHS Ltd**. Payable at New Delhi as mentioned in the bidding document. **Tenders without earnest money deposit shall be summarily rejected. Earnest Money Deposit of unsuccessful bidders would be returned after 4 weeks of opening of bids. Pre- bid meeting to clarify issues relating to tender etc., would be held in society's office on 12th June, 2022 at 3.30 P.M.**

5. The bids will be opened at 15.30 hrs. on 11.06.2022 in the presence of bidders or their authorized representative.

6. This letter shall form part of the **"CONTRACT"** and must be signed and returned along with the tender documents.

Col Satchit Kumar Basu (Retd.)
Secretary
Delhi EPDP CGHS Ltd

Signature of the Tenderer with stamp

DELHI EPDP CO-OPERATIVE GROUP HOUSING SOCIETY LTD.
Registration No. 593 G/H (New) | GST NUMBER : 07AAAAD3724F1Z6

NOTICE INVITING TENDER

SUBJECT : STRUCTURAL STRENGTHENING WORKS OF THE EXISTING BUILDINGS OF DAKSHINAYAN Delhi EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078

No: GH/SSW/2022-23 Dated 18.05.2022

Sealed item rate tenders are hereby invited on behalf of the Management Committee of the DAKSHINAYAN Delhi EPDP CGHS Ltd from experienced professional agencies experienced in structural strengthening and retrofitting work.

S. No.	Name of the work	EMD	Time of Completion	Date of Issue of Tender	Last date of submission
1	REPAIR AND RETROFITTING OF DAKSHINAYAN Delhi EPDP CGHS Ltd.AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078	Rs.50,000/- (Rs. Fifty Thousand only)	90 days	18.05.2022 to 11.06. 2022	11.06.2022 At 15.00 hrs.

1. Blank tender documents (non-transferable) for above work shall be issued from 18.05.2022 to 11.06.2022 from the address given below on payment of required tender fee of Rs. 500/- (Rupees Five hundred only) (non-refundable) in cash/DD in favour of "**Delhi EPDP CGHS Ltd.** " , payable at New Delhi. The bidders may also request for soft copy of the tender document by email to delhiepdp@gmail.com, however, a separate demand draft of Rs. 500/- in favour of "**Delhi EPDP CGHS Ltd.** ", payable at New Delhi is to be enclosed along with the technical bid towards the cost of tender document.
2. The tenderers should have completed minimum two works of similar nature of minimum value of Rs. 40.00 lakhs each or one single work of value of Rs.80.00 lakhs in their name, during the last five years. Similar nature work means Structural Strengthening / Structural Retrofitting/ works involving structural repair of an existing building (multi storied building). Bidder to submit relevant work order and completion certificate as a proof of the same.
3. While applying for the tender document, the intending tenderers shall furnish UDIN based CA Certificates for last three years of audited financial statements in support of their financial soundness, experience certificates, proof of works completed/awarded, valid GST registration as applicable.
4. The tender issuing authority reserves the right to issue or refuse to issue the tender document to any party without assigning any reason thereof and tenderer shall meet all requisite terms and conditions in participating tenders.
5. **Tenders not accompanied by Earnest Money Deposit and tender cost in the prescribed form shall be summarily rejected.**
6. The authority reserves the right to reject all or any tender wholly or partly without assigning any reason whatsoever.

Col Satchit Kumar Basu (Retd.)
Secretary

DAKSHINAYAN
Plot No. 19, Sector - 4, Dwarka, New Delhi - 110078 | Ph. Nos. 25096521 Extn. No. 2155 & 2700 & 011-40110547
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SUBJECT : STRUCTURAL STRENGTHENING WORKS OF THE EXISTING BUILDINGS OF DAKSHINAYAN Delhi EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078

No: GH/SSW/2022-23 Dated 18.05.2022

INSTRUCTIONS TO BIDDERS

1.0 GENERAL: Bidders are advised to acquaint themselves fully with the description of item of work, scope of work, time schedule and terms and conditions including all the provisions of the Tender Document before submitting their tender.

2.0 SITE PARTICULARS: Bidders are advised to contact Society's Office Delhi EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078, Secretary, Delhi EPDP CGHS Ltd for site visit and any query regarding details of the site & its surroundings and scope of the tender and satisfy themselves before submitting their tenders as to site conditions, means of access to the site, details of work etc.

3.0 SUBMISSION OF TENDER : The expression "Tender Notice" referred to in the Tender Documents shall be deemed to include any Notice / Letter Inviting Tender with respect to the work forming the subject matter of the documents and vice-versa. The tender complete in all respects shall be submitted along with Earnest Money as stipulated in the Notice / Letter Inviting Tender.

4.0 BIDDING PROCESS: Single envelop system would be followed. Bidder will submit Technical and Financial Bids in a sealed envelope along with drafts for bid security (EMD) and cost of tender as per details given below.

4.1 <u>TECHNICAL BID</u>

Name of work : Structural Strengthening Works of the Existing Buildings of "Dakshinayan" Delhi EPDP CGHS Ltd. At Plot No-19, Sector 4 Dwarka New Delhi-110078

Due date & time : 11.06.2022 at 15.00 hrs.
Opening date & time of Bid : 12.06.2022 at 15.30 hrs.

Addressed to : "DAKSHINAYAN" Delhi EPDP CGHS Ltd. AT PLOT NO-19, SECTOR 4 DWARKA NEW DELHI-110078

From: Name & address of the tenderer :

This envelope shall contain the following:

a) **BID SECURITY** - Envelope containing EMD of Rs. 50,000/- (Rs. Fifty Thousand only) in the form of Demand Draft drawn on a Scheduled/Nationalized Bank in favour of "Delhi EPDP CGHS Ltd. " payable at New Delhi. **Tenders without Earnest Money Deposit will be out rightly rejected**.
b) Details experience of undertaking similar nature of works. Documentary proof of completing two works of similar nature of minimum value of Rs 40.00 lakhs each or one single work of value of Rs. 80.00 lakhs executed by the bidder during last five years.
c) UDIN based CA Certificate for the Audited financial statements of last three financial years.
d) Valid registration with Tax Department.
e) List of equipment proposed to be committed for the work. It shall be responsibility of the agency for arranging the necessary equipments for the work. No equipment for work shall be supplied by the client. Society will provide water and electricity for the work on request. However, it would the responsibility of the bidder to get the water tested for its suitability for execution of RCC work.

4.2 FINANCIAL BID :

4.2.1 This bid shall contain the tender document with **Rates and amount duly filled by the bidder against the each item prescribed in the Schedule of Quantity of tender document** and no conditions (i.e. deviations / assumptions / stipulations / clarifications / comments / any other request) whatsoever will be accepted and the conditional offers will be rejected.

5.0 DEVIATIONS TO TENDER CLAUSES: Bidders are advised to submit the tenders strictly based on the terms and conditions and description of items contained in the Tender Documents and not to stipulate any deviations. Conditional tenders are liable to be rejected.

5.1 In case of bidder opting for soft copy of tender document, if it is observed at any stage that the tenderer has modified/ altered any of the contents/ matter of the tender document then his tender shall be rejected and his EMD shall be forfeited. In such event, the Society shall be free to take appropriate legal action against the said tenderer.

6.0 VALIDITY OF OFFER : Tender submitted by tenderers shall remain valid for acceptance for a minimum period of 120 days from the date of opening of the tenders.

7.0 AWARD OF WORK : The Society reserves the right to split the job into two or more parts and to award the work to separate agencies. Work shall be generally awarded to the lowest bidder, subject to fulfilling criteria of the work experience and other terms & conditions and specifications.

8.0 ACCEPTANCE / REJECTION OF TENDER :

(i) The Society does not bind itself to accept the lowest tender.
(ii) Society also reserves the right to accept or reject any tender in part or full without assigning any reason whatsoever.
(iii) The Society also reserves the absolute right to reject any or all the tenders at any time solely based on the past unsatisfactory performance by the bidder(s) the opinion/decision of the management regarding the same shall be final and conclusive.

9.0 SAFETY AND INSURANCE:

9.1 Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders.
9.2 All necessary personal safety equipment as considered adequate by the Society/ its Engineer should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned.
9.3 In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at this own expense arrange for the safety provisions as per C.P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith.
9.4 **Insurance under workmen compensation Act**- Contractor is required to take insurance cover under the Workman Compensation Act, 1923 amended from time to time from an approved insurance company and pay premium charges thereof. Wherever required by Society, the contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums. Contractor is liable to settle all claims of accident due to construction.

9.5 **Liability : The contractor shall adhere to the prevailing rules and regulations of the Society and follow best professional practices. The contractor shall designate one safety personnel who will be responsible for the safety of the workers & staff engaged at site, resident and employees of the Society along with visitors visiting the complex.**

10. DEFECT LIABILITY PERIOD : Defect Liability Period (DLP) for the contract will be upto of 12 months (one year). During Defect Liability Period if any defect is found in the work, the Contractor will be liable to repair that at their own cost. Beyond DLP, the contractor has to submit a GUARANTEE CERTIFICATE on Rs. 100/- stamp paper for the executed work for the next 5 years w.e.f. expiry of DLP.

11. ARBITRATION : In case any dispute or difference arises between the Employer and the Contractor relating to any matter arising out of or connected with the agreement, both the parties will try to settle such dispute or difference mutually. If the dispute or the difference cannot be settled mutually, the said dispute or the difference will be settled in accordance with the Arbitration and Conciliation Act, 1996 and its amendments. The Secretary of Delhi EPDP CGHS Ltd. will select the Sole Arbitrator and the proceedings of Arbitration will take place in New Delhi.

12.0 FINANCIAL ASPECTS:

12.1 Abnormal rates: If it is noticed that the unit rates quoted by the Tenderer for any items are unusually high or unusually low, it will be sufficient cause for rejection of the tender unless the Society is convinced about the reasonableness of the unit rates on scrutiny of the analysis for such unit rate to be furnished by the tenderer on demand.

12.2 Corrections : No corrections or overwriting will be entertained in schedule of rates by using correcting fluid. All correction in the schedule of rate should be initialed.

12.3 Correction of arithmetical errors: Provided that the bid is substantially responsive, the Society shall correct arithmetical errors on the following basis:

(a) if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Society there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

(b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) **If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its bid shall be disqualified and its bid security may be forfeited.**

12.4 In the event that no rate has been quoted for any item(s) in the schedule of quantities enclosed with the tender document, leaving space, the space so provided and the corresponding amount blank, it will be presumed that the bidder has included the cost of such item(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly.

12.5 Firm rates- ***The rates quoted by bidder shall remain firm till completion of all works even during the extended period, if any, on any account what so ever reasons. It is provided that the bidder shall not change any of the rates, quoted in the tender till the completion of work.***

13. **PAYMENTS:** All bills shall be prepared by the contractor in the form prescribed by the Society/ its Engineer after the joint measurements are recorded in the Measurement Book. Society will entertain Interim/RA Bill during tenure of work subject to minimum value of Rupees Five lakh. The bills in proper forms duly accompanied by detailed measurements in support of the quantities of work done and showing deductions for all previous payments, retention money, etc. would be checked and verified by the Society/ its Engineer. The Society will deduct retention money as described. The refund of retention money will be made as specified and agreed. All the interim payments shall be regarded payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound, and imperfect or unskilled work to be removed and reconstructed, or re-erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim, nor shall, it conclude determine or affect in anyway the power of the Society under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract. The final bill shall be submitted by the contractor immediately/ within one month of the date fixed for completion of the work or of the date of certificate of completion furnished by the Society/ its Engineer and payment shall be made within 30 days from the date of receipt of the final bill.

PAYMENT TERMS :

1. Mobilization Advance of 10% of award of work amount shall be paid against bank guarantee for an equivalent amount.
2. Running account bills would be verified by the Society / its Engineer and would be paid within 15 days of verification.

14.0 **PERFORMANCE SECURITY** : Performance security would be equivalent to 5% of the actual work executed. Bid security of the successful bidder would be adjusted against the performance security and balance amount would be deducted from running bill proportionally. Security would be returned after 3 months of completion of works. A grace of 15 days would be available after project duration of 90 days, thereafter a penalty of Rs. 1,000 per day would be levied subject to maximum of 5% of the award of work amount. Starting date of work would be considered 10 days after date of issue of mobilization advance by the society.

15.0 **RETENTION MONEY :** Retention Money @10% which may be released after completion of DLP.

16.0 Any further corrigendum/ addendum to this tender document shall be made available to the bidder on their specified email. It is, therefore, requested that the bidders may regularly check their emails for checking any corrigendum/ addendum to this document.

17.0 If bidder withdraws their offer at any stage then EMD submitted by them will be forfeited.

18.0 **PRICE VARIATION (PV) CLAUSE :** PV Clause will be applicable as under :-

Price Escalation formula :

$V = V_s + V_c$

V_s = Adjustment on account of steel component = $q \times R \times (W_s - W_{so})/W_{so}$
V_c = Adjustment on account of cement component = $r \times R \times (W_c - W_{co})/W_{co}$
q = Cost coefficient of steel to the total cost = 0.25
r = Cost coefficient of cement to the total cost = 0.15

W_s = Wholesale price Index issued by RBI for the period of work under consideration for Mild Steel long product (No-21, 1.3.14.4)

W_c = Wholesale price Index issued by RBI for the period of work under consideration for Cement (No-21, 1.3.13.5)

R = Gross value of the work done by the contractor for the period of work.

W_{so} = Wholesale price Index for Mild Steel long products (No-21, 1.3.14.4) (For our tender Base Index = May, 2022)

W_{co} = Wholesale price Index issued by RBI Base Index Cement (No-21, 1.3.13.5) (For our tender Base Index = May, 2022)

TECHNICAL SPECIFICATIONS

Technical specification and procedure to be followed for some of the specialized items to be executed are provided herewith. For overall general guidance and execution of work 'Handbook of Repairs and Rehabilitations of RCC Buildings by CPWD' and CPWD Specifications (Vol. I and II) shall have to be followed.

1. **Repair of cracks in beams, slabs and columns etc. by epoxy grouting:**

   a. Cleaning of the surface to remove all loose laitance by mechanical or manual means, as required on site, in the vicinity of the cracks.
   b. Cutting of the geometrical shape groove (1:2) - width : depth, by controlled method by saw cut, for creating mechanical anchorage to the filler material.
   c. Filling the groove with Polymer Modified Mortar in the cut groove before further applications.
   d. Fixing of Non-Return Valve Packers and cured with filler material complete, after drilling the hole up to required depth, and to ensure that Packers to resist stresses developed while pressure grouting.
   e. Injection of Low Viscous Structural Polyurethane /Low Viscous Epoxy of approved make or equivalent till refusal so as to fill all the cracks/ joints/pinholes/honeycomb etc. to bring structure in Monolithic shape and form, to act as single member for load transfer and behavioral effects.
   f. Allowing the injected material to cure for its optimum technical properties.
   g. Removal of detachable part of the packer and profiling same to flush at the level of concrete or as Instructed.

2. Strengthening of structural elements by epoxy injection grouting :

   a. Providing & laying low viscous epoxy confirming to **ASTM C881** or as applicable, complete after surface preparation (removal of loose\unsound concrete by manually or mechanical means, without disturbing integrity of structural element by controlled dismantling\crippling etc), fixing of **NRV** packers of required sizes & depth (minimum depth to be 75 mm & minimum c/c spacing as 1000 mm), after drilling holes of required sizes to fit the pores completely with its NRV arrangements & air blowing the drilled holes to remove all loose substance\debris.
   b. Packing the areas with Polymer Modified high strength repair mortar to stop loss of injected material.
   c. Injection of low viscous epoxy of approved make as per the manufactures specification with electrically driven injection machines with calibrated dial gauge to assess the pressure of injection

3. Strengthening of structural elements by Confinement by FRP wrapping :

   a. Chipping of the plaster on the RCC element with mechanical or manual means as required on site to reach the RCC substrata for further application of strengthening system.
   b. Rounding of the edges/corners minimum 10-15 mm with grinder or as required on site to avoid stresses developed on the FRP composites used for structural strengthening.
   c. Grinding of the dismantled plastered, to level the surface to avoid any undulation and pointing of stresses towards the entire confinement by the wrap.
   d. Cleaning of the grinded surface by mechanical or manual means, to remove all loose laitance/dust etc. strictly for bonding of the epoxies to be used.
   e. Leveling of the surface by High Strength Epoxy Mortar of approved make in required thickness to level the required surface, and making it free from the pin holes/honeycomb/cracks etc. as per the manufacturers specification or strictly as per the instruction of structural consultant.

f. Allowing to cure for 1 day, the finished leveled surface with high strength epoxy with required Compressive/ Flexural/ Tensile behavior.
g. Application of Primer of approved make over the cured epoxy mortar at following coverage or strictly as per the manufacturer's specification for bonding of the epoxy saturant for further applications & allowing it to cure for 24 hours for proper impregnation of the primer.
h. Application of saturant of approved make over the cured primer in one coat for wrapping of the FRP and holding it in position, strictly as per the manufacturers specification and with the following coverage as specified.
i. Application and Wrapping up of FRP of 400 GSM or Equivalent at the required/designated places of the beam with proper anchorage of 500 mm on both the sides of slabs for confinement and with proper 75-100 mm lap of vertical as well as circumferential joint.
j. Application of saturant over the carbon wrapping to soak each strands of fiber to make it FRP confinement with entire soaked fibers
k. Simultaneously spraying of the silica/quartz sand on the top tacky saturant to give mechanical anchorage for plaster to the confined and strengthened surface.

4. Strengthening Structural Elements by cement injection grouting :

a Providing and laying cement slurry confirming to **IS 9103\IS2645** or as applicable, complete after surface preparation (removal of loose\unsound concrete by manually or mechanical means, without disturbing integrity of structural element by controlled dismantling\crippling etc), fixing of nozzles of required sizes & depth (minimum depth of 75 mm & c/c spacing varying from 0.75 M to 1.2 M c/c) after drilling holes of required sizes to fix nozzles & packing of excess dia. of holes with instant plugging mortar or as required after air blower operation to remove all loose substance\ debris.
b. Packing the areas with Polymer Modified high strength repair mortar to stop loss of injected material.
c. Injections of cement slurry in required consistency (1:1 to 1:5- cement : water) admixed with non shrink grouting polymeric cement & latex of approved make as per the manufactures, recommendation by manually operated injection pumps, so as not exceed pressure by 7Kg./cm².

5. Strengthening of RCC frame of building by introduction of Shear Wall in stilted portion :

a. Chipping of the plaster on the RCC plinth beam top portion, stilt roof bottom portion and inside faces of column with mechanical or manual means as required at site to reach the RCC substrata.
b. Inserting reinforcement in plinth beams, stilt roof beams, column faces at required spacing as shown in enclosed drawing at Annexure II for full strength by 'Rebar Technique' using compound of HILTI or equivalent.
c. Overlap Rebar bars and additional bars including rings to complete the reinforcement as specified in the structural drawing placed at annexure II.
d. A beam as per enclosed drawing all around openings to be provided in shear walls.
e. Provide shuttering on both sides of the shear wall to be used for holding self compacting concrete/ micro concrete.
f. Provide a suitable coat of FOSROC/PIDILITE or equivalent at junction of old and new concrete for proper jointing.
g. Provide self compacting concrete of M35 grade using super plasticizers for major portion of the shear wall. If necessary top portion of shear walls where micro concrete is to be provided suitable expanding admixture such as Cebex 100 of FOSROC (225 gram per bag of cement) shall have to be provided.

6. Strengthening of RCC frame of building of Blocks of RCC Slab :

a. Removing top 115 mm portion of the concrete of existing RCC beams without damaging the reinforcement by manually or by mechanical means**.**
b. Provide shuttering for concreting slab and part of the beam supporting self-compacting concrete.
c. Provide reinforcement as per structural drawing for covering of upper stilt floor placed at Annexure III- IV.
d. Provide rebars using compound of Hilti or equivalent for dia. 8mm, 10mm and 12 mm wherever required for proper anchoring of slab reinforcement.
e. Provide a suitable coat of FOSROC/PIDILITE or equivalent at junction of old and new concrete for proper jointing.
f. Providing Self Compacting Concrete of M25 Grade using plasticizers.
g. Provide 230 mm brickwork in C.M. !:6 and 115 mm brickwork in C.M. 1:4 as per instruction of the Society.

7. Anchoring of reinforcement into RCC structural elements using 'Rebar Technique' using Compound of HILTI or Equivalent :

a. Accurately mark the position of the location and diameter of bars on to the surface of the concrete.
b. Scan the surface for any hindrance to the rebar reinforcement up to embedment depth.
c. Drill holes of suitable diameter and embedment length for proper insertion of anchoring compound of HILTI RE 500/ HY 200 or equivalent as per requirement.
d. Clean the drilled holes with dry air, brush and water etc. as per manufacturer's specification.
e. Inject bonding chemical compound of HILTI RE 500/ HY 200 or equivalent as per design and specifications of manufacturer. .
f. Insert reinforcement after suitable setting time as specified by the manufacture's specifications linking with the temperature at the time of working etc.
g. Do a pull out test to bars for full strength to ensure proper gain in strength.

Note:- Repair Methodology along with material specification is Part of the tender Documents

This bidding document has been divided in two parts.

PART – B: FORMS TO BE FILLED IN BY THE BIDDER

TECHNICAL BID

(QUALIFICATION AND EXPERIENCE OF THE BIDDERS)

FORM T-1: BID SUBMISSION SHEET

FORM T-2: BIDDER'S INFORMATION SHEET

FORM T-3: FINANCIAL SITUATION

FORM T-4: AVERAGE ANNUAL CONSTRUCTION TURNOVER

FORM T-5: PROPOSED KEY PERSONNEL

FORM T-6: AVAILABILITY OF EQUIPMENT FOR THE WORK

FORM T-7: RELEVANT WORK EXPERIENCE

A. PROJECTS COMPLETED

B. WORKS IN PROGRESS

PRICE BID

FORM PB-1: PRICE BID SUBMISSION SHEET

FORM PB-2: BILL OF QUANTITIES

Form T-1: Bid Submission Sheet

Date: _____

Invitation for Bid No.: _____

To: The Delhi EPDP CGHS Ltd, Dwarka, New Delhi - 110078

We, the undersigned, declare that:

1. We have examined and have no reservations to the Bidding Document, including Addenda issued in accordance with Instructions to Bidders;
2. We offer to execute in conformity with the Bidding Document the following Work: Repair and Refurbishment of Boundary Walls of Delhi EPDP Co-Operative Group Housing Society Ltd. (Dakshinayan) at Dwarka, New Delhi – Phase 2;
3. Our bid shall be valid for a period of ninety days after the deadline date for final submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
4. We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed; and
5. We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will be engaged in bribery.

Name _____ In the capacity of _____

Signed _____

Duly authorized to sign the bid for and on behalf of _____

Dated on _____ day of _____, 2022.

Form T-2: Bidder's Information Sheet

Bidder Information	
Bidder's name	
Bidder's address in India	
Bidder's authorized representative (name, address, telephone numbers, e-mail address)	

Note:

The following documents are to be attached with this form:

- **ITR of last 3 years**
- **Copy of PAN Card**
- **GST registration certificate**
- **Aadhar Card**

Form T-3: Average Annual Construction Turnover

Year	Amount (Rs.)
2018-19	
2019-20	
2020-21	

Bidder has to submit UDIN based CA Certificate.

Form T-4: Proposed Key Personnel

Bidders should provide the names of suitably qualified personnel to meet the specified requirements of the Work.

1.	**Title of position**
	Name
	Qualification and Experience
2.	**Title of position**
	Name
	Qualification and Experience
3.	**Title of position**
	Name
	Qualification and Experience
4.	**Title of position**
	Name
	Qualification and Experience

Form T-5: Availability of Equipment for the Work

Sl. No.	Name of equipment	Make	Number available

Form T-6: Relevant Work Experience

A. Works Completed

Sl. No.	Name of Contract	Name of Employer	Value of Work (Rs.)	Date of Commencement	Date of Completion
1					
2					
3					
4					
5					

B. Works in Progress

Sl. No.	Name of Contract	Name of Employer	Value of Work (Rs.)	Value of Up-to-date Invoice Raised (Rs.)
1				
2				
3				
4				
5				

Form PB-1: Price Bid Submission Sheet

Date: _____

Invitation for Bid No.: _____

To: The Delhi EPDP CGHS Ltd, Dwarka, New Delhi - 110078

We, the undersigned, offer to execute the work for Repair and Rehabilitation of Delhi EPDP Co-Operative Group Housing Society Ltd. (Dakshinayan) at Dwarka, New Delhi – Phase 2 at a total price of Rs. ……..…… (Rupees ……..…….. only).

Item-wise breakdown of price is shown in the Form PB-2: Bill of Quantities.

The above-quoted price is inclusive of all duties, taxes and other levies payable by the contractor under the contract, or for any other cause.

If GST is applicable, the Society will reimburse the same on submission of proof. We agree to the Payment Release Schedule and the terms of Release of

Performance Security as stated below:

PAYMENT RELEASE SHCEDULE :

(1) Monthly payment will be released against the running account bills submitted by the Contractor and approved by the Engineer-in-Charge
(2) On completion of work and on receipt of completion certificate from the Engineer-in Charge the Final payment will be made to the Contractor
(3) 10% payment will be retained from each invoice as Performance Security.

RELEASE OF PERFORMANCE SECURITY

The Performance Security will be released after 1 year of completion of the work.

Name _____ In the capacity of _____

Signed _____

Duly authorized to sign the bid for and on behalf of _____

Dated on _____ day of _____, 2022.

FORM PB-2 : BILL OF QUANTITY

ANNEXURE 1

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
Approach for the access of the repair area & Malwa Disposal						
1	Scaffolding	Providing and fixing double scaffolding system (cup lock type) on the exterior side, up to eight story height made with 40 mm dia M.S. tube 1.5 m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staircase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it there after .The scaffolding system shall be stiffened with bracings, runners, connection with the building etc wherever required for inspection of work at required locations with essential safety features for the workmen etc. complete as per directions and approval of Engineer- in-charge .The elevational area of the scaffolding shall be measured for payment purpose .The payment will be made once irrespective of duration of scaffolding. Note: - This item to be used for maintenance work judicially, necessary deduction for scaffolding in the existing item to be done.	5856	Sqm		
2	Woven cloth protection	Providing, erecting, maintaining and removing temporary protective screens made out of specified fabric with all necessary fixing arrangement to ensure that it remains in position for the work duration as required by the Engineer-in-charge.Woven PVC Cloth				
3	ply protection	Providing and protection with corrugated Galvanized sheet / ply board for protection from damage to the door/window glass, outdoor A.C. units, kitchen chimney outlets, lighting fixtures, CCTV cameras, balconies & other parts of the building where necessary.				
4	Disposal of Malwa	Disposal of building rubbish / debris / similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved.	32	cum		

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
Surface preparation						
5	Demolition of unsound and loosed Concrete	Chipping of unsound/weak concrete material from slabs, beams,columns etc. with manual Chisel and/ or by standard power driven percussion type or of approved make including tapering of all edges,making square shoulders of cavities including cleaning the exposed concrete surface and reinforcement with wire brushes etc. and disposal of debris for all lead and lifts all complete as per direction of Engineer-In-Charge.				
		(A) 25 MM THICK	300	Sqm		
		(B) 50 MM THICK	400	Sqm		
		(C) 75 MM THICK	500	Sqm		
6	Demolition of Plaster	Dismantling old plaster or skirting raking out joints and cleaning the surface for plaster including disposal of rubbish to the dumping round within 50 metres lead including removal of debris from all heights & levels. 6mm-15mm	900	Sqm		
7	Demolition of CI pipes	Dismantling C.I. or PVC rain water pipe with fittings and clamps including stacking the material within 50 metres lead :				
		100 mm dia pipe / 150 mm dia pipe	720	M		
8	Rust Remover	cleaning rust from rusted reinforcment bar by using alkaline rust remover painted with brush and removing rust with flex, (after 24 hours of application of rust remover) with the help of wire brush, sand paper or any other suitable device and throulgy washed with water with the help of pressure jet and allowing it dry complete as per direction of engineer incharge, only Lenth of cleaned steel bar shall be measured for payment with dia upto 25 MM.	1200	Mtr		
Bonding Application						
9	Anti-corrosive coating	Providing & application of Nitozinc Primer anti-corrosion coating to the exposed corroded steel reinforcement as well as to the new reinforcements welded together as per manufacturer's specification. **(AREA OF CHIPPED CONCRETE SURFACE SHALL BE MEASURED FOR PAYMENT)**	1200	Sqm		

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
10	To bond new concrete & old concrete surface area	Bonding Coat : Providing & applying cement slurry mix with SBR Latex as per manufacturer specification on prepared surface (SBR Latex shall be BASF/Sika make or equivalent).	1200	Sqm		
Application of Concrete & Mortar						
11	Repair mortar for patch repair	RENDROX HS- EXTRA is a highly specified cementitious repair mortar that is reinforced with special fibers for enhanced physical properties. It is supplied as a ready to use biend of dry powders. Which requires only the addition of clean water to produce a highly consistant repair mortar suitable for structural concrete and masonary repairs. Rendrox HS-Extra may be hand applied or sprayed with suitable equipment.	5000	kg		
Grouting Application						
12	Epoxy Grouting	Application of epoxy grouting for the given application mentioned in the heading:- This item includes the following approach of execution like drilling (holes of required diameter up to recommended depths,fixing of nozzles with non shrink grade approved putty (Polymer modified/cement mortar /polyester putty/epoxy putty as per material compatibility) etc and allow it to cure in order to carrying out pressure grouting, application of Grouting the nozzle with the help of injection gun or similar equipment at a steady pressure as recommended by manufacturer, removal of nozzles after grouting; and finishing good of concrete surface as per satisfaction of EIC which includes the cutting the nozzles and filling with (Polymer modified/cement mortar /polyester putty/epoxy material). Rate should be inclusive of procurement and supply of materials, surface preparation, transportation to job site, Cleaning the relevant surface by injecting high pressure air through the nozzles (by blowing compressed air and then washing with water), lifting, shifting, carriage, storage of material, ensuring safety, providing PPES to worker, barricading of working area if required with all tools and tackles.				
	Nozzle fixing	Nozzle (NRV neoprene)Fixing for epoxy pressure grouting includes drilling 14mm diameter holes about 75 to 100mm deep into the exposed /built up structural section (half of section thickness- whichever is less),which requires improvement at around 300mm c/c in staggered (but not exceeding the thickness of member or 300 mm,)	680	Nos		
13	Epoxy Material	Low viscous Epoxy Material (2-5 cps) which includes the cost of material along with application of grouting material at the pressure of 1 - 2.5 kg/cm2/or material specification/design specifciation given by EIC	816	kg		

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
Surface Treatment and Waterproofing Application						
14	Waterproofing primer on brick wall	Application of priming layer: Before application, the surface should be primed with Hydroproof Xtra as follows: 1 part of Hydroproof Xtra : 2 parts of Water : 4 parts of Cement @ coverage of 16-17m2 for 1L of Hydroproof Xtra. .(cement in client's scope)	900	Sqm		
15	Ready mix coating over surface after primer	Providing and application of 2coats of Nitocote CM 210 or approved eqv. ready mix cementitious elastomeric coating on masonry/RCC surface in 2mm thickness, capable to arrest water/seepage from positive & negative side of wall as per manufacturer's specification. This is to be done for all the buildings. Steps to be done from bevelled edges of the inner side of the parapet wall to the outside till the top floor lintel level.	900	Sqm		
16	Cement plaster mixed with waterproofing over the brick surface	Providing and application of 15mm th. cement sand plaster (1:4) admixed with Conplast WL or approved eqv. integral waterproofing admixture @ 150ml/bag of cement over treated masonry/concrete surface after pointing brick joints with CS plaster admixed with Nitobond SBR @ 5kgs/bag of cement or approved eqv. as per manufacturer's specification, curing etc. complete.	900	Sqm		
17	Shuttering	Centering and shuttering including strutting, propping etc. and removal of form for colum beam and slab	450	Sqm		
18	Reinforcement	Straightening, cutting, bending, placing in position and binding all complete in superstructure. **Reinforcement will be supplied by the client free of cost**	5000	KG		
19	Microconcrete	Providing and placing in position micro-concrete which shall be cement based pre packed single component chloride free non shrink free flow self compacting ready to use after mixing water in specified proportion obtained from approve manufacturer as per specification and direction of Engineer-in-charge. self flowing non shrink micro concrete, Grade not less than M-25 of Make BASF ,SIKA or equivalent.	54	CUM		

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
20	Re-baring	Rebaring : Introducing new reinforcement bars for structural connections in RCC, including power drilling holes of appropriate diameters in reinforced or plain cement concrete to a minimum depth as per drawings and as per manufacturer specification, fixing the reinforcement in position using Hilti HY-170 / FISV 360S chemical or equivalent (Rate shall include cost of labour, T & P for power drilling in concrete, epoxy cartridges, plastic nozzle etc complete including cleaning the drilled holes of loose dust by blowing air. (The cost of reinforcement shall be payable separately)				
		A) 8 mm dia x 80 mm depth	7200	EACH		
		B) 10 mm dia x 100 mm depth	100	EACH		
		C) 12 mm dia x 120 mm depth	800	EACH		
		D) 16mm dia x 160 mm depth	800	EACH		
		E) 20 mm dia x 200 mm depth	200	EACH		
		F) 25 mm dia x 250 mm depth	100	EACH		
21	jack support	P/F jack support in position and tightening below beams and columns shall be fixed per day	3500	EACH		
22	Disamantaling	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.In cement mortar	50	CUM		
23	Brick Work	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in cement mortar 1:6 (1cement : 6 coarse sand)	50	CUM		
24	RCC	Providing and laying in position specified grade of reinforced cement concrete excluding the cost of centering, shuttering, finishing and reinforcement,- up to floor five level				
		1:1.5:3 (1 cement : 1.5 Coarse sand : 3 graded stone aggregate 20 mm nominal size)	15	CUM		

Sl. No.	Search code	Description of work	Quantity	Unit of quanity	Item Unit Rate (Rs.)	Total Cost (Rs.)
25	Disamantaling	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer - in- charge.	5	CUM		
26	Disamantaling	Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.	5	CUM		
TOTAL (A)						
GST @ 18% (B)						
GRAND TOTAL (A) + (B)						

ANNEXURE 11

REPAIR METHODOLOGY
OF

Dakshinayan Apartments CGHS
Dwarka Sector 4, Dwarka Road, New Delhi

HOUSING SOCIETY

Repair Recommendation:-

A. Proper propping and safety arrangement should be made during the repair works. .

B. Pipe line joints to be sealed wherever there is leakage from the pipeline joints.

C. Patch repair to be done in spalling and corroded area wherever it is visible . This is applicable where spalling area is less than 0.5 Sqm and depth of spalling is less than 50 mm.

D. All major spalled area (0.5 Sqm in a single patch) where reinforcements are exposed and loss of reinforcement is more than 20% and depth of spalling is more than 50 mm to be repaired with RCC jacketing method (RCC Wall, Column, Beam & Slab.

E. Injection epoxy grouting to be done at voids, moist & cracks at RCC members.

F. Chajja should be dismantle if corroded and new light weight chajja to be used.

G. Protection coating & routine maintenance to be taken care at regular interval.

Note:- Demolition of Non- structural members like Chhajjas (sunshades), parapet wall and Fins which are not intact with roof slab or main structural system should be demolished. Similarly all non-structural members which has lost its residual life and repairing cost is less than its support system costs like scaffoldings.

Proper propping and safety arrangement should be made during the repair works.

Chhajja

Which columns to be jacketed with RCC.
Wherever patch repair to be done
Pipe lines waste /rain to be separated and old damaged pipelines should be replaced with new one.

Repair Summary

Serial No	Repair Type/Structural members	Vulnerability/priority Order	Corrosion crack and spalling in RCC members	Grit Wash	Shaft wall	Repair of plumbing work in shaft area	External moist wall	Parapet Wall	Bathroom & kitchen wall	Balcony	Fins / Chhajja
1	Patch Repair-A	Vulnerability index 1									
2	Injection Grouting-B	Vulnerability index 1									
3	Dampness and Waterprofing-C	Vulnerability index 2									
4	Replacement Of Plumbing System And Shaft Area-E	Vulnerability index 2									
5	Demolition Of Structure-F	Vulnerability index 3									
6	Grit wash Application-D	Vulnerability index 4									
7	General Maintanance to be done by resident indivisually -G	Vulnerability index 5									

A. Patch Repair- Non Structural Repair Scheme

Against Corrosion Cracks, Spalling & Exposure of Reinforcement

Members:- Beam-Column-Slab

Reference:- wherever corrosion and spalling are shown

Note:- Spalled area is less than 0.5 Sqm in a single patch

Depth of concrete spalling is less than 50 mm

Representative Distress Picture of Site- where patch repair is recommended

Patch Repair-
Non Structural Repair Scheme

Execution Methodology

Patch repair

This method will be used when non-structural distresses occur in RCC sections and it get damaged by delamination of concrete and the reinforcement gets exposed due to corrosion or localized damage which are not effecting the structural system.

- **SURFACE PREPARATION**

1. **Target the damaged area and remove the unsound concrete from the surface using a chipping hammer. The cut should be made in order to remove all the loose concrete and also draft should be given for better bonding of new material. Mark the perimeter of the repair area and give it a simple geometric shape like square or rectangular using a saw cutter. Cut 100 mm extra sound concrete around the spalled/damaged area.**
2. **Rub the rusted reinforcement bar with wire brush and wash it as necessary. Given conditions may be followed depending on repair area:**

- **Repair area is large (greater than 10^6 mm^2) use abrasive material along with rust remover chemical (as per given material specifications) for rubbing the corroded steel bar. Apply rust remover on corroded steel bars in order to completely scrap off the rust and corrosion generating chemical agents.**
- **Repair area is small (less than 10^6 mm^2) use water jet only.**
- **ADDITION OF REINFORCEMENT**

Now the diameter loss of reinforcement is checked. Solution to this can be provided as if:

1. **Diameter loss is less than 20% in a localised area , then additional steel of the type originally used is welded to the place where corrosion has occurred. The amount of steel reinforcement added is same as loss %.**
2. **Diameter Loss is 20% to 40% then additional steel is added to the entire reinforcement of same diameter and lap length of extra reinforcement should be designed as per IS 456:2000.**
3. **Diameter loss is greater than 40% universally, patch repair method is ineffective and not recommended and structure repair methods are used after complete structural adequacy analysis.**
4. **Apply anti-corrosive zinc coating to the old as well as newly added reinforcement bars to prevent further rusting.**

- **APPLICATION OF CONCRETE**

1. **In order to increase its adhesive properties between new and old concrete, epoxy or acrylic based adhesives can be used. For smaller regions acrylic bonding agent is used and for larger sections epoxy bonding agent is used. This helps in binding the new incoming surface (old hardened concrete and green concrete/repairing mortar) and helps in improving surface strain carrying capacity.**
2. **Shuttering & Form Work :**

- **If the filling depth is less than 25mm, filling is done in single layer of PMC.**
- **Else up to 50 mm depth, a layer of 25mm PMC is filled and when it is about to settle, another layer of epoxy adhesive is laid and new layer of PMC is applied.**

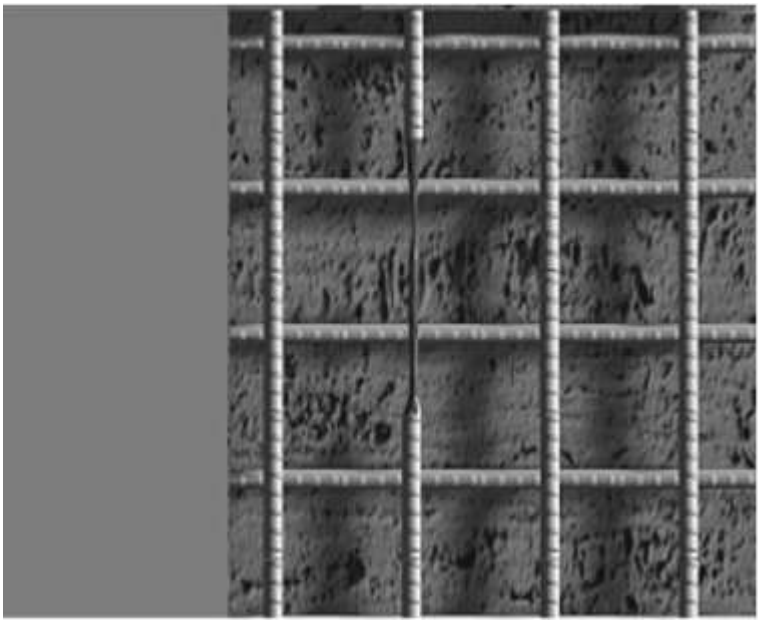
Flow Chart Of Patch Repair Scheme For Non-structural Failures

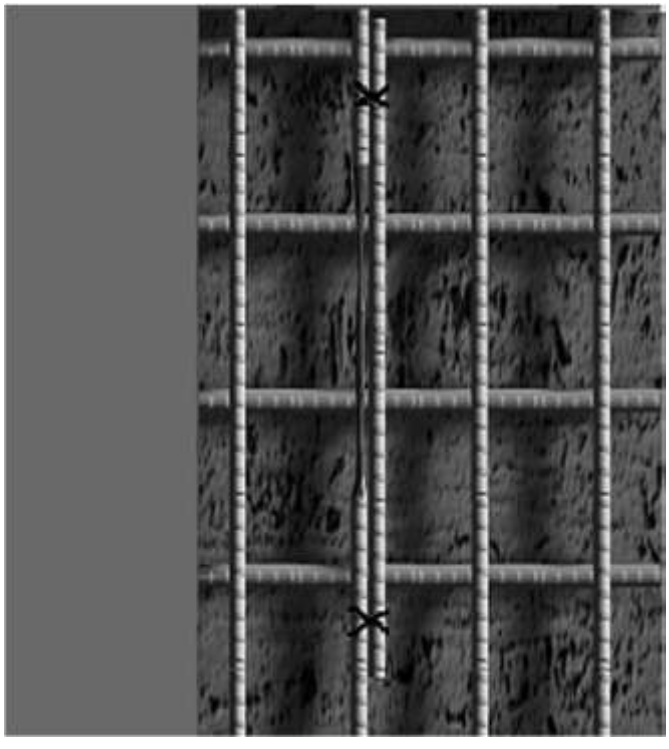
1. • Inspect the structure.
   If damage is present, remove deteriorated concrete and use surface treatment method.
   If damage is absent, surface preparation is not required
2. • Remove the unsound concrete from the surface using a chipping hammer.
3. • Mark the perimeter of the repair area and give it a simple geometric shape like square or rectangular using a saw cutter
4. • Rub the rusted reinforcement bar with wire brush and wash it with water jet.
5. • Apply rust remover on corroded steel bars in order to completely scrap off the rust.
6. • Check the loss of diameter of reinforcement bars. Add extra reinforcement in RCC sections along with cleaned corroded reinforcement if required. Size of extra steel bar will be decided as per given above patch repair description.
7. • Apply anti-corrosive zinc coating to the old as well as newly added reinforcement bars
8. • Epoxy/acrylic based adhesives are applied to increase adhesive properties.
9. • Predesigned shuttering plate is placed and micro-concrete is poured as per given above patch repair description wherever required. At other locations, only PMC is used in multiples of 25mm thick layers.
10. • Shuttering plates are removed after 2-3 days and curing of concrete is done wherever micro-concrete has been used.

Pictorial Representation Of Execution- Vertical Members

Removal of loose concrete

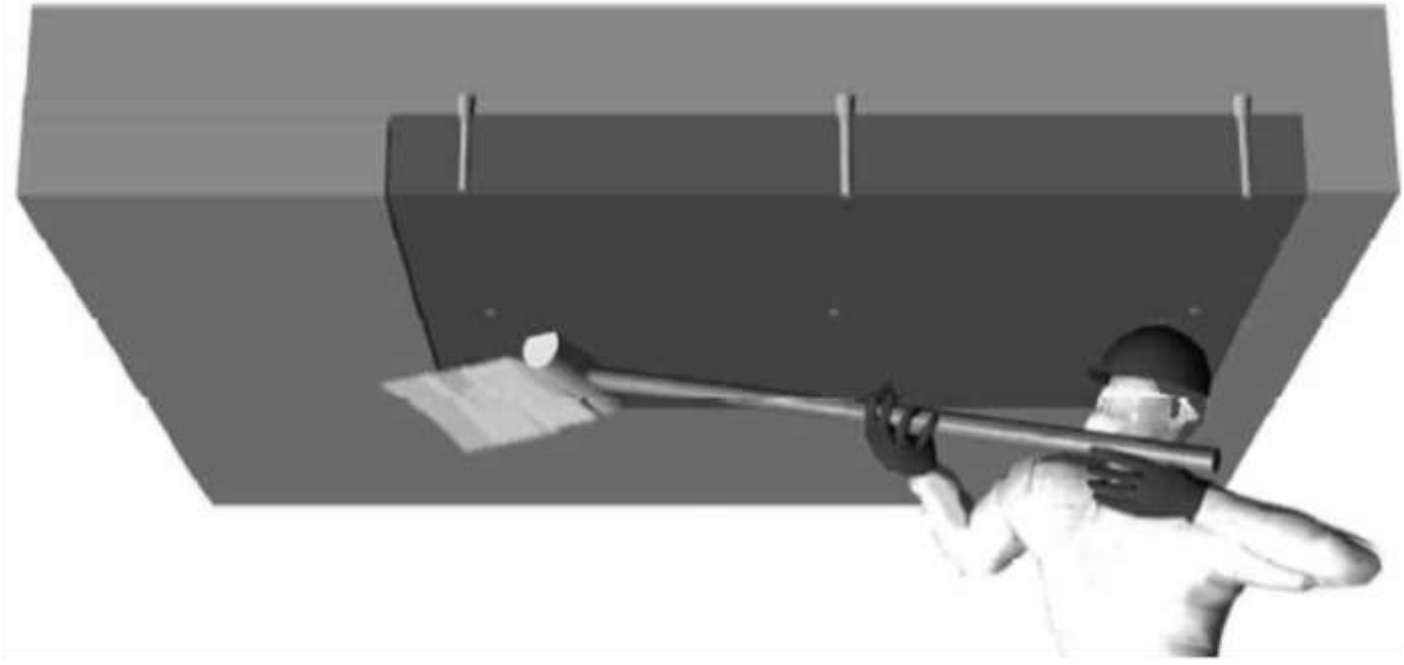
Marking perimeter of the repair area followed by cleaning of the rusted reinforcement bars

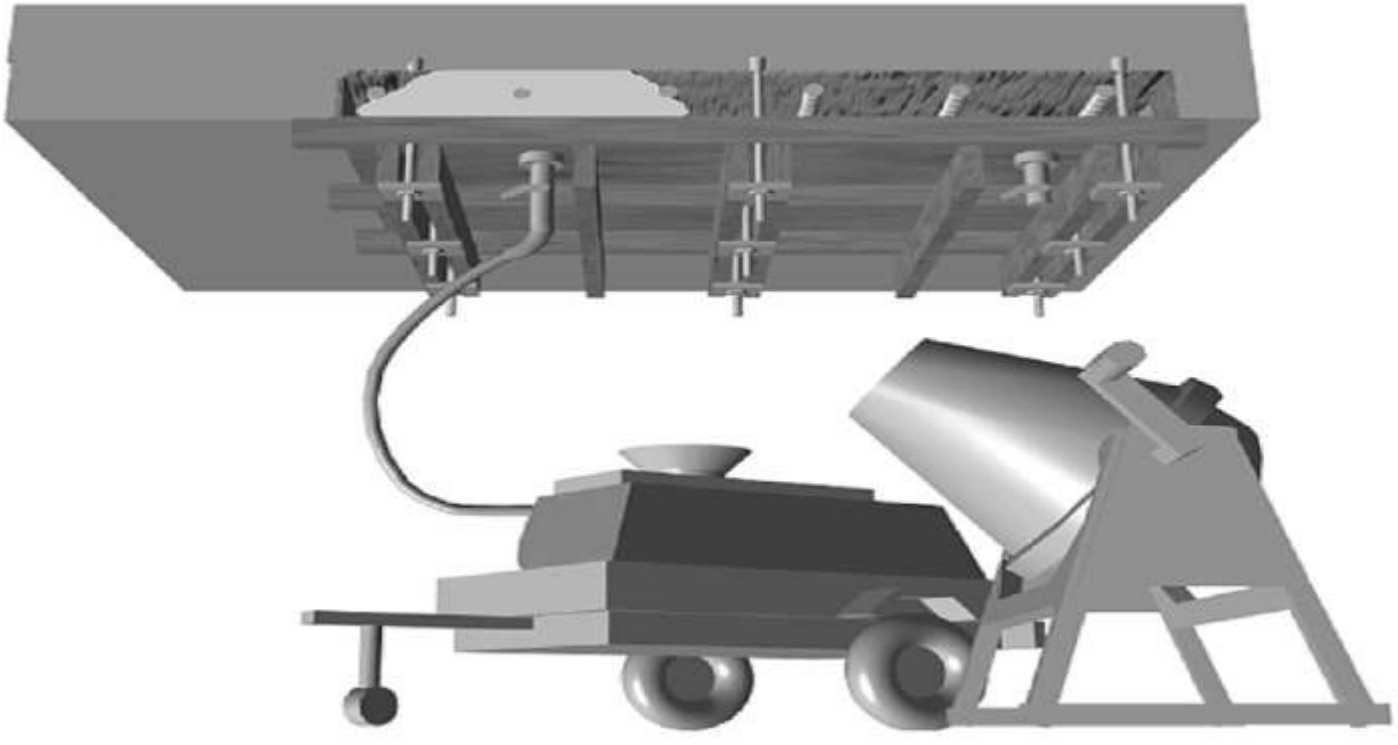




Rust removal and addition of steel

Pictorial Representation Of Execution-Horizontal Members





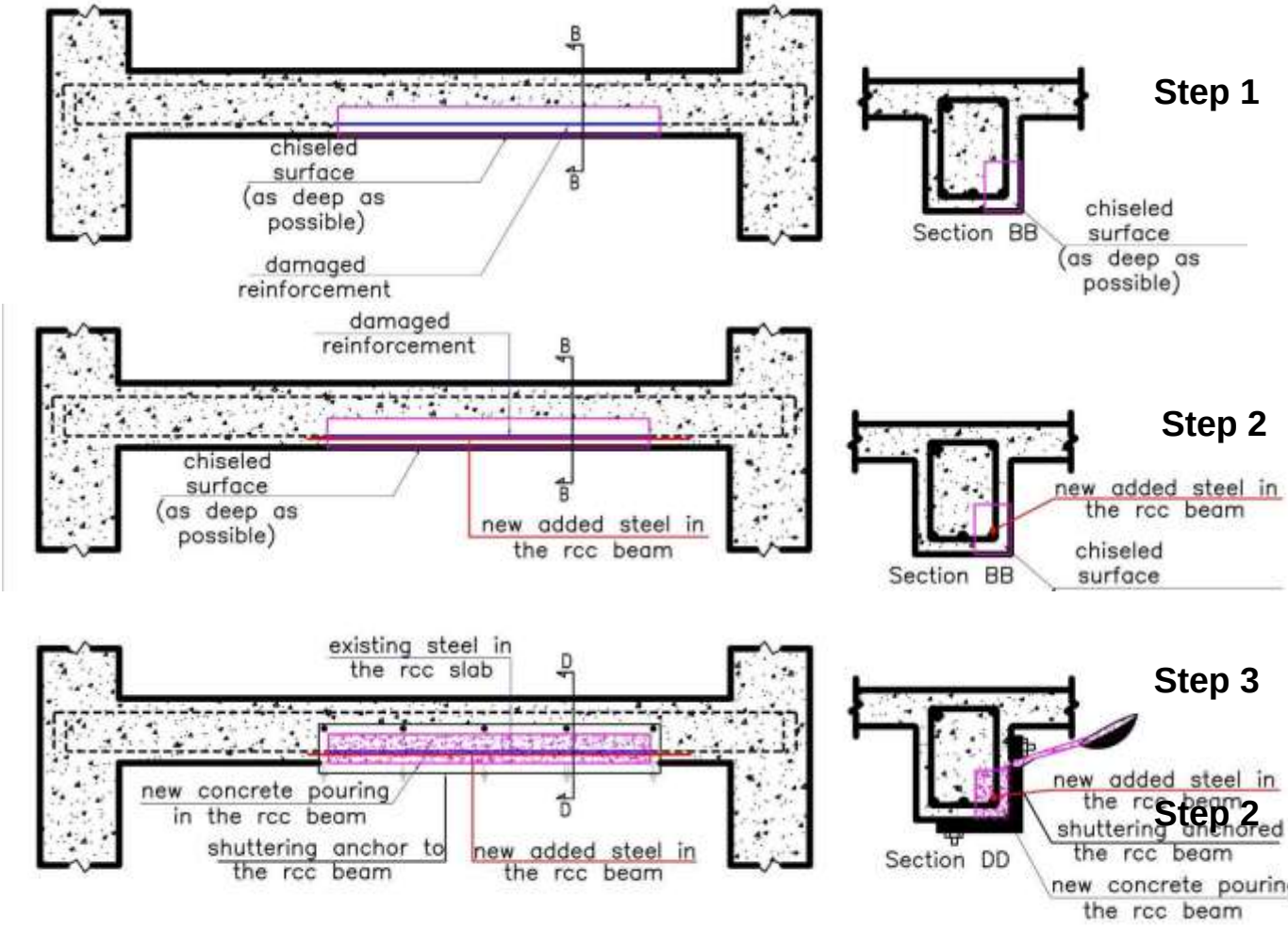
Filling up of removed section with PMC or Micro concrete

Pictorial Representation Of Execution

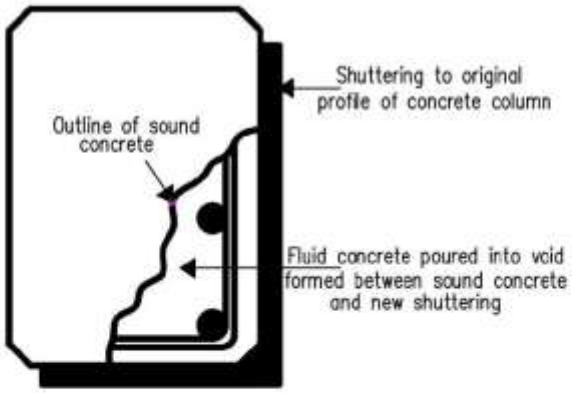
Pictorial Representation Of Execution

Standard drawings - Patch Repair Scheme of Beam/Slab

Use of Micro Concrete with addition of reinforcement

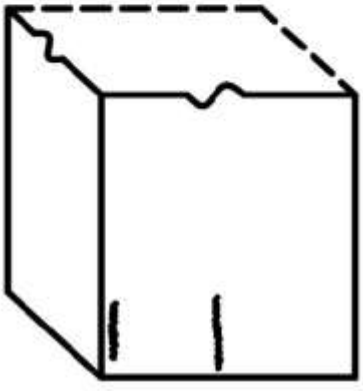


Standard drawings - Patch Repair Scheme for Column

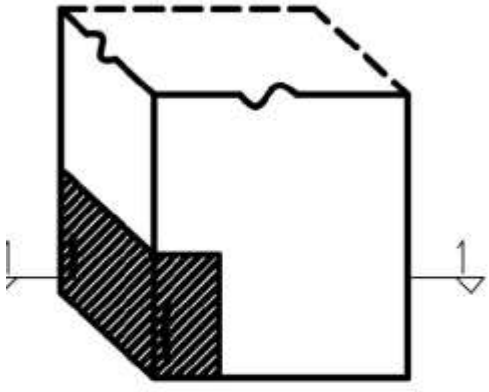


Plan on column to be repaired

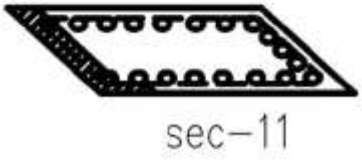
(Two side damage)



Before damage

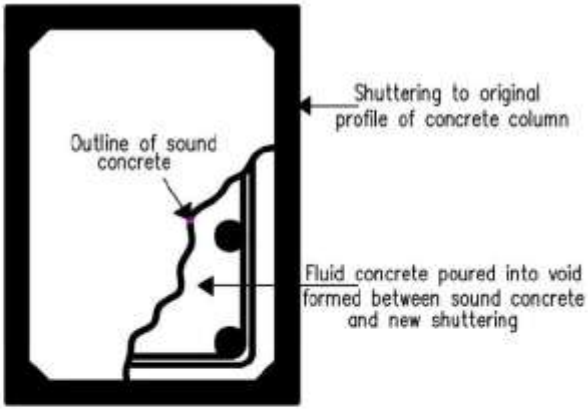


After repair



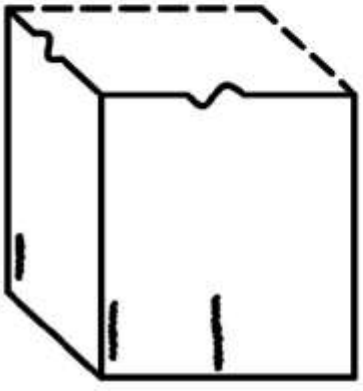
Repair scheme for column

(Two side Damage)

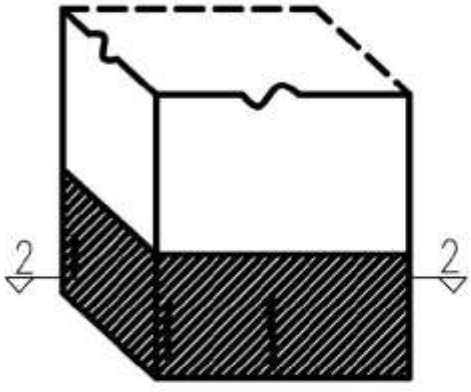


Plan on column to be repaired

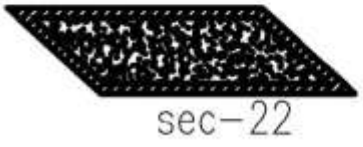
(All sides damage)



Before damage



After repair



Repair scheme for column

(Four side Damage)

B. Injection Grouting

To minimize the seepage condition in balcony and seepage from bathroom area

- **EPOXY GROUTING:- PROCEDURE**
- **Drilling 14mm diameter holes and about 75 to 100mm deep into the exposed /built up concrete which requires improvement at around 300mm c/c in staggered form from all surfaces**
- **Thoroughly clean the holes with compressed**
- **Fixing of Neoprene nozzle 12mm diameter and 40mm length into the holes with non shrink grade two component epoxy putty in order to carry out pressure grouting.**
- **Let the packer is kept in position for 1 hrs to get the material cured for plugging being it as self packing material to avoid back flow of pressure.**
- **Grouting the nozzle with high molecular weight low viscosity (2-5 cps) thermo-set polymer with pressure of 1 - 2.5 kg/cm^2 or/and with epoxy material of super low viscosity grade so that the material penetrates into the concrete to strengthen the matrix. Injection of Low viscous epoxy, the two-component epoxy injection resin shall be low viscosity resin system having viscosity less than 350 cps at ambient temperatures.**
- **Cutting the nozzle and filling the cavity with epoxy putty**
- **Removal of the Packer (Neoprene) portion after injected material gets cured.**

Flow Chart for Epoxy Grouting

1

•Firstly clean the both sides of crack, if surrounding concrete is deteriorated then cut V-groove by removing the unsound concrete and then clean the surface.

2

•Install the ports by Drilling 14mm diameter holes and about 75 to 100mm deep into the exposed /built up concrete which requires improvement. After drilling clean the hole using a water jet.

3

•Now fill the ports using epoxy grout. Epoxy grout can only be used where cracks are fine.

4

•Upon completion of the injection process, remove the ports and cap-seal by heat, chipping, grinding, hammering.

5

•The holes created by ejection of ports are closed using suitable epoxy grout after 24 hrs.

Representative Picture of Injection (Epoxy Pressure Grouting)

C. DAMPNESS & WATERPROOFING


A block unit 6 outer

WATERPROOFING FOR MASONRY WALL

Recommended System for damp treatment of masonry walls:

Application Methodology: All the instruments & facilities to be shifted along the wall. Plastering to be removed entirely along the length of brick wall from inside starting from the floor level up to lintel level, which to be considered as effective area of treatment. Over the exposed brick surface, wire brushing to be done to make the surface smooth and make free from any residual plaster left on it. Joints of the brick work to be checked for soundness,

Pointing of brick wall by cement mortar (C:M – 1:4) admixed with styrene butadiene emulsion at a recommended dosage mentioned by manufacturer after removing the existing plaster, followed by Waterproofing coating with Two component cementitious, elastomeric waterproofing coating NITOCOTE CM 210 at 2mm thickness used for effective & durable waterproofing from positive side & as well as negative of wall.

Priming: Before application, the surface should be primed with Hydroproof Xtra as:1part of Hydroproof Xtra : 2 parts of Water : 4 parts of Cement Mixed at a coverage rate of 16-17m2 for 1L of Hydroproof Xtra. Application of W/P Coating (two component elastomeric cementitious coating): Apply thoroughly mixed two component elastomeric cementitious coating NITOCOTE CM 210 using a soft bristled brush or roller or trowel over the prepared substrate. The first coat should be well brushed into the substrate and be applied at a w.f.t. of 1mm. Finish the application in one direction to give a neat appearance. Dampen the surface in case the brush begins to drag during application. The first coat should be allowed to cure for a period of 3 hours @ 35°C and longer at lower temperatures, prior to proceeding with the application of the second coat. The second coat also should be applied like the first coat at a w.f.t of 1mm, in one direction but does not require dampening of the surface. The total coating thickness will be 2mm in 2 coats. The material should be capable to arrest water/seepage from positive & negative side of wall when applied to either side.

Protect the treated surface with plaster of minimum thickness of 15mm at CM 1:4 admixed with styrene butadiene emulsion at a recommended dosage mentioned by manufacturer.

D. PROTECTIVE COATING AFTER REMOVING OF GRIT WASH


2nd floor outer col. crack

CRYSTALLINE CRACK HEALING MATERIAL/WATERPROOFING AT WALL

Crystalline admixtures should be mixed with dry cement @ 5 kg per 50 kg of cement. Sufficient water should be added to this mix to obtain slurry. The concrete surface should be saturated well with water and a crystallization waterproofing compound should be applied on the clean and saturated surface of the walls in 2 coats at 1 kg per m2. A two-component epoxy resin based coating specially formulated for internal applications for the wall surface should be also be used after application of crystalline coating.

CEMENT-POLYMER COMPOSITE COATING SYSTEM (CPCC):

This is a new method developed by CECRI. This system has been developed to overcome demerits of inhibited cement slurry coating system.

This system consists application of one coat of rapid setting primer followed by a coat of cement polymer sealing product. The primer and sealing products have thermoplastic acrylic resin as basic raw material. Sealing product is formulated with resin mixed with cement as a pigments. Rapid setting primer and sealing coats both are patented item.

This system has been developed mainly as a factory / shop process. The approach behind development of this system is that the base metal of rebars, contains electrons which get readily released in corrosive environment leading to oxidation of iron and thereby formation of Fe_2O_3 (rust) as principal deterrent. In order to prevent this oxidation a surface coating capable of interacting / nullifying the released electrons is provided. Further pre-stressing and reinforcing steel, in concrete during service life, are exposed to an alkaline environment and this necessitates introductions of a top coat which should be compatible to primer and alkaline environment. To meet these two contingencies, suitable polymers are carefully tailored through the formation of a single phase in the polyblend which provides the necessary mechanical and physical properties.

Briefly the following steps are involved in the process:

- SURFACE PREPARATION:

The surface of the steel reinforcing bars to be coated is cleaned by abrasive (dry sand) blast cleaning to the near white metal in accordance with SSPC-SP10/NAC No.2-1994. It includes the following procedures.

i. Prior to blast cleaning visible deposits of oil or grease are removed by suitable cleaning method.
ii. Clean dry compressed air is used for nozzle blasting.
iii. Dry uniformly graded silica sand is used for blast cleaning which should be free from contaminants.
iv. Dust and residues are removed from prepared surface by brushing, blowing off with clean, dry air, vacuum cleaning.
v. The prepared surface shall meet the visual standards of comparisons as in SPC-VIS 1 of SSPC-VIS 2.

- **APPLICATION OF THE COATING:**

i. **The coating is applied to the cleaned surface as soon as after cleaning and before oxidation of the surface discernible to the unaided eye occurs. However, the application of the coating should not be delayed more than 4 hr after cleaning.**

ii. **A rapid setting primer shall be applied over the prepared surface of the reinforcing steel either by brushing or dipping.**

iii. **After 30 minutes of application of the primer a cement polymer sealing coat shall be applied either by brushing or dipping.**

iv. **The coated rods shall be handled after 6 hours.**

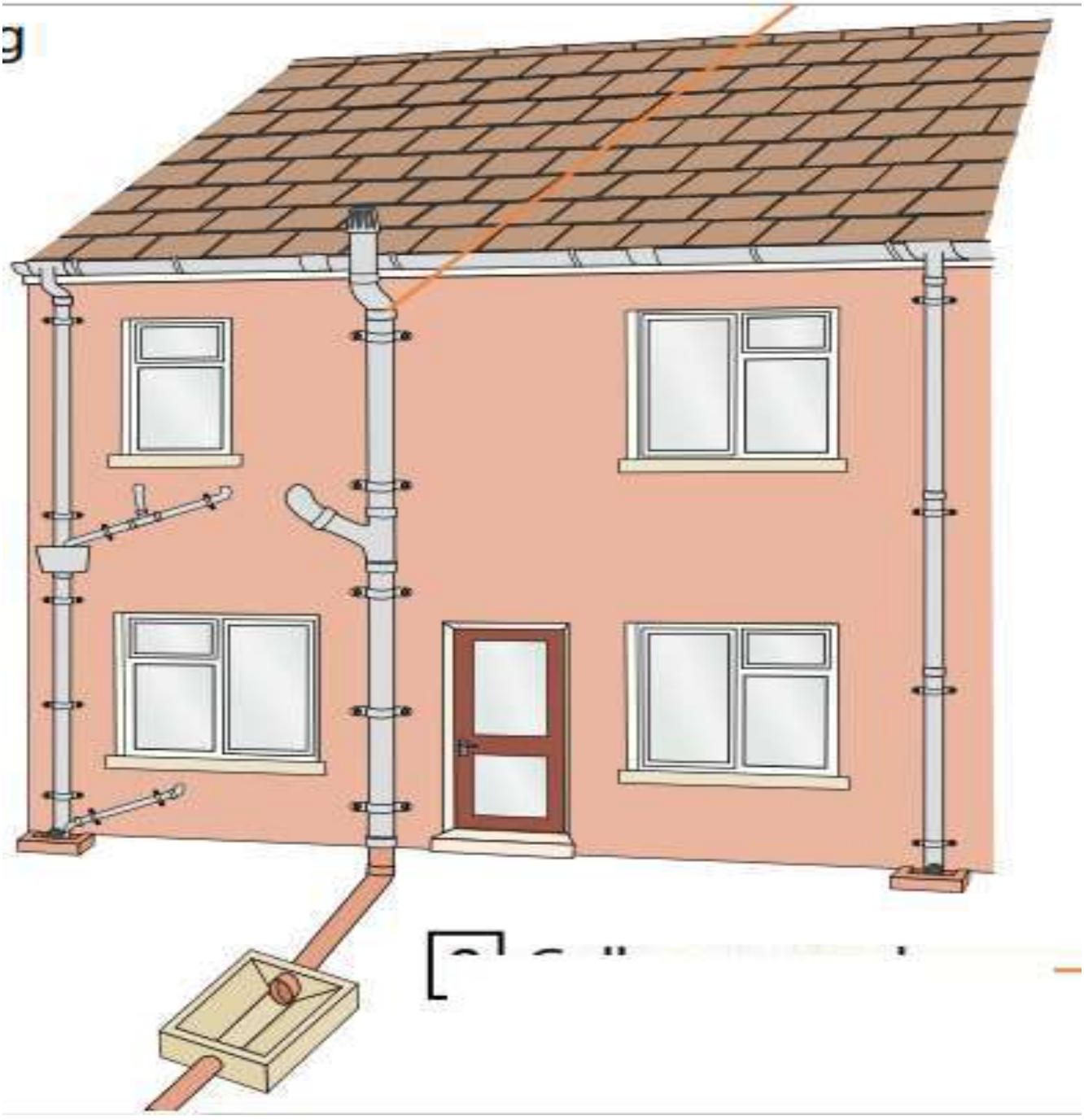
- **INSPECTION AND TESTING :**

Coated rebars shall be checked for minimum average dry film thickness, uniformity of thickness, defects such as cracks, peeling, bulging and uncoated areas etc. Coating shall be tested for adhesion, bond strength, abrasion resistance, chemical resistance . as per specifications laid down by the manufacturer.

d) Detailed specification of chemicals/solutions and quality control aspects, if required, may be obtained from CECRI, Karaikudi. Code of Practice for this system, as received from CECRI is annexed with the report as Appendix-II.

E. Replacement of Damaged plumbing system and shaft area


pipe shaft seepage and crack



Note: All damaged plumbing works should be either repaired or replaced with new plumbing system

This is major source of leakage and seepage in the building

Drainage System improvement approaching steps

Drainage systems can be classified into the rain-water pipe system and sewage pipe system. The integral parts of a drainage system comprise the drain pipes, traps and manholes.

Drain pipes should by no means be connected in an improper way, e.g. sewage discharged from sinks should not be emptied into any rain-water pipe.

Drainage outlets should be clear of rubbish or fitted with gratings to prevent rubbish from blocking the pipes.

All drain pipes, including soil pipes, waste pipes, ventilating pipes and underground drain pipes should be maintained in good working order without defects. All such pipes should be inspected regularly, and where leakage, blockage or defects are detected, they should be rectified immediately.

In order to prevent putrid air and insects in the soil pipe from entering the premises, sanitary installations including hand basin, sinks, bathtubs and showers toilets and floor drains should be fitted with a trap (U-shaped water trap, bottle traps or anti-siphon traps). If the installation is not used regularly, pour about half a litre of water into each drain outlet once a week. Then, pour a teaspoon of 1:99 diluted household bleach solution into the drain outlet. For floor drains, spray insecticide into the drain outlets after cleansing.

Manholes should be checked regularly and any blockage detected should be dealt with immediately.

Manholes should be readily accessible for regular maintenance. Access to them should not be obstructed by floor finishes, planters or furniture items. Foul air leaking from manholes can be stopped by using double seal type manhole covers, or repairing the edges of the manhole openings or cracks in the manhole covers.

Responsibilities for repair and maintenance of the drainage system is determined on whether the defective section of the pipe is for common use or for individual use. For example, if a rain-water pipe bursts, the owners' corporation or all owners shall be liable for repairing it. However, if a branch pipe connected to an individual flat is damaged, the owner or occupant of that flat shall be responsible for repairing it.

F. DEMOLITION OF STRUCTURE

DEMOLITION OF STRUCTURE

Most of sunshade area exhibit exposed corroded rebar shall be treated as beyond repair need to be dismantled safely. As more maintenance required and non-durable solutions should not applied to restore structure. So where concrete is severely deteriorated and strengthening of structure is not economical it should be demolished as per demolition guidelines. Exposed corroded rebar shall be treated as beyond repair need to be dismantled safely.

Demolition of Non-structural members like Chhajjas (sunshades), parapet wall and Fins which are not intact with roof slab or main structural system should be demolished. Similarly all non-structural members which has lost its residual life and repairing cost is less than its support system costs like scaffoldings etc :-

Most of sunshade area exhibit exposed corroded rebar shall be treated as beyond repair need to be dismantled safely. As less maintenance and durable solutions Fibre sheet or stone sunshade should be installed. Parapet wall should be cast at same boundary place with interval anchorage column.

External façade (fins and chhajja and parapet wall) need to be removed or demolished completely and should be recast in-situ

- **DEMOLITION OF CHAJJAS (SUNSHADES) AND FINS**
- **External façade (fins and chhajja), Most of sunshade area exhibit exposed corroded rebar shall be treated as beyond repair need to be dismantled safely and recast in-situ with same RCC materials/durable materials. As less maintenance and durable solutions Fibre sheet or stone sunshade should be installed.**

Fins/Chhajja made of durable materials

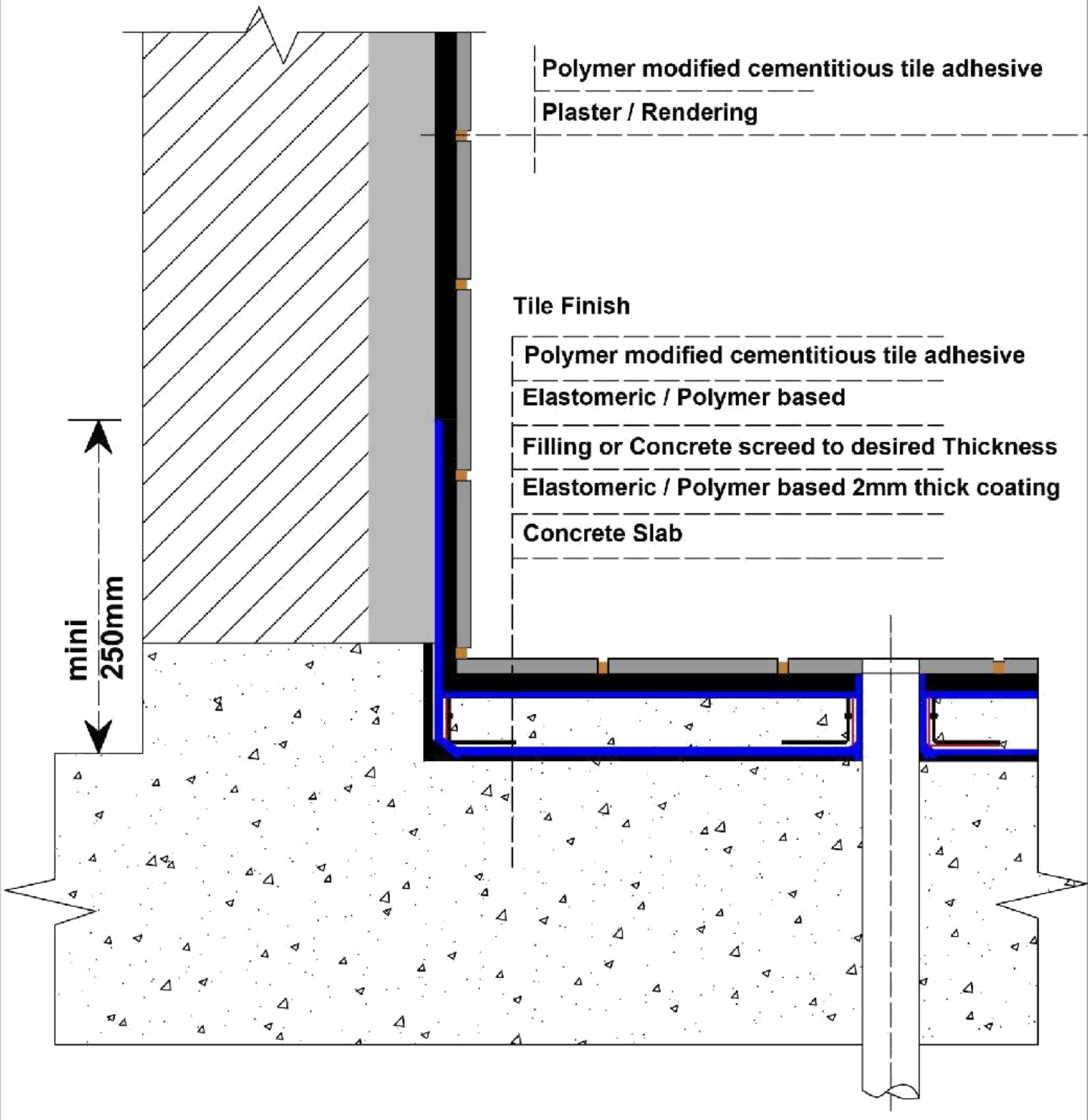
RCC Anchorage column at 2 meter interval in masonry parapet wall

Bathroom Repair Technique which need to be followed by resident in individual capacity

BATHROOM/TOILET/WATER LOGGING BODY IN HOUSES

Depressions are filled and leveled using PMC fillers. For the PMC filler the mixing ratio is 1 kg cement: 1.5 kg silica sand and 0.52 waterproofing materials. Application of one coat of waterproofing Polymer Modified Cementitious (PMC) slurry coating over the prepared concrete surface. The slurry shall be spread out over an area which can be covered with fiber glass fabric before the slurry dries out. Unroll the fibre glass fabric on to the wet slurry layer and impregnate with PMC slurry by pressing the fabric down so as to even out all wrinkles. Application of one coat waterproofing slurry coating over the glass fabric should be done so as to fill and over the fabric. Application of one coat waterproofing - PMC brush topping over the waterproofing slurry coating applied surface after the slurry coat has dried on the next day. Providing protective overlay of 25mm minimum thick screed concrete / plaster to slope of (1 in 100) admixed with Integral Cement Waterproofing compound after curing of PMC brush top coating.

NOTE: Polymer is mixed with neat cement in the ratio of 100 kg cement: 52 kg of waterproofing materials. The mix has to be stirred thoroughly until no air bubbles remain in the mix and lump found in the mix, should be removed.



ACRYLIC WATERPROOFING OF BATHROOM

Periodic Maintenance

There are two ways to execute periodic maintenance :

1. Protective Coating :

a. using existing site specifications

b. following alternate protective measures (explained below)

2. Crystalline Crack Healing (Cracks in Paint (coating) i.e. crack limited to paint thickness) after removal of paint.

3. Expansion Joint

- # PERIODIC MONITORING SCHEDULE OF STRUCTURE :

Inspection should be done systematically, taking notes to identify the nature of problems observed as well as their severity and location. Structure can be kept intact and integral up to its service life by maintaining only surface protection such plaster,

protection coating, waterproofing and patch repair time to time. At the time interval of 5

years health assessment of structure should be done to ensure the serviceability as well as safety of existing structure.

GENERAL COMMENTS

-Are records of pervious inspections available? Have they been reviewed?

-Are there previous engineering reports available? Have they been reviewed?

ISOLATION JOINTS AND EXPANSION JOINT S

-Are there any leaks through isolated joint seals and expansion joint seals?

-Are leaks related to failure of seals adjacent concrete?

--What type isolation joint or expansion joint seal is installed?

-Consult the manufacturer for repair recommendations if applicable?

JOINT SEALANTS

-Are there any signs of leakage, loss of elastic properties, separation from adjacent substrates or cohesive failure of the sealant?

-If bearing pads have been used under beams, are they present and in good condition? Are bearing pads squashed, bulging out of place, or missing?

EXPOSED STEEL

-Is there any exposed embedded reinforcing steel or connections due to the spalling or chipping of concrete cover?

-Is rust visible?

-Is it surface rust or is there significant loss of section?

-Is repainting required?

-What is the condition of attachment point and surrounding concrete?

PREVIOUS REPAIRS

-Are previous repairs performing satisfactorily?

-Are the edges of pervious patens tight?

-Does the patch sound solid when tapped?

• STRATEGY FOR PROTECTION IN FUTURE

Repair of all concrete where rebar corrosion and carbonation has occurred is suggested. It is necessary to ensure effective water proofing of all exposed concrete structural members and concrete slabs to protect the rebar against corrosion process. A repair method is suggested and such a repair method is effective only, when the same is done to near perfection. The application of treatment is equally important as the material of treatment. It is worth mentioning at this stage that timely repair can save the repair cost significantly. Life of the repair is expected to be at least 15-20 years when properly executed. Protective coating should be applied on the concrete surfaces to minimize the penetration of carbonation/moisture ingress inside pour of concrete.

If moisture ingress is continue then patch repair becomes ineffective and same type of spalling and crack will appear within the year. So**, external surface treatment is required** along with patch repair. The most sever deterioration from these corrosive occurs on the exposed wall and the slab underside surface (in contact with soil) at and above the flow line. Released hydrogen sulfide from waste water is converted into sulfuric acid by aerobic microbial oxidation. These sulfuric acid attack on concrete causes abrasion as well as easily erosion of aggregate and cement mortar.

Construction

Friazinc® R

Epoxy based zinc rich primer for steel

Product Description	Two component, low solvent, zinc rich epoxy resin based primer for steel.
Uses	Used as protective coating or as primer Specially suitable for objects which are subjected to mechanical wear, e.g, weirs,interior of pressure pipe line, gates, steel liner of penstocks and tanks etc.
Characteristics / Advantages	Easy to apply Fast application High mechanical properties Good adhesion to substrate Fast curing Resistance to weathering

Product Data

Form

Appearance / Colours	Part A: grey liquid Part B: light brown liquid
Packaging	Part A: 1.88 kg x 2 containers Part B: 0.12 kg x 2 containers Part A+B: 2.00 kg x 2 ready to use units

Storage

Storage Conditions / Shelf-Life	12 months from date of production if stored properly in original, unopened and undamaged sealed packaging, in dry conditions at temperatures between +5°C and +35°C. Protect from frost

Technical Data

Chemical Base	Epoxy resin

Density	Part A: ~ 2.37kg/l Part B: ~ 0.96kg/l Mixed resin: ~ 2.28 kg/l All density values at +27°C
Solid Content	~76% (by weight)
Application Temperature	Min 8^0C, Max 30^0C

Mechanical / Physical Properties

Resistance

Thermal Resistance

Exposure*	Dry heat
Permanent	+ 50 °C

*No simultaneous chemical and mechanical exposure.

System Information

System Structure	With out Top coat: 2 x Friazinc® R Priming under Top coat: 1 x Friazinc® R * For the application onto gypsum plaster boards, please refer to 'Notes on Application / Limitations'.

Application Details

Consumption / Dosage

Coating System	Product	Consumption
Primer	Friazinc® R	~ 0.15 -0.25 kg/m^2

These figures are theoretical and do not allow for any additional material due to surface porosity, surface profile ,variations in level and wastage etc.

Substrate Quality	The substrate must be clean, dry and free of all contaminants such as dirt, oil, grease, coatings and surface treatments, etc. If in doubt apply a test area first.
Substrate Preparation	Steel must be Blast cleaned to Sa 2 1/2 according to EN ISO 12944, Part 4. Blast cleaning is the best. If cleaned by alternate means, substrate should be free from rust.

Application Conditions / Limitations

Substrate Temperature	+8°C min. / +35°C max.
Ambient Temperature	+8°C min. / +35°C max.
Substrate Moisture Content	≤ 4% moisture content. Test method: Sika® Tramex meter, CM - measurement or Oven-dry-method. No rising moisture according to ASTM (Polyethylene-sheet).
Relative Air Humidity	75% r.h. max.

Application Instructions

Mixing	Part A : Part B = 94 : 6 (by weight)

Construction

Mixing Time

Friazinc® R is supplied in two parts. Stir Part A well to remix any settled material. Add Part A to Part B in the ratio of 94 : 6. Then mix thoroughly for about 3 to 5 minutes until a smooth and even consistency is achieved.

Mixing Tools

Friazinc® R must be thoroughly mixed using a low speed electric stirrer (300 - 400 rpm) or other suitable equipment.

Application Method / Tools

The surface to be coated should be prepared well before mixing of the two components of the Friazinc® R. The mixed material should be applied by appropriate brush and should be consumed within two hours after mixing at 30°C.

Cleaning of Tools

Wash all the tools with Sika® Colma Cleaner immediately after use. Hardened material can only be removed mechanically.

Potlife

2 kg mass

Temperature	Time
30º C	~2 hours

Waiting Time / Overcoating

Fraizinc® R on Fraizinc® R

Temperatures	Time
+10°C	~ 240 minutes
+20°C	~ 120 minutes
+30°C	~ 60 minutes

Top coat on Fraizinc® R

Temperatures	Time
+10°C	~ 480 minutes
+20°C	~ 240 minutes
+30°C	~ 120 minutes

Curing Details

Applied Product ready for use

Temperature	Tack free time	Full cure
+10°C	~ 8 hours	~ 10 days
+20°C	~4 hours	~ 7 days
+30°C	~ 2 hours	~ 7 days

Value Base

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

Legal Notes

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Construction

Sika® Rustoff 100

Rust remover cum passivator

Product Description	Sika® Rustoff 100 is a single component liquid that removes rust and prevents further rusting of steel structures by providing a passivating coat.
Uses	Sika® Rustoff 100 removes rust and prevents further rusting of: New or old reinforcement steel in construction Embedded steel in repairable structures Various steel structures like tanks, water pipelines, effluent pipelines, trusses, purlins, rafters etc. Ball bearings, valves, tools etc. Ideal for protecting reinforcements with insufficient cover or in thin sections
Characteristics / Advantages	Removes rust Prevents further rusting by providing a passivating coat To be applied with brush, cotton waste swab or spray gun on the affected metal surface Easy to apply since it is in liquid form For repairable structures when applied with brush /spray gun can reach even the most difficult rusted areas with congested reinforcements

Product Data

Form

Appearance / Colours	Clear liquid
Packaging	250g, 500g, 1kg, 5kg, 20kg

Storage

Storage Conditions/ Shelf-Life	12 months from date of production if stored properly in original, unopened and undamaged sealed packaging in dry conditions at temperatures between +5°C and +35°C.

Technical Data

Density	1.01 kg/l at 30°C

System Information

Application Conditions / Limitations

Construction

Substrate Temperature	+5°C min. / +50°C max.

Application Details

Consumption / Dosage	1kg covers 3- 5 sqm in 2 coats (depending on the diameter of the rods) 0.120 to 0.150 kg/ sqm per coat depending on extent of rusting and nature of substrate.
Substrate Quality	Substrate should be free from oil, dirt and grease. For concrete remove cement skin, loose particles etc. Cavities, pin holes should be levelled.
Substrate Preparation	For heavily rusted surface, first clean mechanically by wire brushing, sand blasting etc. depending on the extent of corrosion.

Application Instructions

Application Method / Tools	Apply Sika® Rustoff 100 by brush, cotton waste swab or spray on the effected metal surface. Leave it in contact with the surface till the reddish colour of the corroded surface has changed to nearest original black. Excess application may sometime give whitish black surface. After a minimum 24 hours remove the loose rust particles by brush. After the removal of loose rust any reddish rusted surface still left has to be re-treated with Sika® Rustoff 100. After the surface dries up totally (within 48 hours). Clean the surface with water jet and allow it to dry. Apply a preventive coating like Sika® Rustop.
Cleaning of Tools	Wash tools with Sika® Colma Cleaner immediately after use. Hardened material can only be removed mechanically
Notes on Application / Limitation	The surface should be dry before application of Sika® Rustoff 100.

Value Base

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Health and Safety Information

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Construction

Sikadur®-32

Epoxy resin bonding agent

Product Description	Sikadur®-32 is a solvent-free, two component bonding agent, based on selected epoxy resins. Complies with ASTM C 881-78 type II, Grade 2 Class B+C
Uses	Sikadur®-32 provides a bond of far greater strength than the tensile strength of the concrete itself. Therefore it is suitable for use as a structural bonding agent for : New to existing concrete Mortar Steel, Iron
Characteristics / Advantages	Easy to mix and apply Solvent free Unaffected by moisture Highly effective even on damp surface Workable at low temperatures High tensile strength
Tests	
Approval / Standards	Conforms to ASTM C 881-78, Type II, Grade 2, Class B+C.

Product Data

Form	
Colours	Part A: white Part B: black Part A+B mixed: light grey
Packaging	3 kg (A+B) Prebatched unit Part A: 2 kg plastic container Part B: 1 kg plastic container
Storage	
Storage Conditions / Shelf Life	12 months from date of production if stored properly in original unopened, sealed and undamaged packaging, in dry conditions at temperatures between +5°C and +40°C. Protect from direct sunshine.

Technical Data

Chemical Base	Epoxy resin.
Density	1.70 kg/l (Part A+B mixed) (at +27°C)
Change of Volume	Shrinkage / Creep: Hardens without shrinkage.

Mechanical / Physical Properties

Compressive Strength (According to ASTM C 881)

Curing time	+30°C
7 days	40 N/mm^2

Flexural Strength (According to IS 9162-1979)

Curing time	+30°C
10 days	30 - 35 N/mm^2

Tensile Strength (According to ISO 527)

Curing time	+30°C
14 days	18 - 20 N/mm^2

Bond Strength (According to ASTM C 882)

Curing time	Temperature	Substrate	Bond strength
14 days	+30°C	Concrete dry	2.5 - 3 N/mm^2 *

Strength Development

Confirm the strength development by producing cubes on site and testing them for compressive and flexural strength.

System Information

Application Details

Substrate Quality

Mortar and concrete must be older than 28 days (dependent on environment and strength).

Verify the substrate strength (concrete, mortar).

The substrate surface (concrete, mortar) must be clean and free from frost standing water.

Steel substrate must be de-rusted similar to Sa 2.5.

Concrete substrate must be sound and all loose particles must be removed.

Substrate Preparation

Concrete, mortar:
Substrates must be sound, dry, clean and free from laitance, ice, standing water, grease, oils, old surface treatments or coatings and all loosely adhering particles to achieve a laitance and contaminant free, open textured surface. Cement laitance must be removed and the surface to be treated must be mechanically roughened

Steel:
Must be cleaned and prepared thoroughly to an acceptable quality i.e. by blastcleaning and vacuum.

Application Conditions / Limitations

Substrate Temperature

+25°C min. / +40°C max.

Ambient Temperature

+25°C min. / +40°C max.

Material Temperature

Sikadur® -32 must be at a temperature of between +10°C and +40°C for application.

Substrate Humidity

When applied to mat moisture concrete, brush the adhesive well into substrate.

Construction

Application Instructions

Mixing

Part A : Part B = 2 : 1 (by weight)

Mixing Time

Pre-batched units
Mix parts A+B together for at least 3 minutes with a mixing spindle attached to a slow speed electric drill (max. 600 rpm) until the material becomes smooth in consistency and a uniform grey colour. Avoid aeration while mixing. Then, pour the whole mix into a clean container and stir again for approx. 1 more minute at low speed to keep air entrapment at a minimum. Mix only that quantity which can be used within its potlife.

Application Conditions / Limitations

After mixing, apply directly to the prepared substrate by brush, roller or spray. On damp surfaces, ensure that it is well brushed in.

Pour new concrete within specified open time, as long as material is still tacky.

Coverage

0.3 – 0.8 kg/m^2 , depending on substrate condition

Cleaning of Tools

Clean all tools and application equipment with Sika® Colma Cleaner immediately after use. Hardened / cured material can only be mechanically removed.

Potlife

(According to EN ISO 9514)

Temperature	Sikadur®-32
30^0C	25 min

The potlife begins when the resin and hardener are mixed. It is shorter at high temperatures and longer at low temperatures. The greater the quantity mixed, the shorter the potlife. To obtain longer workability at high temperatures, the mixed adhesive may be divided into portions. Another method is to chill parts A+B before mixing them (not below +5°C).

Open time

Temperature	Sikadur®-32
30ºC	50 minutes

Notes

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

Transportation Class

Users shall refer to the most recent Material Safety Data Sheet

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Construction

SikaRep® Microcrete-4

Ready to use non-shrink, cementitious micro concrete

Product Description	SikaRep® Microcrete-4 is factory designed pourable, non shrink, repair concrete with selected cement, aggregate and other chemicals. Recommended water and coarse aggregate to be added at site as per requirement.
Uses	SikaRep® Microcrete-4 is mainly recommended for the repair of damaged concrete structures e.g. Columns Beams Slabs, etc. It is also recommended for grouting of large gaps.
Characteristics / Advantages	A properly designed concrete which can be pumped of poured into restricted Placement without any vibration. Expansion system compensates for shrinkage settlement in plastic stage. Easy to mix and apply, high flow characteristic, rapid strength development, good bond with old concrete Contains no added chloride

Product Data

Form

Appearance / Colour	Grey powder
Packaging	30 kg bags.

Storage

Storage Conditions / Shelf-Life	6 months from date of production if stored properly in undamaged and unopened, original sealed packaging, in dry conditions at temperatures between +5°C and +40°C. Protect from moisture, direct sunlight and frost.

Technical Data

Bulk Density	1.2 kg/l (of fresh mortar) at 27 ºC
pH Value	11 - 13.5 when mixed with water (ready to pour).

Mechanical / Physical Properties

Compressive Strength (According to ASTM C 1107 – 99)

Curing Time	Curing Temperature (30°C)
1day	> 25
3 days	>3 5
7 days	>4 5
28 days	≥65

Flexural Strength (According to ASTM C 293 – 79)

Curing Time	Curing Temperature (30°C)
7 days	>4. 0
28 days	≥5.0

Tensile Strength (According to ASTM D 412 – 87)

Curing Time	Curing Temperature (30°C)
7 days	>2. 0
28 days	≥3.0

Note The above mentioned values are based on concrete produced by mixing SikaRep® Microcrete-4 and 10mm down aggregate in proportion of 2:1 (by weight).

System Information

Application Details

Comsumption 1760 kg of powder/ cubic metre of concrete

Productiveness 1 bag yields approximately 13.5 litres of mortar.

Substrate Preparation All concrete surfaces should be clean, sound and free from loose particles, oil, grease, etc. Metal surfaces should be scale, rust, oil and grease.

Application Instructions

Mixing 4.2 to 4.8 l of water per 30 kg bag dependent on the desired flow.

Mixing Time SikaRep® Microcrete-4 can be mixed both in paddle type and slow speed grouting mixture or drum type concrete mixer. In both the cases the powder SikaRep® Microcrete-4 is to be added to water and mix till a pourable consistency is obtained with recommended water –powder ratio as per technical data.
Do not mix more Microcrete that can be used within 15 minutes. DO NOT ADD ANY EXTRA WATER. For field mixing Sika technical department may be consulted.

Application Method/ Tools Pour the SikaRep® Microcrete-4 after mixing into the area to be covered /filled.
During filling if required, ensure proper air displacement.

Cleaning of Tools Clean all tools and application equipment with water immediately after use.
Hardened / cured material can only be removed mechanically.

Notes on Application / Limitations When ready to pour SikaRep® Microcrete-4 is workable for 20 minutes after mixing at +30°C).

Value Base

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

Legal Notes

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

Construction

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Construction

SikaTop®-122 HS

Polymer modified one component repair mortar for hand and machine application

Product Description	SikaTop®-122 HS is a pre-batched one component polymer modified repair mortar.
Uses	Repair of spalling and damaged concrete in buildings, bridges, infrastructure and superstructure works
Characteristics / Advantages	Easy to use (only to be mixed with water) Structural and cosmetic repairs Can be applied up to 40 mm thick in vertical layers Good adhesion Suitable for hand and machine application by wet spray application

Product Data

Form

Appearance /Colour	Grey powder
Packaging	30 kg bag

Storage

Storage Conditions/ Shelf-Life	6 months from date of production if stored properly in undamaged original sealed packaging, in dry conditions at temperatures between +5°C and +40°C.

Technical Data

Chemical Base	Portland cement, polymer redispersable powder, selected aggregates and additives.
Density	Fresh mortar density: ~ 2.1 kg/l at 27 ºC
Grading	2.36 mm down

Mechanical / Physical Properties

Compressive Strength (According to ASTM C109)

1 day	~ 20 N/mm²
7 days	~ 45 N/mm²
28 days	~ 60 N/mm²

Flexural Strength (According to ASTM C293-79)

7 days	~ 3 N/mm²
28 days	~ 5 N/mm²

System Information

Application Details

Consumption	Dependent on the substrate profile and the thickness of the layer applied. As a guide, ~ 1.9 kg of powder per m² per mm thickness.
Productiveness	1 bag yields ~16 litres of mortar.
Substrate Quality	*Concrete:* The concrete shall be free from dust, loose or friable material, surface contamination or other materials which reduce bond or prevent suction or wetting by repair materials. *Steel Reinforcement:* Rust, mill scale, mortar and concrete residues, dust and other loose or friable material which reduces bond or contributes to corrosion shall be removed to a standard equivalent to SA2.5.
Substrate Preparation	*Concrete:* Delaminated, weak, damaged and deteriorated concrete and where necessary sound concrete shall be removed by suitable mechanical or very high pressure water-blasting techniques (up to 110 MPa). Tie wire fragments, nails and other metal debris embedded in the concrete should be removed. The edges around areas of concrete removal should be angle cut at a minimum of 90^{o} to avoid undercutting and a maximum angle of 135^{o} (with the top surface of the adjacent sound concrete), to reduce the possibility of de-bonding. They should then be roughened sufficiently to provide a mechanical key between the original material and SikaTop®-122 HS repair mortar. Ensure sufficient concrete is removed from around embedded or exposed steel reinforcement to allow application of the anti corrosion coating when required and adequate compaction of the repair material. *Steel reinforcement:* Surfaces should be prepared using abrasive blast cleaning techniques or high pressure water-blasting techniques (up to 60 MPa). Where exposed reinforcement is contaminated with chlorides or other material which may cause corrosion, the reinforcement should also be cleaned by low pressure water-blasting (up to 18 MPa) *Bonding primer:* On a well prepared and roughened substrate a bonding primer is generally not required. When a bonding primer is not required pre-dampen the surface to a saturated surface dry condtion. The surface should not be allowed to dry before application of the concrete repair mortar. The surface should have a darkened matt appearance without glistening and the surface should not have free-standing water. When a bonding primer is necessary, apply Sika® Latex modified bond coat - (Refer to the relevant Product Data Sheet).Pressed well on to the substrate. In all cases, subsequent application of the repair mortar should be done ‘wet on wet’. Measured ‘pull off’ values - Structural Repairs minimum value 1.2 - 1.5 MPa; Non Structural repairs minimum value 0.7 MPa (Dependent on the strength of the concrete being repaired)..

Application Conditions / Limitations

Substrate Temperature	+5°C min. / +40°C max.
Ambient Temperature	+5°C min. / +40°C max.

Construction

Application Instructions

Mixing	~ 3.9 litres of water for 30 kg powder
Mixing Time	Pour the water in the correct proportion into a suitable mixing container. While stirring slowly, add the powder to the water. Mix thoroughly for at least for 3 minutes to the required consistency.
Mixing Tools	SikaTop®-122 HS should be mixed with a low speed (< 500 rpm) hand drill mixer or for machine application, using a forced action mixer with 2 to 3 bags or more at once dependent on the type and size of mixer. In small quantities, SikaTop®-122 HS can also be mixed manually by hand.
Application Method / Tools	SikaTop®-122 HS can be applied either manually using traditional techniques or mechanically using wet spray equipment. When a bonding bridge is required, ensure it is still 'tacky' when the repair material is pressed on ('wet on wet' technique). When applied manually, press the repair mortar firmly with a trowel, pushing it well on to the substrate. Finishing with both hand and machine application, can be done with as soon as the mortar has started to stiffen.
Cleaning of Tools	Clean all tools and application equipment with water immediately after use. Hardened material can only be removed mechanically.
Potlife	+20°C : ~ 30 minutes
Notes on Application / Limitations	Avoid application in direct sun and/or strong winds. Do not add water over recommended dosage. Do not add additional water during the surface finishing as this will cause discoloration and cracking. Cure freshly applied material correctly and protect from freezing etc.

Curing Details

Curing Treatment	Protect the fresh mortar from excess evaporation from the surface and early dehydration using the relevant curing method.

Value Base

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

Legal Notes

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BASF

The Chemical Company

EMACO™ S46 T

Dual-shrinkage compensated, micro-concrete for concrete repairs

Description

EMACO S46 T repair micro-concrete is a dual shrinkage-compensated, high flow, high strength formulation for structural concrete repairs. EMACO S46 T is suitable for placing in nominal thickness of 25mm to 200 mm.

When mixed, applied and cured in accordance with the manufacturer's instructions, EMACO S46 T provides a durable, strong structural repair fully compatible with host concrete.

Uses

EMACO S46 T is the ideal material for vertical or horizontal structural repairs wherever the thickness of repair is more than 25mm thick and use of pourable mortar is preferable to hand or machine applied repair systems. Typical applications are:

- Extensive repairs to beams, columns and other structural elements.
- Repair of structural members subjected to repetitive loading.

Repairs to industrial structures

- Repair of structural members subjected to repetitive loading.
- Jacketing of beams, columns and other structural elements for strengthening.

Advantages

Dual shrinkage compensated.

One component – only addition of water

- Quality controlled – Uniform, predictable
- results No additional bonding agent required

Impermeable to aggressive elements.

Pourable mortar – faster and easier placing

Typical Properties

Appearance	: Grey powder
Water/powder ratio, by weight	: 0.14
Fresh wet density	: 2250 kg/m^3
Compressive strength,	: 15 MPa at 1 Day
(ASTM C109, 7cm cube)	: 25 MPa at 3 Days
	: 35 MPa at 7 Days
	: 40 MPa at 28 Days

Specification Clause

The duel shrinkage-compensated, cementitious micro-concrete shall be EMACO S46 T, high flow, single component cementitious formulation. The repair micro-concrete shall have compressive strength minimum of 25 MPa at 3 day and 40 MPa at 28 days. The repair mortar shall not require polymer bonding agent as primer.

Directions for use

Surface Preparation

Correct substrate preparation is critical for optimum performance.

The prepared surface should be structurally sound and free from contaminants. Remove concrete that has been saturated with oil or grease. Simple light sandblasting will not provide a sufficient profile for most repairs.

Depending on the substrate condition and environmental requirements, use an effective method for removal of weak concrete such as, wet grit blasting, high pressure water jetting and needle scaling.

Saw cut the boundary of repair area perpendicular to the surface to at least 20 mm depth and remove concrete within the saw-cut boundary at least to that depth. Where saw cutting is not possible, after material removal, prepare the edge of the repair area vertical.

Prepare the final surface free from dust and debris and to a rough profile with at least 5 mm level difference between surface troughs and peaks.

Where rebars are corroded, cut back the concrete to at least 20 mm behind rebars. Grit blast around the rebars to remove corrosion products. Replace the affected part of rebar if the diameter after grit blasting is found reduced by more than 20% of the original diameter.

Note: It is recommended that the decision on replacement of rebars is taken based on the advice of the structural engineer responsible for the works. For superior protection from corrosion in aggressive environments, coat the rebars with CONCRESIVE ZRi – the zinc rich primer or with STRUCTURITE PRIMER in environments not laden with chlorides. Saturate the prepared surface with clean water for at least one to two hours before applying the mortar.

Formwork

Proper design of formwork is essential for effective repair.

The forms must be of good quality, treated with a chemical release agent such as RHEOFINISH 202 for smooth release, provided with water drain holes, strong and well braced to withstand the fluid pressure of the mortar until it hardens. If required, consult BASF representative for advice.

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Mixing
Mechanical mixing is necessary. Use a slow speed electric drill fitted with a spiral paddle for 1-2 bags mixing. For larger batch size, use a pan type mixer, or a tilting drum type mixer.

Place approximately 80% of the water in the mixer. Keeping the mixer running, add EMACO S46 T slowly.

Mix for 3-4 minutes or until a lump free mix is obtained. Add the remaining water while continuing to mix until the desired consistency is achieved.

Water requirement

Consistency	Min. water content per 25 kg	Max. water content per 25 kg
Sprayable or Trowelable	13% (3.25L)	15%. (3.75L)

If ambient temperature is >30°C, use chilled water and condition the bagged product in an air-conditioned store prior to use. Maximum mixed temperature should be no more than 35°C. EMACO S46 T can be used when the ambient temperature is between 5 and 40°C.

Placing
Place the mixed mortar within 20 minutes by pouring or pumping. Place continuously into the pouring hopper of the formwork until completion. Do not vibrate EMACO S46 T.

Strike off the formwork after 1 - 3 days.

For repairs beyond 100 mm in thickness, extend EMACO S46 T with up to 25 kg of 5-12 mm sized, washed, saturated surface-dry(SSD), graded, low absorption, high density aggregates. Please consult your local BASF representative for advice.

Subsequent protective finishes:
Depending on the environment of the structure, protect the entire structure with MASTERSEAL 200 H or PROTECTOSIL BH N protective systems. Where it is necessary for aesthetic reasons to retain natural concrete background the use of MASTERSEAL 550 is recommended.

Curing
Apply a uniform coat of MASTERKURE 181 (see separate data sheet) by roller or low-pressure spray immediately after striking formwork.

Cleaning
Clean all tools and equipments with water immediately after use. Hardened material can be removed using mechanical means.

Coverage
Each bag of EMACO S46 T when mixed with 3.5L of water yields approximately 12.5L.

4 bags of 25kg will be sufficient to cover $1m^2$ area at an average 50mm thickness.

Packaging
EMACO S46 T is supplied in 25kg bags.

Storage and Shelf life
Store under cover, out of direct sunlight and protect from extremes of temperature. In tropical climates the product must be stored in an air-conditioned environment.

Shelf life is 6 months when stored as above.

Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice please consult BASF's Technical Services Department.

Safety precautions
As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs (which can also be tainted with vapour until product fully cured or dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek immediate medical attention. Keep away from children and animals. Reseal containers after use. Do not reuse containers for storage of consumable item. For further information refer to the material safety data sheet. MSDS available on demand or on BASF construction chemicals web site.

Note
All BASF Technical Data Sheets are updated on regular basis; it is the user's responsibility, to obtain the most recent issue.

Field services where provided, does not constitute supervisory responsibility, for additional information contact your local BASF representative.

Disclaimer
Whilst any information contained herein is true, accurate and represents our best knowledge and experience, no warranty is given or implied with any recommendations made by us, our representatives or distributors, as the conditions of use and the competence of any labour involved in the application are beyond our control.

TDS Ref. no.: EmcxS46T/02/1206

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The Chemical Company

MBT RUSTKLEEN

Rust converter for rusted steel reinforcement in concrete repair situations

Description
MBT RUSTKLEEN is an effective rust converter that when applied over rusted rebars, chemically converts the rust layer into black, protective iron phosphate**.**

Uses
To eliminate the harmful rust from the steel reinforcement and to enable application of an appropriate protective primer while repairing corrosion damaged concrete.

Advantages
Works even in wet conditions
Forms tough protective iron phosphate layer
Improves bond strength with reinforcement protection primers
Reduces the time and labour required for mechanical cleaning
Easy to use in less accessible situations

Typical Properties

Aspect	: Pale yellow liquid
Mixed density	: 1.45 kg/litre
Drying time	: 20 minutes
Over coating time	: 18 hours

Specification Clause
Treat all the rusted reinforcement using MBT RUSTKLEEN, single component, water based, rust converter before treating with anti-corrosive primer. The rust converter shall be capable of forming tough protective layer of iron phosphate.

Directions for use

Surface Preparation
Remove dirt and contaminants on steel using detergent and water.
Mask the area surrounding the steel to be treated using polyethylene sheet and masking tape. Also mask any seems or depressions that could collect MBT RUSTKLEEN during treatment of rebars.
If steel is corroded heavily, remove the corrosion products on steel using wet sand blasting or wire brushing.

Mixing
Mix MBT RUSTKLEEN with clear water in the ratio 1:3. Distilled water gives the best result.

Apply MBT RUSTKLEEN onto the affected steel using, nylon scrub pad, spray or other such convenient tools. Allow to dry.

Clean all the splashes and traces with clean water. Apply CONCRESIVE ZRi or THORO STRUCTURITE PRIMER as corrosion protection primer.

Coverage
One litre of diluted (1:3) solution shall be sufficient for 10 m^2 area.

Packaging
MBT RUSTKLEEN is supplied in 5 kg pack.

Storage and Shelf life
Store under cover, out of direct sunlight and protect from extremes of temperature. In tropical climates the product must be stored in an air-conditioned environment.
Shelf life is 12 months when stored as above.
Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice please consult BASF's Technical Services Department.

Safety precautions
As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs (which can also be tainted with vapour until product fully cured or dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek immediate medical attention. Keep away from children and animals. Reseal containers after use. Do not reuse containers for storage of consumable item. For further information refer to the material safety data sheet. MSDS available on demand or on BASF construction chemicals web site.

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TDS Ref. no. : Rtkxxxxx/02/1206

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CONCRESIVE® 1414

Long open time epoxy bonding agent

[redacted]

CONCRESIVE 1414 is a two component epoxy system which on mixing yields an adhesive for internal or external bonding of renderings, granolithic toppings, and new concrete to old concrete. It tolerates a degree of moisture before and during curing. The ultimate bond strength is greater than the tensile strength of concrete. CONCRESIVE 1414 does not shrink and provides an even and stress-free bond.

[redacted]

CONCRESIVE 1414 is recommended for bonding:

- Fresh concrete to set concrete
- Repair mortar to concrete or mortar

[redacted]

- High bond strength
- Sufficient time to apply the overlay
  Moisture tolerant
- Effective transfer of stresses at bond line
  Resistant to chemical attack
- Effective barrier to migration of chlorides
  Supplied in pre – weighed units

Typical [redacted]

Aspect	: Grey viscous dispersion
Mixed density	: 1.48 kg/litre
Mixed Viscosity	: 2450±450 cps at 25°C
Mixing Ratio, by weight	: 83(Base) : 17(Hardener)
Compressive Strength	: 65 MPa at 7 Days
Tensile Strength	: 25 MPa at 7 Days
Adhesive bond strength to concrete (ASTM D4541)	: > 2.5 MPa (substrate failure)
Slant Shear bond Strength (BS 6319, Part 4)	: > 11 MPa (concrete failure)
Pot life	: 2 Hours at 25°C : 1 Hours at 40°C
Overlay time (Open time)	: 8 Hours at 25°C : 6 Hours at 40°C
Setting time	: 150 minutes at 25°C
Full cure	: 7 days

[redacted]

ASTM C881 Type 2, Grade 2, Class B & C.

[redacted]

The structural grade bonding agent shall be CONCRESIVE 1414, a two component, solvent less epoxy resin based. It shall be formulated to meet the requirement of ASTM C881 Type 2, Grade 2, Class B &C. The Bonding agent shall exhibit minimum open time of 6 hours and shall exceed the tensile strength of concrete in terms of its adhesive bond strength. It shall be fully compatible with EMACO Range of repair mortars.

[redacted]

Temperature [redacted]

Substrate temperatures: 15°C – 35°C

Very low or very hot temperatures will make application more difficult and careful consideration should be given to storage of materials. In the cold weather conditions, pre-condition materials by keeping it in a heated room. In hot weather conditions, some form of air-conditioned storage is required. Pre-conditioned materials at 20-25°C will reduce the possibilities of flash/slow setting and other defects.

[redacted]

All surfaces must be thoroughly cleaned and prepared. All loose particles, laitance, dust, curing compounds, floor hardeners, oil, grease, fat, bitumen and paint must be removed if good bond strength is to be achieved. Gloss surfaces must be abraded.

If oil, grease, fat, etc. are present, they should be removed before starting any other form of preparation. All laitance weak or friable concrete should be removed by chipping, grit blasting, or scrabbling until a sound base is obtained.

All laitance should be removed by mechanical scarification, grit blasting, or by acid etching. Visible signs of mould growth, lichen, or algae, should be removed and treated with a fungicidal wash.

New concrete should have cured until the shrinkage and moisture movement is low. Surfaces heavily impregnated with mould oil should be degreased and grit blasted or mechanically scarified to remove the contaminated surface. All curing compounds should have disintegrated or be removed and application carried out only onto a clean, dust free surface.

[redacted]

Carefully transfer the entire Hardener to the Base and thoroughly mix, using a stout palette knife or a slow running drill with a paint mixing paddle until uniformity is achieved. This normally takes about three minutes. Avoid part mixing at site to achieve best performance.

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[redacted]

Apply CONCRESIVE 1414 evenly across the whole surface with a clean, short haired paint brush.

Apply the screed overlay within 45-50 mins to achieve best performance.

For bonding fresh concrete to old concrete ensure to place the fresh concrete within the overlay time depending upon the ambient temperatures, in case exceeded re-apply the bonding agent and place the concrete.

It is important to protect applied CONCRESIVE 1414 from contamination, especially in horizontal surfaces, until overlay is placed

[redacted]

Although CONCRESIVE 1414 is self curing, it will cure slowly at low temperatures. The reaction stops at below 5ºC.

Equipment [redacted]

Use CLEANING SOLVENT NO. 2 to clean tools when CONCRESIVE 1414 is still wet or tacky. Once CONCRESIVE 1414 has set hard, it can only be removed by chipping or burning.

[redacted]

2 - 2.7 m²/kg dependent on substrate profile.

[redacted]

CONCRESIVE 1414 is available in 1 kg & 3kg units consisting of base and hardener.

[redacted]life

Store under cover, out of direct sunlight and protect from extremes of temperature. In tropical climates the product must be stored in an air-conditioned environment.

Shelf life is 12 months when stored as above.

Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice please consult BASF's Technical Services Department.

[redacted]

As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs (which can also be tainted with vapour until product fully cured or dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek immediate medical attention. Keep away from children and animals. Reseal containers after use. Do not reuse containers for storage of consumable item. For further information refer to the material safety data sheet. MSDS available on demand or on BASF construction chemicals web site.

[redacted]

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[redacted]

Whilst any information contained herein is true, accurate and represents our best knowledge and experience, no warranty is given or implied with any recommendations made by us, our representatives or distributors, as the conditions of use and the competence of any labour involved in the application are beyond our control.

TDS Ref. no. : Ccrx1414/02/1206

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CONCRESIVE® ZRi

Two component epoxy based zinc rich primer for steel

Description

CONCRESIVE ZRi is a two component, solvent borne zinc rich epoxy primer, providing active galvanic protection to steel. It is a thick grey liquid of paint-like consistency, recommended for use where chloride induced attack on steel is likely.

Uses

- As a protective coating to steel reinforcing bars in concrete.
- As a touch-up primer for damaged galvanised metal.
- As a primer for steel substrates prior to suitable top coating.

Advantages

- Provides positive protection of steel components against corrosion.
- Excellent adhesion to steel.
- Short overcoating time.

Typical properties

Aspect	: Thick grey suspension
Mixed density	: 2.3 kg/litre
Volume Solids, %	: 50 ± 3
Mixing Ratio, by weight	: 96(B) : 04(H)
Pot Life	: > 2 Hours at 25°C
Tack free time	: 20 Minutes at 25°C
	: 5 Minutes at 40°C
Recoat time	: 5 Hours at 25°C
	: 2 Hours at 40°C
Total zinc content in dry film	: >90% by volume
D.F.T. per coat	: > 50 microns
Application temperature	: minimum 10°C
	: maximum 40°C

Standards

CONCRESIVE ZRi is formulated to meet the scope of BS 4652, Type 2

Specification Clause

The primer shall be CONCRESIVE ZRi, a two component, epoxy zinc rich. It shall be formulated to meet the requirement of BS 4652 Type 2. The primer shall be an active type having zinc content of greater then 90% in dry film state which is capable of negating the generation of incipient anodes in the areas surrounding the repairs. The product shall have mix density not less than 2.25 kg/litre. It shall be fully compatible with EMACO Range of repair mortars.

Directions for use

Surface preparation

The steel surfaces should be grit blasted or wire brushed to remove all traces of corrosion. Ensure no oil, grease or dust is present. Surfaces should be dry.

Mixing:

Stir each component of CONCRESIVE ZRi. Add Hardener to Base and mix using a drilling machine fitted with a mixer.

Application:

Apply CONCRESIVE ZRi immediately after completion of preparation to prevent any contamination. Do not leave blasted or prepared steel uncoated.

Brush the CONCRESIVE ZRI onto the prepared substrate, ensuring uniform and full coverage, particularly on the back face of reinforcement. In case of doubt on achieving continuous film in one coat apply second coat immediately after the drying of the first coat. Please consult BASF representative for advising the numbers of coats necessary. Repair mortars can be applied as soon as the CONCRESIVE ZRi is dry.

CONCRESIVE ZRi is not designed as a finished coating. Although protection to the steel will be provided for some time, overcoating should be carried out as soon as possible, particularly in aggressive environments.

Equipment care

Tools should be cleaned with CLEANING SOLVENT NO. 2 immediately after use.

Coverage

Each 1 litre pack can cover 8 - 10 m^2/coat on smooth substrates. On rebar approximate coverage shall be as under:

Diameter of rebar (in mm)	Coverage Running meter/litre/coat
8	210 ~ 265
12	140 ~ 175
16	105 ~ 135
25	85 ~ 115
32	55 ~ 65

Packaging

CONCRESIVE ZRi is a two component system, supplied in 1 litre combined unit.

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Storage and Shelf life
Store under cover, out of direct sunlight and protect from extremes of temperature. In tropical climates the product must be stored in an air-conditioned environment.

Shelf life is 12 months when stored as above.

Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice please consult BASF's Technical Services Department.

Safety precautions
As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs (which can also be tainted with vapour until product fully cured or dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek immediate medical attention. Keep away from children and animals. Reseal containers after use. Do not reuse containers for storage of consumable item. For further information refer to the material safety data sheet. MSDS available on demand or on BASF construction chemicals web site.

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EMACO™ S48C T

Single component, fibre reinforced, thixotropic repair mortar

Description

EMACO S48C T repair mortar is a one-component thixotropic, dual shrinkage-compensated, fibre-reinforced formulation for structural concrete repairs. EMACO S48C T can be applied vertically or overhead by low-pressure wet-spraying or hand trowelling.

EMACO S48C T is reinforced with specially designed bean shaped, alkali resistant synthetic fibres for exceptional resistance to cracking.

Uses

EMACO S48C T is recommended for repair situations requiring application of mortar up to 50mm thickness in one layer, such as:

- Extensive repairs to beams, columns and other structural elements.
- Repair of structural members subjected to repetitive loading.
- Repairs to industrial structures

Advantages

Dual shrinkage compensated.

One component – only addition of water

Quality controlled – Uniform, predictable results No additional bonding agent required

Sprayable, Virtually no rebound.

Impermeable to aggressive elements.

Typical properties

Aspect	: Grey powder
W/P ratio, by weight	: 0.16
Fresh wet density	: 2250 kg/m^3
Compressive strength,	: 15 MPa at 1 day
(ASTM C109, 7cm cube)	: 25 MPa at 3 days
	: 35 MPa at 7 days
	: 45 MPa at 28 days

Specification Clause

The duel shrinkage-compensated, cementitious patch repair mortar shall be EMACO S48C T, single component mortar modified with fibres. The repair mortar shall exceed compressive strength of 35 MPa at 7 day and 45 MPa at 28 days. The repair mortar shall not require polymer bonding agent as primer and shall be thixotropic consistency, capable of applying 50mm thick in single layer.

Directions for use

Surface preparation

Correct substrate preparation is critical for optimum performance.

The prepared surface should be structurally sound and free from contaminants. Remove concrete that has been saturated with oil or grease. Simple light sandblasting will not provide a sufficient profile for most repairs.

Depending on the substrate condition and environmental requirements, use an effective method for removal of weak concrete such as, wet grit blasting, high pressure water jetting and needle scaling.

Saw cut the boundary of repair area perpendicular to the surface to at least 10 mm depth and remove concrete within the saw-cut boundary at least to that depth. Where saw cutting is not possible, after material removal, prepare the edge of the repair area vertical.

Prepare the final surface free from dust and debris and to a rough profile with at least 5 mm level difference between surface troughs and peaks.

Where rebars are corroded, cut back the concrete to at least 20 mm behind rebars. Grit blast around the rebars to remove corrosion products. Replace the affected part of rebar if the diameter after grit blasting is found reduced by more than 20% of the original diameter.

Note: It is recommended that the decision on replacement of rebars is taken based on the advice of the structural engineer responsible for the works.

For superior protection from corrosion in aggressive environments, coat the rebars with CONCRESIVE ZRi – the zinc rich epoxy primer or with STRUCTURITE PRIMER in environments not laden with chlorides.

Saturate the prepared surface with clean water for at least one to two hours before applying the mortar.

Mixing

EMACO S48C T must be mixed mechanically. Use a heavy-duty, slow speed drill with spiral mixing paddle or a Pan type mixers etc. Mixers attached to spray units such as, MEYCO DEGUNA are suitable.

Place approximately 80% of the water in the mixer. Keeping the mixer running, add EMACO S48C T slowly. Mix for 3-4 minutes or until a lump-free mix is obtained. Add from the balance 20% water, while continuing to mix, until the desired consistency is achieved.

The Chemical Company

Water requirement

Consistency	Min. water content per 25 kg	Max. water content per 25 kg
Sprayable or Trowelable	15% (3.75L)	17%. (4.25L)

If ambient temperature is >30°C, use chilled water and condition the bagged product in an air-conditioned store prior to use. Maximum mixed temperature should be no more than 35°C. EMACO S48C T can be used when the ambient temperature is between 5 and 40°C.

Placing

EMACO S48C T has been formulated for placing both by trowel and spray application, depending on the size and location of the repair area.
For best results, before application by trowel, apply the first layer by gloved hand including packing behind the rebars, and then firmly trowel on the rest to required thickness.

When applying by hand force EMACO S48C T tightly onto the substrate to ensure intimate contact with the pre-wetted substrate.
If applying by spray, for best results, utilise the services of an experienced nozzle-man.
Finish the final surface smooth using a wood, plastic or synthetic sponge faced trowel. When the material has stiffened to the point where finger pressure lightly marks the surface, give a final firm trowelling using a steel float.

Curing

Good curing is essential. Particular care is required in hot and/or windy conditions. Cure either by a single coat of MASTERKURE 181 curing membrane, which is compatible with most subsequent protective coatings or by covering the work with plastic sheet fixed over wet hessian or wet foam rubber.

Coverage

One 25kg bag of EMACO S48C T mixed with 4 litres water will yield approximately 12.8 litres.

Approximately four bags of 25kg are needed per 1 m^2

Packaging

EMACO S48C T is available in 25kg bags.

Storage and Shelf life

Store under cover, out of direct sunlight and protect from extremes of temperature. In tropical climates the product must be stored in an air-conditioned environment.

Shelf life is 6 months when stored as above.

Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice please consult BASF's Technical Services Department.

Safety precautions

As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs (which can also be tainted with vapour until product fully cured or dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek immediate medical attention. Keep away from children and animals. Reseal containers after use. Do not reuse containers for storage of consumable item. For further information refer to the material safety data sheet. MSDS available on demand or on BASF construction chemicals web site.

Note

All BASF Technical Data Sheets are updated on regular basis; it is the user's responsibility, to obtain the most recent issue.

Field services where provided, does not constitute supervisory responsibility, for additional information contact your local BASF representative.

Disclaimer

Whilst any information contained herein is true, accurate and represents our best knowledge and experience, no warranty is given or implied with any recommendations made by us, our representatives or distributors, as the conditions of use and the competence of any labour involved in the application are beyond our control.

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Fosroc® Nitoprime

Zincrich Plus

1
CI/SfB:

constructive solutions

Single component zinc primer for use with Renderoc repair system

Uses

Nitoprime Zincrich Plus is the recommended anti-corrosion primer for exposed steel reinforcement for use with Fosroc concrete repair mortars.

It is fully compatible with all Renderoc mortars and fluid micro-concretes.

Advantages

- ‘Active’ zinc-rich system combats corrosion by electro-chemical means
- Formulated for use with Renderoc repair products
- Single component product — easy to use with no restrictive pot-life
- Economical — single component ensures almost no waste

Description

Nitoprime Zincrich Plus is supplied as a single component grey-coloured liquid based on metallic zinc.

Specification clauses

Steel reinforcement primer

The steel reinforcement primer shall be Nitoprime Zincrich Plus, a single-component zinc-rich liquid packed and supplied ready to use. An unbroken 40 microns thick coating shall be capable of providing ‘active’ galvanic protection. It shall be a suitable viscosity to enable the coating to penetrate imperfections and pits within the surface of corrosion-damaged steel bars.

The formulation of the primer shall be such that drying occurs to allow the application of the repair mortar to proceed after 2 hours at 20°C.

It shall be fully compatible with the Renderoc system of concrete repair.

Properties

Test method\	Typical result
Specific gravity:\	2.5
Recommended thickness per coat:\	40 microns (dry)
Application thickness per coat:\	100 microns (wet)
Drying times —\	@ 20°C\
Touch dry:\	2 hours
Fully dry/recoatable:\	4 hours

Note: at temperatures below 20°C, the drying times will be slower.

Application instructions

Preparation

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. Grit-blasting 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 grit-blasting to remove corrosion products from pits and imperfections within its surface.

Application

The application of Nitoprime Zincrich Plus must take place as soon as possible to a dry steel surface after completion of the preparation work but always within 3 hours. Although a single component product, it should be stirred thoroughly before use in order to redisperse any settlement.

Apply one full and unbroken coat of Nitoprime Zincrich Plus by suitable brush, making sure that the back of exposed steel reinforcing bars are properly coated. A small brush is generally more suitable for this purpose. Allow to dry fully before continuing. If any doubt exists about having achieved an unbroken coating, a second application should be made as soon as the first coat is fully dry (generally after 2 hours).

The primed surfaces should not be left exposed to the elements for longer than necessary before overcoating or application of the repair material. Nitoprime Zincrich Plus will, however, protect steel under clean interior exposure conditions for a period of several months. In non-aggressive exterior environments, a maximum interval of 14 days will be tolerated but in industrial and/or marine environments this interval should be reduced to the practical minimum.

The application of concrete repair materials should proceed as soon as the Nitoprime Zincrich Plus is touch dry (generally 2 hours — see under Properties).

Fosroc® Nitoprime Zincrich Plus

Low temperature working

The minimum application temperature is 5° C. The material should not be applied when the substrate and/or air temperature is 5° C and falling. At 5° C static temperature or at 5° C and rising, the application may proceed.

Cleaning

Nitoprime Zincrich Plus should be removed from tools, equipment and mixers with Fosroc Solvent 102 immediately after use.

Estimating

Supply

Nitoprime Zincrich Plus:¥	1.9 litre and 800ml cans
Fosroc Solvent 102 :¥	5 and 25 litre tins

Coverage

Nitoprime Zincrich Plus:¥	8 m_2 / litre

Note: this coverage figure is theoretical — due to wastage factors and the variety and nature of possible steel substrates, practical coverage figures will be reduced.

Limitations

Nitoprime Zincrich Plus should not be applied when the temperature is below 5° C or is 5° C and falling. If any doubts arise concerning temperature or application conditions, consult the local Fosroc office.

Storage

Store in dry conditions in the original containers. Nitoprime Zincrich Plus and Fosroc Solvent 102 have a shelf life of 12 months if kept in a dry store in the original, unopened containers.

If stored at high temperatures and/or high humidity conditions the shelf life may be reduced.

Precautions

Health and safety

For further information refer to the appropriate Product Safety Data Sheet

Fire

Nitoprime Zincrich Plus and Fosroc Solvent 102 are flammable. Keep away from sources of ignition. No smoking. In the event of fire, extinguish with CO_2 or foam. Do not use a water jet.

Flash points

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

For further information, refer to the Product Material Safety Data Sheet.

Additional information

Nitoprime Zincrich Plus is the approved reinforcing steel primer for use with the Renderoc, Patchroc and Paveroc systems of concrete repair.

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Certificate number FM 610

Epoxy based concrete bonding agent

Uses

For bonding fresh wet cementitious materials to existing cementitious surfaces. For use on horizontal surfaces or on vertical surfaces where mortar or concrete can be supported by formwork. The long 'open' life makes it suitable for use with formwork or where additional steel reinforcement has to be fitted. The product is ideal for roads, bridges, pavements, loading bays and factories, and for bonded or granolithic floor toppings. Nitobond EP is equally suited to internal and external applications.

Nitobond EP may also be used as part of a repair system where a substrate/repair barrier is required or where the substrate is likely to remain permanently damp or wet.

Advantages

- Can be applied on to dry or damp substrates.
- Exhibits high mechanical strength.
- Positive adhesion - exceeds that of the tensile strength of the host concrete.
- Special 'slow-set' version available allowing time to erect steel reinforcement and formwork.
- Solvent-free - can be used in enclosed locations.

Description

Nitobond EP is based on solvent-free epoxy resins containing pigments and fine fillers. It is supplied as a two component material in pre -weighted quantities ready for on site mixing and use. The 'base' component is white and the 'hardener' component is green, providing visual evidence that adequate mixing has been achieved.

Technical support

Fosroc offers a comprehensive range of high performance, high quality repair, maintenance and construction products. In addition, Fosroc offers a technical support package to specifiers, end-users and contractors as well as on-site technical assistance in locations all over the world.

Design criteria

Nitobond EP is designed to have an overlay time of 90 minutes at 20^{o}C. A special 'slow-set' version is available with an overlay time of 24 hours at 20^{o}C, 12 hours at 30^{o}C or 8 to 10 hours at 35^{o}C, making it more suitable for use where additional steel reinforcement and formwork has to be fitted or where temperatures are high. The minimum application temperature for Nitobond EP is 5^{o}C. Consult the local Fosroc office for further information.

Properties

Test method	Typical result
Compressive strength (BS 6319 Part 2):	50 N/mm^2
Tensile strength (BS 6319 Part 7):	20 N/mm^2
Flexural Strength (BS 6319 Part 3):	35 N/mm^2
Shear strength (BS 6319 Part 4):	25 N/mm^2
Adhesive bond to concrete:	In general, the bond will always exceed the tensile strength of the host concrete.

The following properties were measured at 20^{o}C:

	Standard set	Slow set
Pot life:	35 to 45 mints	5 to 7 hours
Initial hardness:	24 hours	48 hours
Full cure:	7 days	7 days
Maximum overlay time:	90 mints	24 hours

Note: At temperatures below 20^{o}C, the cure rate will be slower. Conversely, at temperatures above 20^{o}C, the cure rate will be faster.

Specification clause

Epoxy bonding agent

The bonding agent shall be Nitobond EP, a two-component solvent-free epoxy resin. The two components shall be differentially pigmented in order to ensure visually that correct mixing has taken place prior to the application. The product shall achieve 50 N/mm^2 compressive strength, 20 N/mm^2 tensile strength, 35 N/mm^2 flexural strength and 25 N/mm^2 shear strength. The adhesive bond to the concrete substrate shall exceed the tensile strength of the host concrete.

Application instructions

Preparation

Clean all surfaces and remove any dust, unsound material, plaster, oil, paint, grease, corrosion deposits or algae. Roughen the surfaces, remove any laitance and expose aggregate by light scabbling or grit-blasting.

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

Mixing

Any steel reinforcement and formwork should be prepared, cut to size and shape, and made ready for assembly before mixing commences.

Care should be taken to ensure that Nitobond EP is thoroughly mixed. The 'hardener' and 'base' components should be stirred separately before mixing to disperse any settlement. The entire contents of the 'hardener' tin should then be poured into the 'base' tin and the two materials thoroughly mixed using a suitable slow-speed drill and mixing paddle for 2 minutes until a fully uniform colour is obtained. The sides of the tin should then be scraped and mixing should continue for a further 2 minutes.

To facilitate mixing and application at temperatures below 20^{o}C, the separate components should be warmed in hot water up to a maximum temperature of 25^{o}C before beginning to mix. If heated to 25^{o}C, the subsequently mixed material will need to be used more speedily as the pot-life will be reduced to 20 minutes for the 'standard' version and 4 hours for the 'slow-set' version. Alternatively, the material should be stored in an environment heated to 20^{o}C and only removed immediately before use.

Application

Nitobond EP should be applied as soon as the mixing process has been completed. It should be brush or spray applied to the prepared surfaces.

In the case of the 'standard set' material, the new concrete or screed should be applied to the coated substrate within 90 minutes at 20^{o}C or within one hour at 30^{o}C.

In the case of the 'slow-set' material, the new concrete or screed may be applied to the coated substrate up to 24 hours after application at 20^{o}C or up to 12 hours at 30^{o}C or between 8 to 10 hours at 35^{o}C. However, the coated substrate should be left for one hour before the new concrete or screed is placed.

Where Nitobond EP is to be used as part of a repair system to form a substrate/repair barrier, care should be taken to achieve an unbroken coating. One coat should be applied and allow to gel. A second coat should be applied and used as the bonding coat. In some situations (e.g. sprayed concrete repairs) it may be advantageous to scatter dust free sharp sand over this coat and leave to harden.

As soon as the Nitobond EP has been applied, any required steel reinforcement and/or formwork should be elected and fixed securely in place.

Low temperature working

The minimum application temperature is 5^{o}C. In temperatures below 15^{o}C, the separate components should be heated in warm water (up to 25^{o}C) or stored in a heated environment for 12 hours before use. These measures will facilitate mixing and application. Normal precautions for winter working with cementitious materials should then be adopted.

High temperature working

At ambient temperatures above 30^{o}C, the materials should be stored in the shade or in an air-conditioned environment for 12 hours before use.

Cleaning

Nitobond EP should be removed from tools, equipment and mixers with Fosroc Solvent 102 immediately after use. Hardened material can only be removed mechanically.

Limitations

Nitobond EP should not be applied when the temperatures is below 5^{o}C and falling. If any doubts arise concerning temperature or substrate conditions, consult the local Fosroc office.

Estimating

Supply

Nitobond EP:	5 kg and 1 kg packs
Nitobond EP Slow Set:	5 kg and 1 kg packs
Fosroc Solvent 102:	4 litre cans

Coverage

Nitobond EP:	5 m^{2} per kg
Nitobond EP Slow Set:	5 m^{2} per kg

Note: The coverage figures for Nitobond EP products are theoretical - due to wastage factors and the variety and nature of possible substrates, practical coverage figures will be reduced. Unless otherwise specified, Nitobond EP 'standard' set will be supplied. Where the 'slow-set' system is required, care should be taken to ensure that this is specifically requested.

UN packaging regulations

To comply with current regulations, all products of a hazardous nature which are subjected to a sea crossing as part of their delivery requirements, must be packed in UN approved receptacles.

When a known sea crossing is involved, whether locally or for export, Fosroc will supply in the correct UN packaging. Where Fosroc are requested to deliver within a mainland boundary but the Purchaser intends to onward ship, it is incumbent upon the Purchaser to specify that UN packaging is required at the time of placing the order. Otherwise, once received, responsibility rests with the Purchaser. The use of UN packaging may affect the selling price of products. Please consult the local Fosroc Area Manager or office.

Storage

Shelf life

Nitobond EP, Nitobond EP Slow Set, and Fosroc Solvent 102 have a shelf life of 12 months if kept in a dry store in the original unopened packs.

Storage conditions

Store in dry conditions in the original, unopened packs. If stored at high temperatures, the shelf life may be reduced.

Precautions

Health and safety

Nitobond EP, Nitobond EP Slow Set and Fosroc Solvent 102 should not come in contact with skin or eyes, or be swallowed. Ensure adequate ventilation and avoid inhalation of vapors. Some people are sensitive to resins, hardeners and solvents. Wear suitable protective clothing, gloves and eye protection. If working in confined areas, suitable respiratory protective equipment must be used. The use of barrier crams provide additional skin protection. In case of contact with skin, remove immediately with resin removing cream followed by washing with soap and water. Do not use solvent. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. If swallowed, seek medical attention immediately - **do not** induce vomiting.

Fire

Nitobond EP and Nitobond EP Slow Set are non flammable. Fosroc Solvent 102 is flammable. Keep away from sources of ignition. **No smoking**. In the event of fire extinguish with CO_2 or foam. **Do not** use near open flames or smoke during use.

Flash point

Fosroc Solvent 102:	33°C

For further information, refer to the Product Material Safety Data Sheet.

Additional information

Fosroc manufactures a wide range of products specifically designed for the repair and refurbishment of damaged reinforced concrete. This includes hand -placed and spray grade repair mortars, fluid micro-concrete, chemical resistant epoxy mortars and a comprehensive package of protective coatings. In addition, a wide range of complementary products is available.

Fosroc has also produced several educational training videos which provide more details about the mechanisms which cause corrosion within reinforced concrete structures and the solutions which are available to arrest or retard these destructive mechanisms.

Further information is available from the publication. Concrete Repair and Protection. The 'Systematic Approach', available in seven language formats.

For further information about products, training videos or publications, contact the local Fosroc office.

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Reebaklens RR

constructive solutions

Rust remover, cleaning and etching agent

Uses

Reebaklens RR is used as a rust remover from steel bars prior to encasing in concrete / microconcrete. It can also be used on ohter steel surfaces prior to coating with epoxy systems.

Advantages

Rapid action

Safe with metals (except zinc and galvanised steel), wood, glass, plastic and rubber. No corrosive action. Penetrates oil and grease.

Description

Reebaklens RR cleaning agent is a combination of acid based material, corrosion inhibitors and dispersing agents and is supplied as a clear green solution.

Technical Support

Fosroc provides a technical advisory service to specifiers, end-users and contractors as well as on-site technical assistance in locations all over the country.

Properties

Specific gravity : 1.16 - 1.22 @ 25^0C

Application instructions

For rusted metal (iron base)

Apply Reebaklens RR with brush for complete wetting of rusted metal surface and allowed to react it for 16-24 hours. After 24 hours, a white layer will appear which will protect further corrosion of metal / steel for about 5-7 days. Before applying protective coating, the surface should be wire brushed and thoroughly cleaned for dust with dry cloth.

Removal of rust and mill scale

Prewet the floors, then using a stiff bristle broom, brush the affected areas with a solution of Reebaklens RR cleaning agent and water. Strength of the solution required will vary but should be between 1 : 1 and 1 : 4 (Reebaklens RR cleaning agent to water).

When the action has finished, wash down thoroughly with clean water. Wire brush again to remove remaining loose material and finish by thoroughly washing down with clean water. Repeat if necessary. High degree of rust or scale can be removed by soaking in the Reebaklens RR cleaning agent solution for 60 minutes.

Estimating

Coverage

Approx. 2.0 - 2.5 m_2/L

Note coverage depends on the rusted area and the depth of deposition.

Packaging

Reebaklens RR cleaning agent is available in 1, 5 and 20 L containers.

Storage

Shelf life

At least 1 year in original sealed containers under normal warehouse conditions.

Precautions

Health & Safety instructions

Reebaklens RR cleaning agent is acid based and should be handled with care. It attacks zinc, aluminium and putty. If in doubt about its effect on a material, test a small area before application.

Avoid contact with skin. Rubber gloves and goggles should be worn. Wash spillages with plenty of water. Enclosed areas should be well ventilated. If contact with eyes occur, wash immediately with water and seek medical advice.

Fire

Reebaklens RR cleaning agent is non flammable.

Additional information

Technical data and guidance can be provided on a wide range of admixtures, concreting aids, grouts, repairs, Protective coatings and the Nitoflor range of industrial flooring systems which includes non metallic floor hardeners, epoxy floor coatings and self levelling floor toppings, epoxy heavy duty abrasion resistant screeds.

Separate datasheets are available on these products.

Reebaklens RR

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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INDIA/2004/0210/A

Renderoc® RG

constructive solutions

General purpose, non-shrink, cementi-tious micro-concrete

Uses

Renderoc RG is used for repairs to damaged reinforced concrete elements, particularly where access is restricted and where vibration of the placed material is difficult or impossible.

It is suitable for various structural strengthening measures such as encasement build-ups, jacketing etc.

Advantages

- Gaseous expansion system compensates for shrinkage and settlement in the plastic state.
- Can be pumped or poured into restricted locations.
- Highly fluid to allow for placement without vibration.
- Pre-packed to overcome site-batched variations.
- Rapid strength gain to facilitate early reinstatement.
- High ultimate strengths and low permeability of cured repair.
- Contains no chloride admixture.

Description

Renderoc RG is supplied as a ready to use blend of dry powders which requires only the site addition of clean water to produce a free-flowing non-shrink repair micro concrete. The material is based on Portland cements, graded aggregates and fillers, and additives which impart controlled expansion characteristics in the plastic state, while minimising water demand. The low water requirement ensures high early strength and long-term durability.

For larger repairs, the mixed Renderoc RG may be modified by the addition of 5mm to 12mm clean, graded, saturated surface dry aggregates at site. For exceptionally large repairs, the local Fosroc office shall be consulted.

Technical support

Fosroc offers a technical support package to specifiers, end users and contractors as well as technical on-site assistance in locations all over the country.

Design criteria

Renderoc RG can be applied in sections upto 100mm deep. For larger sections, the addition of approved aggregates may be required. This will depend on the specific configuration of the repair location. Fosroc office shall be contacted for further information.

Properties

The following results were obtained at a water:Powder ratio of 0.16 @ 30^0C.

Test	Typical result at 30^0C
Compressive strength (N/mm^2) (Tested on 70.7mm cubes as per BS 4551-80)	
1D 10 / 3D 30 / 7D 40 / 28D 50	
Tensile strength	2.0N/mm^2 @ 28 days
Flexural strength (BS4551 - 80)	5N/mm^2 @ 28 days
Young's Modulus	25 kN/mm^2
Expansion characteristics (ASTM C827 - 1987)	Unrestrained expansion 1 to 4%.
Pressure to restrain Plastic expansion	Approx. 0.004N/mm^2.
Coefficient of thermal expansion	10 - 12 x 10^{-6} / ^{0}C.
Thermal conductivity	1.5 W/m^0C
Fresh wet density (Mixed density @27^0C)	2100 - 2200 kg/m^3

Specification clauses

Performance specification

The fluid micro-concrete repair material shall be a single component, cement based, micro-concrete to which only the site-addition of clean water (and approved graded coarse aggregates where specified) shall be permitted. The micro-concrete shall contain no metallic aggregates, or chlorides and shall be shrinkage compensated in the plastic state.

Renderoc® RG

The micro concrete in the flowable consistency should achieve a compressive strength of not less than 10N/mm_2 after 24 hours, 40N/mm_2 after 7 days and 50 N/mm_2 after 28 dyas at 30_0C. Most importantly, the cured microconcrete shall contain no metallic aggregates, or chlorides and shall be shrinkage compensated in the plastic state. The unrestrained expansion shall be between 1 - 4%. The flexural strength shall not be less than 5 N/mm_2 @ 28 days. The microconcrete shall have a coefficient of thermal expansion similar to that of the host concrete. The mixed density of microconcrete shall exceed 2100 kg/m_3 at 27_0C.

Supplier specification

All microcreting (specify details and areas of application) must be carried out using Renderoc RG, manufactured by Fosroc, applied strictly in accordance wtih the manufacturer's technical datasheet.

Application instructions

Preparation

The unrestrained surface area of the repair must be kept to a minimum. The formwok should include drainage outlets for pre-soaking and, if beneath a soffit, provision for airventing. Provision must also be made for suitable access points to pour or pump the mixed micro-concrete in place.

Defective concrete surfaces must be cut back to a sound base. Smooth surfaces should be mechanically roughened. Corroded reinforcing steel should be exposed around its full circumference and cleaned to remove all loose scale and corrosion deposits. It is important to clean the steel to a bright condition. Grit-blasting is recommended.

One coat of **Nitozinc Primer** should be applied on the reinforcing steel. If any discontinuity in the applied film is noticed, one more coat has to be applied.

Several hours prior to placing, the concrete substrates should be saturated with clean water. Immediately prior to placing, any free water should be removed.

Alternatively, all prepared concrete substrates should be primed using Nitobond EP, a slow - setting epoxy bond aid. Nitobond EP shall be applied only on dry substrate.

Note : For repair sections generally deeper than 100mm it may be necessary to mix the Renderoc RG with properly graded 5mm to 12mm silt-free aggregate to minimise temperature rise. The quantity of aggregate required may vary depending on the nature and configuration of the repair location. The typical results with a few aggregate proportions, for various applications are furnished below for guidelines.

Typical results of Renderoc RG with graded coarse aggregates of maximum size 12mm.

Renderoc RG : Coarse aggregate (SSD) (By weight)
1 : 0.75

Water: Powder ratio (By weight)	0.16

Compressive strength (N/mm_2)			
1 D	3 D	7 D	28D
15	35	45	55

Workability	Flowable

Note : W/P shall not be increased under any circumstances.

Estimating

Packaging

Renderoc RG is supplied in 25 kg moisture resistant bags.

Yield

Approximately 13.0 litres per 25 kg bag. Actual yield per bag will depend on the consistency of Renderoc RG and quantity of coarse aggregate added.

Storage

Shelf life

6 months if kept in a dry store in the original, unopened bags. If stored at high temperatures and/or high humidity conditions the shelf life may be reduced.

Renderoc® RG

Precautions

Health & Safety instructions

Renderoc RG contains cement powders which, during normal use, have no harmful effect on dry skin. However, when Renderoc RG is mixed, or becomes damp, alkali is released which can be harmful to the skin. During use, avoid inhalation of dust and contact with skin and eyes. Suitable gloves, eye protection and dust masks shall be worn. The use of barrier creams is recommended. Incase of contact with skin, it shall be washed with clean water. Incase of contact with eyes, it shall be rinsed immediately with plenty of clean water and medical advice shall be sought. If swallowed, medical attention shall be sought immediately - Vomitting should not induced. Renderoc RG is non-flammable.

Additional Information

Fosroc manufactures a wide range of products specifically designed for the repair and refurbishment of damaged reinforced concrete. These include hand placed and trowellable repair mortars, fluid micro concretes, chemical resistant epoxy mortars and a comprehensive package of protective coatings. In addition, a wide range of complimentary products are available. These include admixtures, joint sealants, waterproofing membranes, grouting, anchoring, and specialised flooring materials.

Separate datasheets are available on these products.

Renderoc® RG

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Important note :

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INDIA/2004/0404/E

HIT-RE 500 with HIT-V / HAS rods

Injection Mortar System

Hilti HIT-RE 500
330 ml foil pack
(also available as 500 ml and 1400 ml foil pack)

Static mixer

HAS rods
HAS-E (Zinc)
HAS-E-F (Gal)
HAS-E-R (A4-70)
HAS-HCR rods

HIT-V rods
HIT-V (Zinc)
HIT-V-F (Gal)
HIT-V-R (A4-70)
HIT-V-HCR rods

Benefits

- suitable for non-cracked concrete C 20/25 to C 50/60
- high loading capacity
- suitable for dry and water saturated concrete
- under water application
- large diameter applications
- high corrosion resistant
- long working time at elevated temperatures
- odourless epoxy
- varied embedment depths
- small edge distance and anchor spacing possible


Concrete


Small edge distance & spacing


Variable embedment depth


Fire resistance

Corrosion resistance

High corrosion resistance


European Technical Approval


CE conformity


Hilti anchor design software

Basic loading data (for a single anchor)

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Non cracked concrete $f_{c,cyl}$ = 32 MPa
- Temperate range I (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range +5°C to +40°C

Embedment depth and base material thickness for the basic loading data

Recommended loads

Anchor size	M8	M10	M12	M16	M20	M24	M30	M36
Typical embedment depth [mm]	80	90	110	125	170	210	270	330
Base material thickness [mm]	110	120	140	165	220	270	340	410

Recommended loads

			Anchor HIT-V grade 5.8				Anchor HAS grade 8.8	
Anchor size	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**
Tensile N_{rec} \ \[kN]	8.6	13.8	20.0	36.4	58.1	79.4	115.7	152.1
Shear V_{rec} \ \[kN]	5.1	8.6	12.0	22.3	34.9	50.3	120.6	173.5

Note: For varied embedment depths please contact your local Hilti engineer for further details.

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-04/0027 / 2009-05-20
Fire test report	IBMB, Braunschweig	UB 3565 / 4595 / 2006-10-29 UB 3588 / 4825 / 2005-11-15
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26 & suppl. WF 172920 / 2008-05-27

a) All data given in this section according ETA-04/0027, issue 2009-05-20.

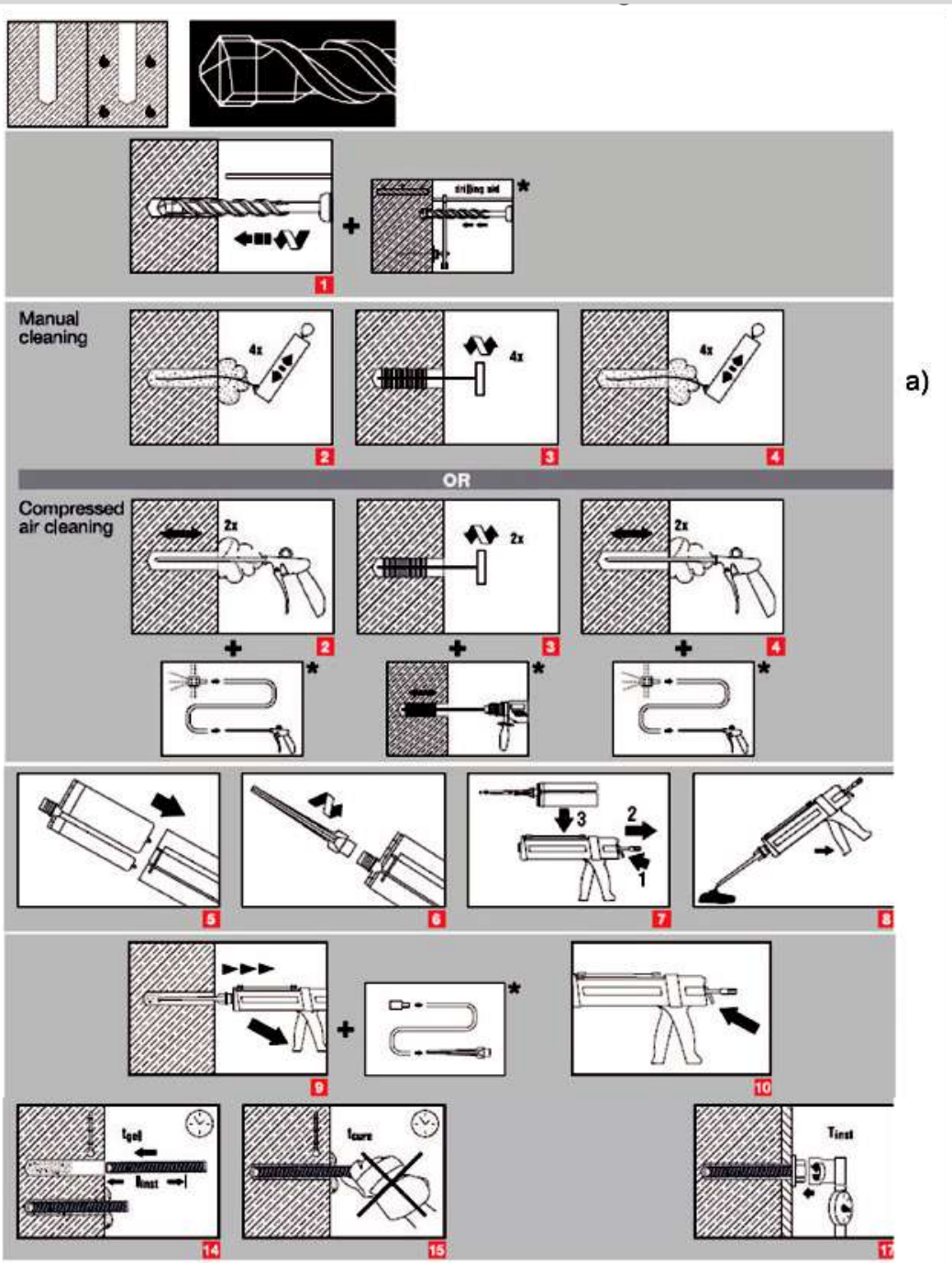
Curing time for general conditions

Data according ETA-04/0027, issue 2009-05-20		Additional Hilti technical data	
Temperature of the base material	Curing time t_{cure} before anchor can be fully loaded	Temperature of the base material	Working time t_{gel} in which anchor can be inserted and adjusted
40 °C	4 h	40 °C	12 min
30 °C to 39 °C	8 h	30 °C	20 min
20 °C to 29 °C	12 h	20 °C	30 min
15 °C to 19 °C	24 h	15 °C	1 ½ h
10 °C to 14 °C	48 h	10 °C	2 h
5 °C to 9 °C	72 h	5 °C	2 ½ h

Setting details

			Data according ETA-04/0027, issue 2009-05-20							Additional Hilti technical data
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	24	28	35	40
Effective anchorage and drill hole depth range a)	$h_{ef,min}$	[mm]	40	40	48	64	80	96	120	144
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	600	720
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + 2 d_0				
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	33	39
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	150	180
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	150	180
Torque moment b)	T_{max} b)	[Nm]	10	20	40	80	150	200	300	360

Setting instructions



Brush bore hole with required steel brush HIT-RB

a) Note: Manual cleaning only for hef ≤ 250 mm and anchor size ≤ M16

For detailed information on installation see instruction for use given with the package of the product.