



THE JOURNAL OF THE CONCRETE REPAIR ASSOCIATION

ISSUE NO. 17

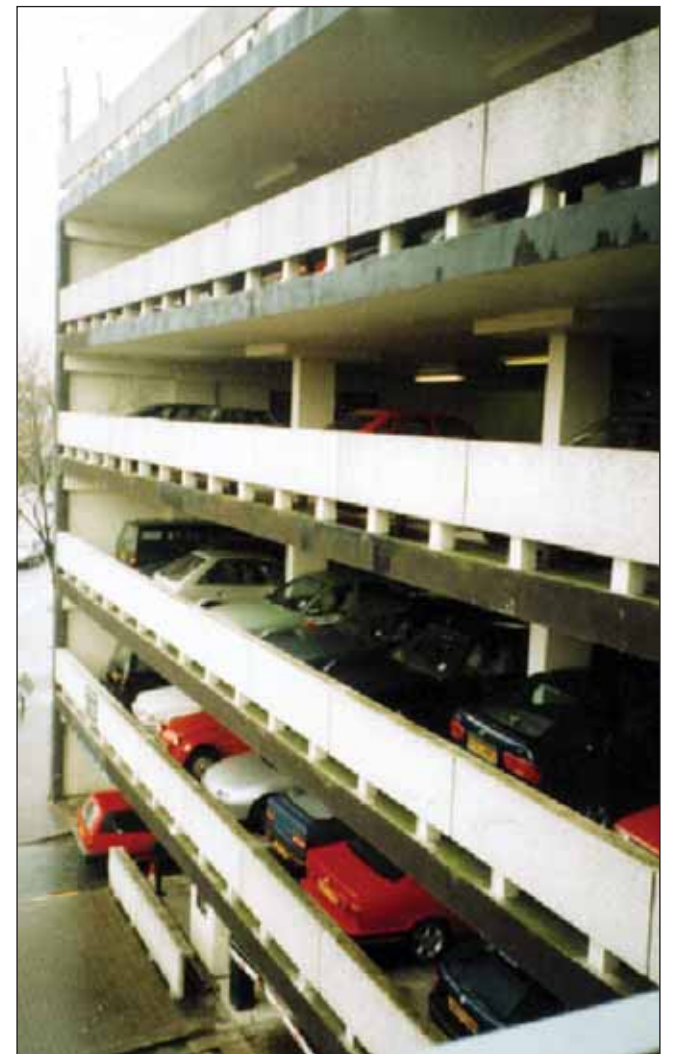
CAR PARK MAINTENANCE - are we doing enough?

By: Professor Peter Robery, Halcrow Group Ltd

Over the past 15 years, the commercial advantages of providing an improved quality of parking environment have been increasingly realised by owners and operators and this has led to a significant number of car parks being refurbished in the UK. It is wrong to believe that the application of decorative coatings and waterproofing membranes to concrete is necessarily tackling the root issue of structural durability. There is a risk, unfortunately, that such coatings merely cover up defects, making them harder to monitor and treat.

The shortcomings in car park maintenance were made clear in the guidance issued by the UK's Institution of Civil Engineers (ICE). It has been more than four years since the ICE National Steering Committee for the Inspection of Multi-storey Car Parks (NSC) published its 'Recommendations for the inspection, maintenance and management of car park structures', which were heralded as providing guidance on standards of care for multi-storey car parks.

It should be asked, however, that with the publication of the ICE-NSC Recommendations, whether the UK parking industry has done enough to avoid another possible car park collapse. In particular, are the risks



The definitive guide to concrete repairers

The CRA has just updated and re-designed the 2006 edition of its handy and informative Members Directory, which is specifically intended to be of practical, every-day use to Clients, Specifiers, Consultants, Surveyors and Local Authorities.

The latest edition includes updated information on all of the CRA's thirty-nine member companies that comprise the majority of the UK's established specialist contractors, product manufacturers and distributors involved in the business of concrete repair and allied activities. Since the Directory was last published, CRA membership has risen by almost 20%.

The 62-page pocket-sized booklet gives information on each Member Company, its head and regional office locations, web site, email details and the names of primary contacts. A description of the company's specialist concrete repair activities (in the case of manufacturers - its products) and third party accreditations are also included. To assist selection



when compiling tender lists for concrete repair work, each contractor's entry includes details of contract values catered for, the company's largest contract to date, its total turnover, the value of its concrete repair related business and its geographical area of operation.

The Directory contains details of the Association's technical helpline; its NVQ/CSCS related training scheme and Codes of Practice. It also provides information concerning the Association's free CD-ROM, which contains audio-visual programmes on 'The route to a successful concrete repair' and

'Structural strengthening with composites', as well as other useful literature, a bibliography of allied documents and a list of closely related organisations.

Copies of the 2006 CRA Directory can be obtained free of charge from the Secretary, Concrete Repair Association, Association House, 99 West Street, Farnham, Surrey GU9 7EN.
Tel: (01252) 739145 Fax: (01252) 739140
Email: cra@associationhouse.org.uk
Website: www.cra.org.uk

to our car parks fully understood by all designers, contractors and owner/operators working in this field?

It must be remembered that while the majority of the UK's 4,000 or more car parks are owned and operated by specialist car parking companies, many

has the UK parking industry done enough to avoid another possible car park collapse

are 'one-off' structures forming part of another complex such as a theatre, or shopping mall. If the message contained in the NSC Recommendations is not getting through to these owners, who may include

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www.cra.org.uk



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investment companies, or retail / commercial outlets, their structures may be particularly at risk.

BACKGROUND

Despite a boom in multi-storey car park construction over the past 40 years, reports of early deterioration, structural failure and accidents have raised concerns over the structural safety of some multi-storey car parks. The incident at Wolverhampton's Pipers Row car park in March 1997 (HSE, 2003), when a 120t section of the top floor collapsed onto the deck below, triggered several initiatives concerning safety. Industry and Government responded promptly:

- The Institution of Structural Engineers (ISE) commenced a revision of their design recommendations for new multi-storey car parks, including measures to prevent penetration of de-icing salt into the concrete ramps and driveways (ISE, 2002).
- The Institution of Civil Engineers (ICE) responded by forming a National Steering Committee responsible for producing recommendations for the inspection, maintenance and management of car park structures (ICE-NSC, 2002).
- Under the auspices of The Office of the Deputy Prime Minister (ODPM), Mott Macdonald undertook a research project to provide analysis of car park structure performance and provide easy-to-follow guidance notes.
- The DETR also reported on edge barrier assessment for multi-storey car parks, led by Cranfield University (DETR, 2001).

Four years after publication, questions remain as to whether the ICE-NSC Recommendations have been fully adopted for use in the car park industry. For example:

- Are all owner/operators aware of the ICE-NSC Recommendations and taking active steps to prepare a Life Care Plan (LCP) for their multi-storey car parks?
- Has the UK car parking industry done enough to avoid another car park collapse?
- Have effective maintenance strategies been put in place to ensure our car park structures are safe and durable?
- Are the risks to our car parks fully understood by all designers and contractors at the earliest stage possible?
- Are personnel, responsible for the operation and maintenance of the car park, familiar with the reasons for the Pipers Row collapse and the implications for their structures?
- Are training schemes available to both owners and operators to enable implementation of the LCP and to carry out daily surveillance by on-site staff?

ICE-NSC RECOMMENDATIONS

The ICE-NSC Recommendations clearly demarcate the responsibilities of the car park owner and operator in terms of maintaining their structures in a safe and serviceable condition. A key recommendation is that an LCP is produced for each car park structure, to ensure that the safety and serviceability of the structure is verifiable and that evidence of action taken is recorded. The LCP is also a statement of the present and predicted condition of the car park, based on regular inspection, structural assessment and maintenance needs. It sets out a management strategy for achieving long-term serviceability and safety, with minimum cost and disruption. The LCP is therefore an effective management and maintenance tool based on asset management systems. To comply with the ICE-NSC Recommendations, the owner and operator should:

- Appoint an experienced engineer to advise on material durability, structural safety, inspection, maintenance and repair, to industry standards
- Instruct engineers to prepare LCPs for each structure and provide the resources needed
- Keep records up to date and available.



UNDERSTANDING

It must be acknowledged that the standards of design and specification of car parks have improved considerably since the 1960s. This has been accompanied by potential improvements in the quality of concrete and in achieving increased reinforcement cover, along with a better understanding of the effects of de-icing salts and freeze/thaw action on concrete structures, particularly since the 1980s (ICE-NSC, 2002).

A key problem remains, which is the lack of understanding by some owners, operators, designers and contractors of the mechanisms at work that affect the life of a car park:

- De-icing salt exposure of unprotected car park decks is often more severe than for a concrete bridge
- A high risk of reinforcement corrosion exists, yet the car park often has poor design detailing and low quality construction (poor quality concrete, low cover, poor curing practices, no surface protection)

- Unprotected concrete will be cracked and saturated, leading to leakage into the decks below and a risk of freeze-thaw damage
- Simple patch repairs to areas of visible damage will not slow down deterioration and in fact can accelerate it.

Owners and operators of car parks can perhaps be forgiven for not understanding the key technical issues affecting their car parks. Concrete has traditionally been considered a highly durable construction material that required little or no maintenance. In a dry, chloride-free environment this is certainly the case, even with concrete built in the 1960s. But in a multi-storey car park, potential problems can include: de-icing salt contamination; cast-in chlorides; carbonation; inadequate reinforcement cover; wet and cyclic wet/dry environments, conducive to corrosion; substandard concrete mixes; exposed, unprotected surfaces; defective waterproofing systems and coatings; poor drainage; inadequate or completely absent

...experience suggests that there are still a significant number of car parks that have no LCP in place.

edge protection systems; and damage resulting from vehicle impact. Concrete elements can also be potentially affected by alkali silica reaction and sulfate attack in foundations.

If left uncontrolled, any of the factors mentioned above can accelerate the deterioration process and thereby begin to reduce the car park's structural capacity. If left unchecked the car park structure continues to deteriorate eventually leading to structural failure.

Many of the largest car park owners and operators have adopted the ICE-NSC Recommendations and have LCPs in place. In fact, many of these organisations contributed to the document. However, experience suggests that there are still a significant number of car parks that have no LCP in place, with owners and operators remaining completely unaware of their recommended obligations in this area.

ACTION

The key factor in getting the message across to owners and operators is to

provide clear technical advice and support from the engineering world. The message must stress that the recommendations are not optional, but are endorsed by the Health and Safety Executive, who note that as a minimum the occupier has a duty of care to arrange for the premises to be reasonably safe for people who enter them (ICE-NSC, 2002).

Preparation of the LCP is therefore not a luxury, nor an option. In addition, an LCP will allow owners to realise the financial savings and benefits of efficient management of their resources.

Generally, the main objective of car park owners and operators is to achieve a long, low maintenance and serviceable structure, with minimum cost and disruption to the ongoing operation. In today's competitive industry a practical management tool such as the LCP is essential and collaborative effort is needed by the owner, operator, engineer and suppliers to develop a cost effective maintenance strategy that will ensure structural safety is assured, resources are optimised and declining capital value is avoided.

NOTE:

Professor Peter Robery will be presenting a full paper on this topic at the forthcoming Structural Faults and Repair event in Edinburgh, 13th-15th June 2006 (www.structuralfaultsandrepair.com)

Enquiry No: 1701

NEW SPECIFICATION TEAM FOR WEBER



weber building solutions are pleased to announce the appointment of 3 new Specification Managers who will focus on building facade concrete repairs and the protection of structures. Each Specification Manager will work within the Technical Mortars business unit of weber building solutions providing technical advice and guidance to specifiers and contractors alike.

The new appointments

David Wylie
South East & London 07917 489379

Chris Hughes
Northern England 07976 159218

Kevin Davies
South West & South Wales 07976 159127

are available to answer any questions you may have about the repair, strengthening or protection of buildings so do not hesitate to contact your local weber Specification Manager for further assistance.

ENQUIRY NO: 1702

STRUCTURAL RENOVATIONS SHORT-LISTED FOR SPECIALIST CONTRACTOR AWARDS

Slough based Structural Renovations Ltd has been short listed in the Concrete Category of the Construction News Specialist in Construction Awards 2006 held at the Park Lane Hilton on 11th May 2006.



These prestigious awards are supported by both the Specialist Contractors Council and the Specialist Engineering Contractors Group and recognise the critical role played by specialist contractors of all sizes and types on this country's construction projects. By reaching the short-list, Structural Renovations Ltd has demonstrated to the judges that the company improved in all aspects of its business ranging from accident statistics, levels of training, client satisfaction and financial return, over the past 12 months.

Why not join our satisfied client base by visiting our web site on www.structren.co.uk or by calling Andrew Muirhead on 01753 825511

ENQUIRY NO: 1703

THE CONCRETE CONSULTANCY 2000 LTD



As an ISO 9001:2000 accredited firm, a member of the CRA and with a wealth of experience both at home and overseas, the Concrete Consultancy 2000 Ltd offers a truly independent service for the assessment and testing of reinforced concrete structures, upon which Engineers, Consultants and Surveyors can rely. Employing the latest and most cost-effective access and analytical techniques, our clients are assured of both a professional and practical service from initial enquiry, through site and analytical works, to the final reports, recommendations and assistance with specifications.

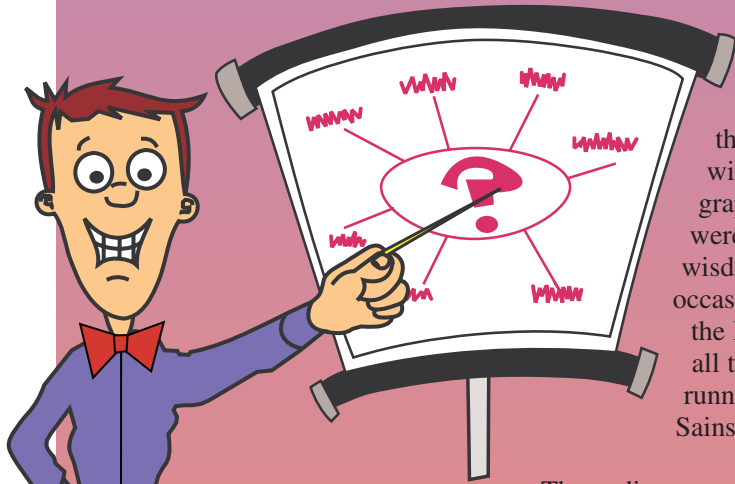
Tel: 01707 647266, or Mobile: 07775 940896

ENQUIRY NO: 1704

A PLAGUE ON THEM!

We recently came down with the second worst corporate disease in the known universe; a plague of Management Consultants. Not as bad as the worst corporate disease; a plague of Accountants, but bad enough!

It was, in our opinion, easily equal to the arrival of a swarm of locusts (who would have probably eaten less), or darkness at midday, which is a condition that we have become used to working in.



After much wandering round with (and without) clipboards and covering the walls of our training room with a rainbow of charts, graphs and statistics, the MCs were ready to impart their wisdom. After a brief delay, occasioned by the discovery that the MC contingent had guzzled all the milk, precipitating a fast runner being dispatched to Sainsbury's, we began.

The audience was, it is fair to say, evenly split between the eager beaver attendees who hung on every word and the Luddite tendency, who sat back ready to criticise. Well, the charts, graphs and statistics were fully elucidating. At the end of the presentation, the Chief Luddite pronounced to anyone prepared to listen, "I've been saying that for years!" and returned to his office snaffling the last of the custard creams by way of a trophy.

The primary MC looked gratified at this and on the basis that you should always quit when ahead, gathered his papers and people together and left.

Now, as befits a correspondent to 'Cracking Matters', I took a fairly neutral view of the proceedings. But it does occur to me there is a lesson here for all of us. Companies in general and large ones in particular, are very good at ignoring the pool of experience and advice that they have in house, preferring to bring in an outside consultant as a first, rather than a last resort.

There are, of course, plenty of occasions when you need to bring in expertise, since structural engineers, architects and the like tend to work independently of contracting organisations. These professionals have to be brought in as and when they are needed. But do we always need an outside eye to come in and to quote John Cleese, "... state the bleedin' obvious?"

I think we are missing a trick if we fail to capitalise on the expertise that we have in our own organisations before calling in outside help. At the very least we will have covered all the angles by canvassing the full range of opinion available, which should give the best possible answer, or advice, a chance to surface. In fact, to use the jargon of the day, it enables us to make an 'informed choice'.

Which reminds me of a funny

A Management Consultant was brought in to advise on the recruitment of a new PA for the CEO of a large company. A psychological test was devised which, the CEO was assured, would identify the strengths, weaknesses and potential of each applicant.

All day long the hopefuls came and went. Each was interviewed, tested and evaluated. Finally, the Management Consultant drew up a short list of three. He explained to the CEO. "Candidate A showed strength of character, but possibly a tendency to want to over control situations. Candidate B was more flexible, but could be indecisive under pressure, while Candidate C had great potential to develop into the role."

The CEO mulled the advice over for some time. Finally he spoke, "Clarify something for me, which was the one who looked a bit like Jennifer Lopez?"



NEWS from CRA Members

Use the enclosed Fax-Back to obtain more information

NEW NANOCRETE REPAIR MORTAR RANGE BEATS EUROPEAN STANDARDS

Degussa Construction Chemicals has launched an exciting new generation of concrete repair mortars with outstanding characteristics – Emaco® Nanocrete. Emaco® Nanocrete mortars exceed all technical requirements of European Norm EN 1504, guaranteeing performance levels through a reference to identification and performance tests for a standardised approach to the design and execution of concrete repairs.

Emaco® Nanocrete uses Degussa's applied Nanotechnology to produce a long-term solution, offering improved bond and tensile strengths, densities and impermeability as well as reduced shrinkage and cracking. Better compatibility with concrete and improved thixotropy, non-slumping and finishing properties allow easier, quicker application, reducing application problems and overall costs.



ENQUIRY NO: 1705

COST-EFFECTIVE REFURBISHMENT



In order to meet new legislation for both potable water and waste water treatment, the UK water industry is currently investing record

sums. With such significant expenditure involved, it makes sense to consult a specialist and experienced contractor to ensure that completed structural refurbishment work satisfies new legislation and stands the test of time.

Concrete Repairs Ltd (CRL) has been providing cost-effective services to water and sewerage companies, throughout the UK, for more than 50 years. As a result, it is able to provide the necessary expertise required to meet the industry's current programme. CRL is an approved applicator for a broad range of D.W.I. and W.R.C. approved systems and is able to offer cost-effective and best-value solutions.

For copies of the company's new brochure, entitled 'Professional refurbishment of water industry structures', telephone 020 8288 4848. Email: mail@concrete-repairs.co.uk or visit: www.concrete-repairs.co.uk

ENQUIRY NO: 1706

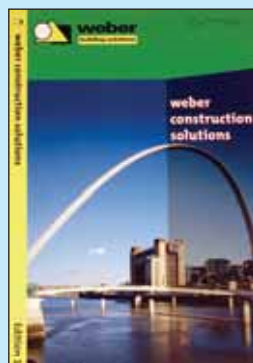
THE WEBER RE-BRAND PROJECT

weber building solutions, major manufacturer of building materials for the construction market, has begun a re-brand programme of its' Technical Mortar product range. By linking each product name on every piece of product packaging and literature with the umbrella weber brand, the weber name will be strengthened and the link to its customers reinforced providing instant recognition of weber products.

Designed to direct specifiers around the weber product range, weber's new construction solutions handbook carries the new weber.cem, weber.tec and weber.cote brand names throughout and has been released in preparation for packaging changes that will follow this year.

For further information on the re-brand or to request your copy of weber construction solutions contact us on 01525 722110.

ENQUIRY NO: 1707



CRA restructure Technical Advisory Service

Part of the CRA's remit is a commitment to consistently high standards of business integrity, quality of materials and workmanship, as well as advancing the understanding, education, technology and practical development of concrete repair.

With this in mind, the Association is currently interfacing such issues as the new British Standard for Concrete Repair (BS EN 1504 series), the new Health and Safety legislation relating to the formulation of cementitious products, working at height, hand/arm vibration levels and the ever-changing employment law; all examples of the many challenges facing both large and small businesses throughout the industry. To confront these issues, two new Committees have been established.

The new CRA Technical Committee, chaired by Nigel Cox of Dew Construction Ltd, comprises of engineers and surveyors from within CRA-member contractor and material supplier companies. It intends is to review and update current CRA documents which, when complete, will be available free of charge, either in hard copy format, or as downloads from the CRA website. In addition, whilst specific technical enquiries should be referred directly to individual member companies, the Committee is also able to provide advice in order to assist specifiers, building owners, main or specialist contractors, manufacturers and end users, regarding concrete repair systems and services.

Advice is provided without charge and without obligation, or any liability on the part of the CRA, or its members. The Technical Helpline is 01252 739145. Email: cra@associationhouse.org.uk

The recently established CRA Health and Safety Committee, chaired by consultant John Peardon, of Peardon Health & Safety, is made up of H&S specialists from within CRA member companies. The group will tackle and advise on matters such as Health and Safety training, as well as the monitoring and reporting on the accident records of CRA members.

Extra... Ordinary!

Unusual installations & developments reported by CRA members

CRA MEMBER UNCOVERS TIME CAPSULE DURING BRIDGE REFURBISHMENT

A CRA contractor member has unearthed a time capsule from the 1930s while undertaking major structural repairs to the Dinnet Bridge over the River Dee in Aberdeenshire.

A letter dated September 1935 was found between two plates within the bridge joint as damaged concrete stones were removed. The letter, together with four coins, was placed there by the bridge's site foreman, George Black Esq., seventy years ago. The letter read simply: *The year of the King's Jubilee, 1935. This bridge was completed by W. Tawse Ltd, contractors, Aberdeen.*

A spokesman for the CRA member said, "We were amazed to find the time capsule while undertaking the repairs. It

is an interesting piece of history and it is rare to find such artefacts".

The original letter along with one of the coins is now being held by Aberdeenshire Council at a local museum. Three of the original coins, a replacement letter and new coins were returned to the bridge for future generations to discover.

The bridge's concrete structure was suffering from spalling and cracking and if left unrepaired, its strength would have been reduced. The 16-week project involved carrying out concrete repairs, installing cathodic protection to the integral steelwork and the replacement of stone copings.

LIGHTENING THE LOAD

The third phase of the technically demanding task to strengthen west London's extremely busy Hammersmith Road Bridge, is nearing completion by a CRA member.

The 105 years-old, three-span structure, which carries traffic over two Network Rail and one London Underground railway lines, is located on the A315, close to Olympia. Originally constructed with thirteen longitudinal cast-iron girders per span, supported by brick and piers, the bridge is currently well below the required capacity for accommodating 40-tonne vehicles. As a result, restrictions to both the number of lanes on the bridge and vehicle weight limits have been in place.

Because of the massive disruption that would be caused, the construction of a replacement bridge was simply not an



option. Neither was the installation of a steel/composite alternative, since the solution needed to be both as light in weight as possible and quick to install.

The method finally chosen was the installation of carbon fibre reinforced polymer (CFRP) plates. Unlike steel it will not corrode, is considerably stronger and will not confer significant additional dead load to the structure. The plates were bonded to the lower flange of each beam, using a two-part cold-cure epoxy adhesive. No additional mechanical fastening was employed.

CRISIS CONCRETE!



Imagine the surprise of the staff working in the basement office when the demolition contractor working on the site above broke through the concrete slab! Just another everyday repair job for a CRA member!

CRACKING MATTERS is published by the Concrete Repair Association (CRA), Association House, 99 West Street, Farnham, Surrey GU9 7EN. Tel: (01252) 739145 Fax: (01252) 739140 Email: cra@associationhouse.org.uk Website: www.cra.org.uk

Comments and opinions expressed in the articles provided are those of the Author and not necessarily of the CRA.

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CURRENT CRA MEMBERS

Phenomenal success of CRA CD-ROM and road show seminars

Following its introduction in 1997, the CRA CD-ROM, which includes two audio-visual programmes, has proven a runaway success with more than 5,000 copies having been requested and issued. And, it appears, the seemingly never-ending demand continues unabated.

The CD was introduced in line with the Association's commitment to promoting and developing the practice of concrete repair and advancing education and technical training in the concrete repair industry.

The original disk contained the audio-visual programme entitled 'The route to a successful concrete repair' only, but this has since been supplemented with a new 'Structural strengthening with composites' programme.

Shortly following the introduction of the original CD, the CRA also began presenting personalised CPD Seminars covering the same topics, to groups of interested Consultants, Authorities, Surveyors and Engineers. Recently the Association organised event number 138, with more than 1,200 delegates having attended over the years.

Unlike large, centrally organised events, the CRA takes its road show seminar

programmes directly to the offices of those requesting them and presents them at a time of the recipient's choosing. Each programme is about 45 minutes in duration, with another 15 minutes allowed for questions. In order that both technical and practical queries can be dealt with, both programmes are presented by a specialist contractor and a specialist product manufacturer member of the CRA. The road shows are also presented free of charge and can be arranged provided a minimum of 4 delegates are able to attend.



The CD-ROM also contains the CRA's Method of Measurement for concrete repair as a PDF file and as a 'Word' document to enable it to be transferred to a hard drive and used time and time again for producing Bills of Quantities.

Copies remain available free of charge by completing and returning the enclosed Cracking Matters Fax-Back form.

Note from Ed: Over the coming 12-months, the Association intends to supplement its current CD-Rom and Road Show Seminars with other programmes illustrating specific aspects of concrete repair.