

Cracking Matters

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ISSUE NO. 1

TRAINING

... the way forward

How often have we heard it?

When business is good contractors say that they are too busy to train people. There is so much work to be done that they simply cannot spend time on training. It's all hands to the pumps!

But what happens when the boot's on the other foot? During recession there is too little spare cash to spend on training, they say. Work is extremely difficult to win, prices are very competitive and the very low margins will simply not allow for investment in training.

So what does all this add up to? The answer is a serious decline in new operative training and precious little refresher education for existing site operatives. The situation exists throughout the construction industry. It has been estimated that the lack of training investment during the last recession exacerbated the loss of around 150,000 tradesmen and professionals from the construction industry.

So what's the answer?

The Concrete Repair Association (CRA) believes that the answer lies in co-operation between specialist organisations in the same field. It has therefore set up its own internally administered training scheme and is currently registering card carrying operatives among its contractor members. The scheme involves CRA contractor member operatives being given systematic training and refresher courses by CRA manufacturer members, thus ensuring that they are fully aware of the new products and systems being introduced and of the latest installation techniques.

In order to be registered as a 'Concrete Repairer' under the scheme, the operative will need to have been employed within the industry (by a CRA contractor member) for a minimum of twelve months and to have satisfactorily passed the training programmes of at least two CRA product manufacturer members.



Provided he has achieved the standards required he will be issued with an ID card containing his name, photograph, company, registration number and an expiry date of three years hence. The ID card is updated only if the operative remains within the industry, or as and when further training is undertaken.

CRA manufacturer training modules, both in-house and on-site, embody all the critical aspects essential to accomplish a successful project. It has been found that participating companies have subsequently increased productivity and reduced wastage through improved skill levels. Training modules include; symptoms, causes and diagnosis of distress to reinforced concrete; the correct systematic approach to repair; preparation techniques; mixing and practical application of repair mortars, fairing coats and anti-carbonation coatings; curing methods; question and answer sessions.

After each course, all operatives must successfully complete a questionnaire based on the training programme.

The scheme will enable the client, or his representative, to check the validity of

WELCOME TO 'CRACKING MATTERS'

The journal of the Concrete Repair Association.

It is the aim of the Association to keep you informed of the latest developments in this specialist construction sector. We hope you find this first issue of interest and would welcome your views on any matter relating to concrete repair.

Pat McArdle, Chairman - CRA

the operative, via the Association, at any time during a contract.

As the new CRA training scheme is vocational, it is expected that it will eventually be adopted as a National Vocational Qualification (NVQ). As it grows, the CRA envisage that a full time consultant may be needed for its administration.

BUSINESS DOWN, BUT OPTIMISM PERSISTS

The latest set of state of trade findings, relating to the U.K. concrete repair market between January and June of 1997, show a slight increase in civil engineering related work and a decrease in standard building work, over the same period for 1996. Overall, however, business volume was down.

The findings, produced by the CRA on a six-monthly basis, cover both contracting values and product sales volume.

In comparison with the first six months of 1996, the figures reveal a decrease of 23% in the value of concrete repair work completed by CRA contractor members and a corresponding decrease in the number of contracts completed. Orders received during this period (currently being carried out), however, were significantly greater in value than actual work completed in both halves of 1996.

Concrete repair related work enquiries received were also up in the building sector and about the same on the civil side, but during the period no appreciable change in the intervals between concrete repair enquiries being received and work being let had been experienced. Other findings showed that in all sectors an average of approximately 58% of CRA members' total workload was accounted for by concrete repair work.

Not surprisingly, most contractors reported that they continue to operate at less capacity than they would normally regard as a satisfactory workload, but remain optimistic about work volume and value for the forthcoming twelve months.

The second survey, carried out among the CRA's product manufacturer members shows a slight increase in sales of spray applied and flowable repair mortars, but decreases in sales of hand placed mortars, fairing coats (which had experienced outstanding sales in the final half of 1996) and in anti-carbonation coatings.

Manufacturer returns show that whilst most foresee sales volume remaining static over the forthcoming twelve months, they do anticipate an increase in sales value and margins.

THE JOURNAL OF THE
CONCRETE REPAIR ASSOCIATION

THE
CONCRETE
REPAIR
ASSOCIATION

AUDIO VISUAL GUIDELINES

TO CONCRETE REPAIR

The continuous deterioration of concrete structures and a seemingly endless requirement for knowledge of repair procedures, has prompted the CRA to produce a seminar slide presentation clarifying the essential procedures necessary to conclude a successful concrete repair project.

The programme is based upon the Association's publication, 'The route to a successful concrete repair' and is designed to assist understanding of this specialist activity among construction professionals.

It highlights the various aspects to be taken into account when faced with the repair of reinforced concrete and provides guidelines to the best approach to be adopted. It is approximately 45 minutes in duration.

Details regarding types of repair product, alternative repair techniques, the causes of concrete deterioration and methods of carrying out concrete repairs are included, but not in detail. The programme concentrates more on aspects of overall project control such as: Safety of the structure and environmental hazards; Assessment of damage, deterioration and diagnosis of its cause; Definition of the clients objectives; Design of the repair work and choice of methods and materials; Preparation of contract documents, specification and Bill of Quantities;



Contractor selection and evaluation and Supervision of the work.

The CRA is prepared to present the programme to relevant professional organisations at no charge - provided more than 20 delegates are able to attend. The programme is presented by

a CRA specialist contractor and a CRA product manufacturer member in order that questions can be fielded from both a practical and product viewpoint. In the opinion of the CRA the programme is suitable for CPD.

Interested? Contact: (01703) 738953.

SECOND EDITION OF 'STANDARD METHOD OF MEASUREMENT FOR CONCRETE REPAIRS'

Earlier this year, the CRA updated and printed the second edition of its established publication, the 'Standard Method of Measurement for Concrete Repair'. The 52 page document, originally produced in 1990, enables the production of clearer Bills of Quantities for concrete repair work.

Pre-determining the depth and area of deteriorated or damaged concrete before breaking out is complete cannot be precise. This in turn makes it difficult to accurately quantify the volume of work and time needed to complete the project. Bills of Quantities can therefore only be regarded as approximate, with the accuracy of quantities depending upon the degree of initial survey, sampling and test data available prior to the contract documents being produced.

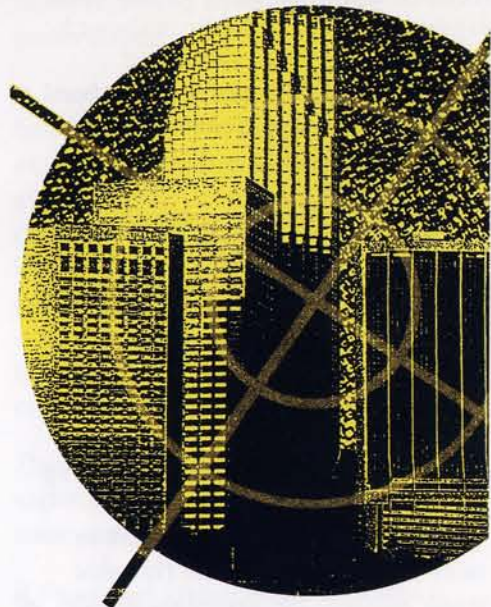
The CRA's Standard Method of Measurement has been produced specifically in order to overcome some of the difficulties associated with this situation.

The publication fully clarifies the various repair functions such as trails and testing; surface cleaning; survey; patch repairs; pore/blow hole filling; levelling mortar; surface coating and resin injection. Each of these sections separately lists the various alternative methods of completing the functions and provides a measurement procedure.

The document will assist with remeasurement for valuations of actual works. A specimen Bill of Quantities is also included, together with pages for individual user notes.

Copies of the publication (£15.00) can be obtained from: CRA, Association House, 235 Ash Road, Aldershot, Hants GU12 4DD. Tel: (01252) 321302. Fax: (01252) 333901. email: john.fairley@btinternet.com

CRA target specific groups



The CRA has just launched an awareness promotional campaign specifically targeted at U.K. Consulting Engineers and Housing Associations. 'Cracking Matters' is part of the promotional programme.

It has long been appreciated by the Association that Consulting Engineers are involved at the very early identification and assessment stages of concrete deterioration, which is often the time when most help and assistance is required. Since the Association is

ideally placed to provide support, through its specialist publications, its Members Directory and via advice from its independent Technical Consultant, the organisation feels that it needs to increase awareness of the availability of these services.

The CRA also considers that the same services could be made use of by Housing Associations, especially now that many have taken responsibility for maintaining much of the U.K.'s public housing stock.

To spread the word, the Association is placing advertisements and product cards in selected journals and sending regular mailer packs to both targeted categories. In addition, the CRA is organising presentations of its successful audio-visual programme entitled 'The route to a successful concrete repair' to regional groups of Consulting Engineers and Housing Associations.

The Association considers this promotional activity an essential component in its declared 'commitment to quality'. If not already obtained, the Association insists that all full specialist contractor and product manufacturer members are Q.A. registered to ISO 9001/9002. Such self-regulating standards and procedures ensure that engineers, authorities, clients and other specifiers are able to select from a list of established specialists for concrete repair projects.

JOHN PARKER NEW CRA TECHNICAL CONSULTANT

John Parker ARICS., FInstD. is the Association's new Technical Consultant. He recently took responsibility for the position from retiring Frank Dyton, who has held the post for more than three years.

The CRA Technical Consultant is responsible for the management and co-ordination of the CRA technical working groups, the production of technical papers/ advice notes and for liaison with other trade bodies and external committees.

He is also available to assist specifiers, contractors and building owners with technical enquiries on concrete repair techniques, product systems and contracting services and can be contacted direct on telephone/fax: (01829) 270230, or via the CRA Secretariat on (01252) 321302.

This advisory service is provided in line with the CRA's commitment toward advancing understanding of the technological and practical aspects of concrete repair and is available without charge.

John Parker, who has more than 25 years experience in specialist concrete repair contracting - many at Technical and Managing Director level, is a Chartered Surveyor and an Associate of



the Royal Institution of Chartered Surveyors.

Between 1989 and 1993, as a member of the CRA, he was Technical Committee Chairman and produced the 'CRA Method of Measurement for Concrete Repair'. He was the initiator of the CRA Training Scheme and has served on European Standards Committees and Concrete Society Working Parties.



COMPLETE REFURBISHMENT FOR SOUTHAMPTON CAR PARK

The 680 space, ten level, Eastgate Street MSCP in Southampton, has just been completely refurbished by specialist contractors - **MAKERS INDUSTRIAL LIMITED**. The City centre car park, constructed in 1967 using the cambered deck British Lift Slab design, utilising pre-cast columns and in-situ deck slabs, had been suffering from both chloride and carbonation attack. The extensive refurbishment package included substantial concrete repair, the installation of new solvent free, elastomeric deck membranes at every level, the application of anti-carbonation coatings to all concrete soffits, columns, parapets and the re-sealing of expansion joints in the decks. External elevations were re-clad with profiled, powder coated aluminium panels, security grillage installed, lifts and lighting upgraded and anti-graffiti coatings applied to pedestrian areas. For more details of Makers Car Park Division and Makers tool box approach to concrete repair contact Mike Darby (01487) 832222. ENQUIRY NO: 100



BALFRON TOWER BENEFITS FROM BAGNALL'S

Travel through the Blackwall Tunnel into London's East End and your eye will be caught by one of the largest residential tower blocks in the City. This 1960s solution to the then housing shortage is Balfron Tower and it has recently been undergoing refurbishment by specialist contractors, **ALFRED BAGNALL & SONS (RESTORATION) LIMITED**, of Belvidere in Kent Listed by English Heritage. Balfron Tower required all the advanced Project Management skills of Bagnall's team to complete the project in accordance with the specification. The client's wisdom in choosing a specialist contractor is being revealed as the scaffolding comes down on another successful job by Bagnall's. Further information is available from Bagnall's on: 0181 311 3910 ENQUIRY NO: 101



CONCRETE REPAIRS LIMITED LEADERS IN C.P.

Cathodic Protection (C.P.) is now established in the U.K. market as a proven method for controlling the corrosion of reinforcement in concrete. With over 30 installed contracts in the U.K., **CONCRETE REPAIRS LIMITED (C.R.L)** continues to lead this market. In High Wycombe, C.R.L is currently repairing Easton Car Park, which involves repairs to delaminated areas of concrete and the installation of a C.P. system using a combination of conductive paint and titanium ribbon anodes. By using a C.P. system the client, Wycombe District Council, has reduced the amount of concrete repairs which are necessary and maximised the durability of the concrete. Further information is available from Concrete Repair Limited - Tel: 0181 288 4848. ENQUIRY NO: 103



BALVAC COMPLETELY REFURBISH LISCARD HOUSE, WALLASEY

The residents of Liscard House, a 13-storey tower block on the Wirral in Merseyside, are soon to be taking in magnificent views through new windows, surrounded by repaired and refurbished exposed aggregate cladding panels. Wirral Metropolitan Borough Engineers had raised concern over the integrity of the panels during routine inspection. Defects in the concrete frame, caused by carbonation induced corrosion, were apparent. **BALVAC** secured each panel to the structural frame with four stainless steel anchors, 25mm diameter by 600mm long, installed through each panel into cementitious grout. This was followed by conventional repairs to the exposed and deteriorated concrete frame and panels. The 80 week, £550,000 project is being carried out whilst the building remains fully occupied. For further details contact: (01773) 542600 ENQUIRY NO: 102



INSPECTING AND TESTING BY PITCHMASTIC

Probably the single most important function of any Property Owner or Manager is that of accurate budgeting/accessing of future (short and long-term) maintenance expenditure. To do this, it is of prime importance to understand both the true cause and extent of defects, because only when in possession of all the relevant information/facts relating to the problem can a long term successful remedial strategy be arrived at. The Inspection and Testing Division of **PITCHMASTIC PLC** carries out all forms of inspection and testing to concrete and steel structures and buildings. Contact: Michael Nugent, PITCHMASTIC PLC, on (01322) 303132 for further information ENQUIRY NO: 104

News from CRA members



IRISH BRIDGES PROTECTED WITH BETONFLAIR

Ten newly built concrete bridges, two culverts and a number of retaining walls, (15,000m²) forming part of the recently constructed M50 Northern Cross Motorway in Ireland, have been treated with the full **MC BUILDING CHEMICALS' Betonflair** coating system. The four products comprising the system are primarily designed to resist attack from carbonation and atmospheric gases, as well as water and chloride ingress. The system also needed to comply with the new (1995) Irish Specification for Road Works and to meet other specification requirements. These called for a specific UV resistant, colour stable and non-staining colour design to blend with the environment and an anti-graffiti finish. Further details from: MC Building Chemicals, Tel: 0121 789 8333. ENQUIRY NO: 105



Ronacrete Take the Lead!

RONACRETE has been heavily involved in the refurbishment of the new premises for Dogs For The Disabled, one of the Guide Dogs For The Blind's key initiatives. The concrete kennel runs were repaired and the basement floor was waterproofed to convert the area into a boiler room. Ronafix Mix E watertight render was specified for the basement, while Ronafix Mix B floor topping was applied to the dog runs within the kennel blocks. The floors have to be waterproof, urine resistant, easy to clean and have the right degree of surface roughness to keep the dogs' paws in good condition. Ronafix meets the Association's stringent requirements for floors in these areas. "Having sponsored two of their dogs, we are delighted that we and our products are strongly associated with them" comments Joint Managing Director, Daniel Osen. Further information is available from Ronacrete - Tel: 0181 593 7621. ENQUIRY NO: 106



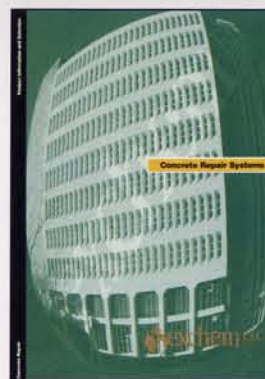
CORROSION INHIBITORS

Complementing traditional approaches to concrete repair, **SIKA** has introduced a surface-applied, penetrating corrosion inhibitor, Sika FerroGard-903, to its range. It is applied by brush, spray or roller and penetrates the concrete to form a strongly-adhered layer on the surface of the reinforcing steel. In most cases, this alternative electrochemical approach should be used as part of a comprehensive repair system, including protective coatings. The track record is now considerable, with numerous project references to support the extensive laboratory work. Cost-effectiveness will depend upon circumstances, but a recent housing project resulted in 30% savings compared to the traditional approach. Sika FerroGard-903 now provides a valuable option within a long-term concrete repair and protection strategy. For more information telephone: (01707) 394444. ENQUIRY NO: 107



CATHODIC TECHNIQUE USED AT HUNTERSTON 'B'

Battling against the extreme weather and tidal conditions of the West Coast of Scotland, **LLEWELLYN STONECARE LIMITED** has recently completed the repair and protection of the Water Intake Jetty at Hunterston 'B' Nuclear Power Station. Access was achieved by specifically designed climbing platforms to minimise wave loading. The damaged concrete was removed by hydrodemolition and reinstated using both sprayed and hand placed techniques. As Scottish Nuclear require a durable refurbishment, a cathodic protection system was installed using titanium mesh/sprayed concrete overlay above tide level and fixed zinc anodes underwater. The system is set up to be remotely monitored over the next 20 years. For further information contact: Brian Gardiner (01908) 679222. ENQUIRY NO: 108



CONCRETE REPAIR SYSTEMS FROM EXCHEM

In today's aggressive environment, **EXCHEM'S** concrete repair and protective coating systems provide simple solutions to the damaging effects of freeze/thaw action and reinforcement corrosion. Our research and development technicians are specialists in developing products that are both outstanding in performance and absolutely cost effective. Exchem materials can be used individually or as part of an overall concrete repair and protection system. For over 25 years, Exchem has been developing and supplying materials which perform to the highest industry standards. More information on the company's products can be obtained by telephoning (01773) 540440 ENQUIRY NO: 109



YES MINISTER, THE CONTRACT IS COMPLETE

Chris Smith, MP for Islington South & Finsbury and Secretary of State for Culture, Media and Sport, recently accepted contract documents and guarantees from **YOLDINGS LIMITED**, on behalf of Islington Council, following the completion of a £400,000 housing refurbishment project at Ewen and Ritson House, Islington. Yoldings were the Main Contractors for the work which included specialist concrete repairs, roofing and drainage. Pictured on site are (from the left), Ian Cole (Contracts Manager: Yoldings), Peter Clark of Roughton Consultants (Supervising Engineers for the contract), Councillor Pat Haynes (Islington Deputy Mayor), Bob Berry (Marketing Manager: Yoldings) and Chris Smith (MP and Secretary of State). For further details contact: Yoldings Ltd., (01323) 442288. ENQUIRY NO: 110



FOSROC AND CONCRETE REPAIR Over 60 years of technical expertise

Every day, **FOSROC** successfully puts over six decades of experience into practice. In the field of concrete technology, Fosroc leads the way. By developing a disciplined, systematic approach to the problem, Fosroc has been consistently successful. Through the careful selection of procedures and products designed to suit each task, a permanent technically-correct repair is achievable. Fosroc's traditional expertise has been further strengthened by the introduction of the Norcure electrochemical methods of desalination and realkalisation. These non-invasive treatments, combined with the Renderoc and Dekguard concrete repair systems, provide products and technical excellence for the rehabilitation of carbonated and chloride contaminated concrete. No one knows how to do it better than Fosroc. Telephone: (01827) 262222. ENQUIRY NO: 111



BIRMINGHAM CITY LABORATORIES

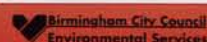
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Telephone for a free copy of - "The First Step to Successful Repair"



Birmingham City Laboratories, Engineering Services, 20 Howe Street, Birmingham, B4 7XW Telephone: 0121 303 3819 Facsimile: 0121 236 6174

ENQUIRY NO: 112

INVESTIGATION

... the first step to successful concrete repair

By: Trevor Box - Birmingham City Laboratories

No person has money to waste.

Whether we are building owners needing to repair or refurbish our property, or professionals charged with the repair, maintenance or safety of a building or structure, we need to ensure that any works undertaken are appropriate and represent good value for money.

To achieve such goals all repairs must be appropriate for the particular circumstances that exist and their performance must guarantee that the design objectives are met. The old adage 'If we don't know what's wrong we can't fix it' is very true and we would be negligent if we refurbished a structure that incorporated a major latent defect that was likely to lead to significant damage in the near future.

At the inception it is important to consult the owner to get his perspective of the serviceability requirements of the structure. This will allow the design of an appropriate investigation and ensure that sufficient information is generated to accurately predict the performance of the structure and its maintenance requirements.

Various techniques are available to investigate a reinforced concrete structure, to determine its condition, to establish the causes of deterioration and consequently to allow predictions to be made regarding its likely future performance.

A two-stage investigation is generally the best approach. The initial survey should, as a very minimum, include an overall assessment of the condition of the concrete. Representative testing should be undertaken to determine concrete cover to reinforcement, the depth to which the concrete has become affected by carbonation, the chloride ion content of the concrete and its cement content.

These investigations need to be undertaken at sufficient locations to have some statistical relevance.

If this initial investigation indicates a significant risk of deterioration of the concrete, then a more in depth survey should be undertaken to explore the likelihood of this risk being realised. This second stage investigation could include visual and hammer testing, further carbonation and chloride assessments, half-cell potential mapping and electrical resistivity surveys as appropriate.

One of the more recent techniques developed is Linear Polarisation. This technique measures the corrosion rate of the reinforcement i.e. the amount of steel



Testing is a critical aspect of the concrete repair process

dissolving and forming oxide. The site use of this technique is beginning to become feasible following improvements in the available equipment. The technique directly measures the electric current generated by the anodic reaction, thus allowing an estimate of the corrosion rate to be calculated. It does, however, have a number of limitations and these should be fully appreciated. Most work using linear polarisation has been done in chloride induced corrosion conditions. However, data is now being generated for corrosion rates in structures with carbonation induced corrosion.

Other testing techniques, such as the removal of core samples from the structure using diamond-drilling apparatus, can be undertaken. The removed cores can then subjected to a



number of tests such as compressive strength and petrographic examination. The later may be used to diagnose deterioration due to the formation of sulphate phases such as Ettringite and evidence of or potential for alkali aggregate reaction, especially if electrochemical rehabilitation is being considered.

A range of non-destructive techniques is available to the Engineer to allow comparisons of concrete quality and to determine areas of voidage or discontinuities such as cracks or delamination. The techniques most commonly employed during concrete condition surveys are ultrasonic pulse velocity testing, thermography and radar image analysis.

It goes without saying that investigations should proceed in as many stages as may prove necessary until they have identified the principle cause(s) and extent of deterioration. The thorough investigation of a structure will enable the visible and latent defects to be established along with the mechanisms that have led to deterioration of the structure. This will enable an appropriate repair strategy to be formulated including the techniques and materials to be used, be they traditional patch repairs or electrochemical rehabilitation techniques.

Expenditure incurred at the investigation stage, to fully understand the problems associated with a particular structure before the initiation of a major repair contract, is invariably money well spent.

CRA'S POPULAR DIRECTORY UPDATED FOR 1997/98

The Concrete Repair Association's comprehensive Members Directory, designed to be of practical use to engineers and specifiers, has just been updated for 1997-1998.

The handy, 44 page, one-third A/4 pocket sized booklet, lists all the U.K.'s established specialist concrete repair contractors and product manufacturers and carries detailed information on each company.



Each member's entry gives main office address and regional office details, a description of the company's specialist activities, third party accreditation's and the company's areas of operation.

To be of assistance when compiling tender lists for concrete repair work, each contractor's entry also includes information on contract values catered for, the company's largest contract to date and approximate annual turnover.

The Directory also includes information on the technical services provided by the Association, the CRA training initiative, the CRA Code of Practice, CRA publications, a bibliography of related literature and names and addresses of associated organisations.

High performance concrete repair work calls for specialist application capabilities and specialist materials. The CRA believes that general contractors and untrained personnel are simply not up to the task. This booklet will therefore prove invaluable to those involved with concrete repair projects.

Copies of the Directory are available free of charge. Listed below are other publications available from the Association:

- The Standard Method of Measurement for Concrete Repair: £15
- Application & Measurement of Protective Coatings for Concrete: £5
- The Route to a Successful Concrete Repair: £5

All can be obtained from: The CRA, Association House, 235 Ash Road, Aldershot, Hants GU12 4DD. Tel: (01252) 321302. Fax: (01252) 333901. email: john.fairley@btinternet.com

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