

# Cracking Matters

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ISSUE NO. 4

## BILLS OF QUANTITIES - Do they assist concrete repairers?



Good Bills of Quantity are essential for all types of structure.

By: Tony Elven, Partner, The Anton Gill Partnership

A constant problem encountered by concrete repair contractors concerns inadequate and poorly prepared Bills of Quantities. No doubt Concrete Repair Association members can be counted among them. It is sometimes thought that the person that prepares the Bills has never visited the site and had no means of properly describing or quantifying the work, yet nevertheless expects the concrete repairer to provide a fixed price sum for the contract. What then, with regard to extra or varied work, is a reasonable basis for the agreement and fixing of new rates?

Most readers will be able to identify with these problems. So how can they be resolved?

First it must be understood that the concrete repairer is a fellow professional and in order to survive in today's market, he has to produce specified compliant work **economically**. Concrete repair is a sequential operation and therefore at the time of tender it is vital that the work is properly measured and identified by reference to drawings detailing the location and size of repairs required. It is therefore a prerequisite to fully survey and identify the extent of repairs necessary prior to sending out tender documents. Why is this necessary?

Much like other contractors, concrete repairer's costs include overheads, plant, labour and materials. But unlike many other contractors his work cannot always be properly defined. Costs relate to time and time can be maximised if it is possible to properly programme and sequence the work. This allows gang times to be accurately identified with only a very reasonable allowance made for 'float'.

The sequencing of operations is also vital in view of the nature of concrete repair. Once these considerations have been ascertained, the concrete repairer is in the position to provide a competitive tender with which he can be satisfied. The costs should be reasonably competitive and

therefore the client should not be too concerned about making unrealistic allowances for 'hidden' extras. Extras should not be necessary if the client has given the task of document preparation to an organisation that properly understands what the industry requires of them.

Remember; if the survey is inadequate regarding number, depth and size of repairs, the concrete repairer will quite properly expect additional payment. It is interesting to note that Engineers who have failed to properly identify the work prior to tender are the ones that most frequently resist this.

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### We need your Assistance

Enclosed with this issue of 'Cracking Matters' are two Fax-Back forms.

The 'Reader Enquiry' form enables you to quickly and easily obtain more details regarding any or all of the projects, products and services reported by CRA members (Page:3), or to request copies of other CRA publications.

The 'Reader Questionnaire' requests your opinions with regard to the CRA and the concrete repair industry. We would be obliged if you would spend just a few minutes to complete and return the forms. *Thank you.*

### THE TENDERING PROCESS - A skill or an attempt to beat the clock?

In today's highly competitive market, to receive an invitation to tender for a concrete repair project is every specialist Contractor Company's primary objective. Within these organisations it is the marketing personnel's responsibility to generate awareness and demand for their company's services and expertise in order that the estimating staff receive a regular flow of tenders. The combined objective is to secure profitable contracts for the company, at best value for the client and to ensure continued employment at all levels of the firm's workforce.

The skill in estimating, procuring subcontract services, quotes, project materials, resources and logistics are gained only over many years of experience within the industry. Estimating is one of the key contributors toward business generation within a contracting company. Estimating teams generally consist of a small number of committed personnel who need to be efficient, accurate, have a network of contacts, be used to working to strict deadlines and be able to handle multi workload functions whilst under significant pressure.

In an ideal world all should operate smoothly. An ideal world, however, it is not.

Following the last recession, a slimmed down, mean and lean concrete repair industry has emerged. In recent years demand has grown noticeably and as a consequence, estimating workload has increased significantly. This is a positive situation, greatly welcomed by all involved in the industry, but on the negative side there has been a significant shortening in tender periods for both high and low value concrete repair projects.

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THE JOURNAL OF THE  
CONCRETE REPAIR ASSOCIATION



# The Importance of Training

By: Leigh Williams (Member of the Executive of the London Building Safety Group)



Training is essential to equip all levels of the workforce with suitable skills.

It is one of the great British traditions that the gifted amateur is preferable to the trained professional. Or I should say, it was. In today's complex and results driven society, this is one tradition that has had to be firmly rejected in favour of properly equipping all levels of the workforce with suitable skills.

The construction industry, in common with most traditional employers, has always had a strong relationship with the training ethic. This was best expressed by the old indentured apprentice scheme that provided generations of craftsmen for this and other industries. However, times change and

the industry in general has had to wake up to the fact that a shortage of skilled personnel is becoming a real problem. In common with all other traditional sectors, the construction industry has had to take on board the requirements of the modern apprenticeship scheme together with NVQ accreditation.

It is this last accreditation of NVQ levels that has marked the greatest change in the industry's attitude. Traditionally, there has always been something of a gulf between the time served craftsman and the 'general labourer'. While there remains justifiable differences, one of the modern concepts that has to be taken on board is the fact that within the present-day construction industry, there are numerous, highly skilled jobs that are not covered by old classifications.

The concrete repair operative is one such job.

Increasingly, the discipline of concrete repair is being recognised for the specialist area that it undoubtedly is, with the inevitable requirement for a validated qualification for the operative in question. In addition to the technical competence required by operatives performing concrete repairs, modern regulations require that all site personnel possess a sound knowledge of health and safety procedures. These requirements have led to the Construction Skills Certification Scheme (CSCS) recognising concrete repair as a separate entity and

making available NVQ qualifications in concrete repair for the first time.

This is all very well, but how about the cost? It would be wrong to suggest that there is no capital commitment involved in training, but it would be equally wrong

to assume that there is no cost involved in not training personnel properly. There is no greater cost that can be incurred on any project, than the cost of putting right faulty workmanship. In the modern world, where clients can (and do) regard litigation as part and parcel of normal business practice, contractors have to ensure that they are in a position to argue their case where necessary. Proper training

provides two major benefits here.

In the first instance, a properly trained workforce will be less likely to execute a contract in a faulty manner, thus minimising the likelihood of complaint. Secondly, and this is particularly true when a third party is the root of the problem, documented proof of the ability of the workforce will enable the contractor to show that his people at least know what they are doing.

There is a third benefit. The ability to prove to a prospective client that they are dealing with a competent organisation able to meet its promises. There is no doubt that a

properly trained workforce, functioning to the highest standards can engender considerable goodwill on the part of the client. Ultimately the client wants the job done with the minimum of fuss and delivered on time. The chances of doing this with a trained workforce are significantly higher than would otherwise be the case - and that has to be good for everyone concerned.

(Continued from page 1)

What problems can result from poor Bills of Quantity? Let us consider two typical areas of concrete repair work, namely concrete framed blocks of flats and concrete carriageways.

## 1: Concrete framed blocks of flats

On a site in London, the contract for concrete repair work was let on the basis of a substantial sub-contract; the concrete repairs being the major element of a necessary refurbishment of several concrete framed blocks of flats. In this particular instance, the content of the Bill of Quantities bore not the slightest resemblance to the work finally instructed.

The administration of the contract was even worse with new repairs being instructed after finishing gangs had completed their operations. This situation led to almost total chaos with cutting out gangs having to move back into areas previously completed to earlier instructions.

The blocks of flats, of which there were a number, were also several storeys tall and the reader, with discernment, should imagine the complete delay and disruption that ensued, especially when the following operations of window and door replacements were also involved. The increase in costs ran into hundreds of thousands of pounds and it took some time before it was possible to negotiate a successful resolution. It is very difficult to reach a satisfactory negotiation with an Engineer who simply did not understand the logistics of concrete repair. He could not comprehend that repairs need to be surveyed, identified, accurately quantified in number, area and depth.

## 2: Carriageway repairs

Concrete carriageways have been the subject of much repair work in recent years as their original design life comes to an end, but it is not the intention of this article to concern itself with design requirements at the time of construction.

Surveys of the work content on one particular contract seemed adequate within the tender documents and most repairs were

identified by area to specific drawings and carriageway locations. The minimum requirements detailed earlier were therefore reasonably complied with. They proved, however, wholly inadequate. Why? It must always be remembered that roads crack for a reason and in this instance the cracking was assumed without establishing the actual cause prior to issue of the tender documents.

Upon commencement of the repairs it was found that the embankment upon which the motorway had been built had softened over some 20 years, due to a long-running drainage problem. The Bills of Quantities had provided for a provisional quantity of 30 cubic metres for excavation of soft spots. One particular area, up to 6 metres in depth, involved the excavation and replacement of several thousand cubic metres of embankment causing serious delay and disruption to the concrete repair operations. This was only one of many problems on this particular contract that led to substantial claims for reimbursement.

This article has shown how properly prepared Bills of Quantity can assist concrete repairers and has illustrated two examples of where they were in serious error. If a contract involving such specialist work is going to keep to programme and budget, it is vital that adequate sums are allocated to properly identify the content, quantity and position of the proposed repairs prior to the issue of tender documentation. Only then can the concrete repairer provide a meaningful tender that can reflect the realistic costs for the client.

## The author:

Tony Elven is an ICE and CIC listed Adjudicator and a member of the Commercial Management Practices Committee: Institution of Civil Engineering Surveyors (ICES)

## Note from Ed.

For those not already aware, the CRA's 'Standard Method Of Measurement For Concrete Repair' (Second Edition) is designed to facilitate clearer Bills of Quantity (cost: £15.00)

## CRA UPDATE USEFUL GUIDANCE NOTE

The CRA has just updated and republished its well-received Guidance Note entitled 'The route to a successful concrete repair'.

The publication is specifically targeted at surveyors, engineers, property managers and owners responsible for the care and maintenance of buildings and structures. It provides useful guidelines as to the best approach to be adopted when setting out to repair reinforced concrete.

The CRA regularly presents an audio-visual programme on the same subject to professional groups in the UK and the republished Guidance Note reflects many of the comments and questions raised at these events. Evidence of this can be found in the extended information covering the various types of repair method available.

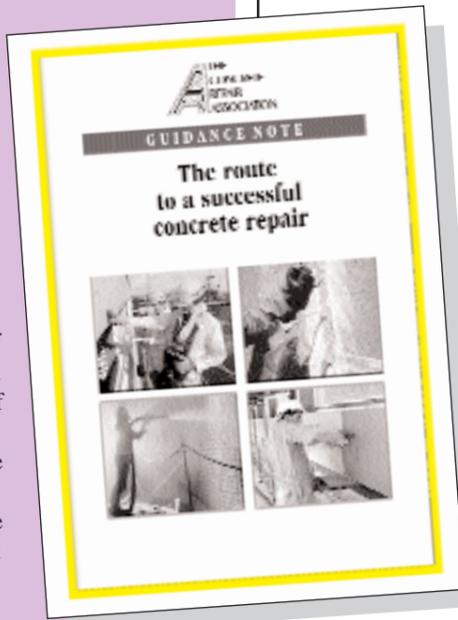
The guidance note tackles safety and environmental hazards, assessment of the damage or deterioration and

diagnosis of its cause. A definition

of the client's objectives is included, as well as details concerning the specification of the repair work and the choice of methods and materials. Advice regarding the preparation of contract documents, including a full specification and Bill of Quantities is included, with reference to the Association's 'Method of Measurement for Concrete Repair'. Other sections deal with the important aspect of contractor selection and evaluation and supervision of the work, once awarded. A useful appendix tables generic types of materials for the various stages of concrete repair work and cross-refers to their individual functions.

Whilst the guidance note does not set out to be an exhaustive study of concrete repair, nor is it intended to cover all causes of concrete deterioration or methods of carrying out effective concrete repair, it does give a useful overview of this specialist construction activity. The CRA believes that such improved understanding will result in better long-term standards being set.

Copies of the liberally illustrated 8-page publication (price £5.00 each) are available from: The Concrete Repair Association, Association House, 235 Ash Road, Aldershot, Hants GU12 4DD. Tel: (01252) 321302. Fax: (01252) 333901. Email: john.fairley@associationhouse.org.uk



(Continued from page 1)

For low value projects, with minimal scope of works, the situation can be resourced and handled satisfactorily. Higher value and multi disciplined projects, however, are far more difficult to deal with in a short period. Unfortunately, however, a two week tender period for a £250,000 multi disciplined, external concrete repair scheme, is no longer the exception. Should the trend continue, problems are likely to ensue. The trend is causing concern among estimating departments.

The primary reasons for the current situation appear to be (a) poor forward planning and (b) time. Proposed projects are often unplanned, postponed, put on hold, or at worse cancelled prior to tender invitation. The scope and degree of proposed works, together with other associated elements, are not always fully appreciated. Unachievable contract commencement dates are often set and can be severely hindered when agreement for project funding is also delayed.

A typical example is as follows. A project is approved to proceed at short notice but due to previously incurred delays the scheme becomes urgent and must be treated as a priority - especially if the work needs to be carried out in favourable weather conditions. Delays now have to be minimised. Time has to be saved to bring the project back on programme and the most convenient method is to reduce the tender period. The tendering contractor is usually expected to absorb these problems and reduce delays.

Estimating departments can sometimes help, but in such circumstances, the client and his administrators should be aware of the following consequences of applying this method of 'catching up on lost time'.

- As previously stated, estimating departments are generally small units of individuals dealing with numerous subjects. Heavy demand on their services causes real problems. Additional experienced personnel to handle the increase in workload are difficult to source and recruit at short notice.
- Short tender periods do not permit the tendering contractor to fully research or source competitive sub contractors and associated project requirements outside of their core business activity, even though all are essential in producing the best value bid. This is particularly relevant when multi-disciplined concrete repair projects are involved.
- By adopting this route there is no financial benefit to be gained by either party. Clients now expect best value or on occasion, fixed price contracts, yet under these circumstances both are difficult if not impossible to achieve accurately.

So what is needed to improve this ever-growing problem? The Concrete Repair Association suggests the following:

- Contractors should be provided with a realistic and achievable tender period for the client to gain the benefit of a best value bid
- Project tender programming should be improved
- Wherever possible programmed project start dates should be adhered to, but not at the expense of reducing tender periods
- It should be recognised that the Contractor can not easily absorb or rectify delays that have occurred at pretender stage, all of which will have occurred outside his control or influence
- The Contractor's existing commitments and resources should be acknowledged.

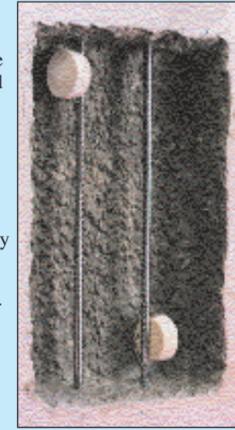
Members of the CRA undertake to provide quality services, materials and contracting expertise for their various clients. The co-operation of clients and their contract administrators, as detailed above, would assist enormously.

### PEACE OF MIND FOR INSURERS

The prestigious Eagle Star Insurance building in Cheltenham has recently benefited from a long-term refurbishment of the precast reinforced concrete panels. The 26-storey building was exhibiting numerous signs of distress caused by the combined effects of carbonation, chloride ion contamination and low cover.

Following patch repairs using Sika MonoTop environmental mortar, the remedial solution involved the use of Sika FerroGard-903, a surface applied corrosion inhibitor that simultaneously tackled the carbonation and chloride problems. This eliminated the need to break out latent damage - a major benefit in an occupied commercial building. The protective SikaGard coating was matched to the existing concrete using a colour computer, to satisfy local planning demands. Joints were also sealed using a durable, compatible one-part Sika material.

For further information contact Jimi Fadayomi on 01707 394444  
ENQUIRY NO: 408



### FOSROC ANNOUNCE MAJOR BREAKTHROUGH

The Burmah Castrol subsidiary, Fosroc Ltd., a world leader in concrete repair technology, has made a major breakthrough in the repair of chloride affected concrete. Following years of collaborative research with the world-renowned Corrosion Group of Aston University, Fosroc has successfully developed a method of applying the principles of galvanic protection to steel reinforced concrete.

The result is 'Renderoc Galvashield XP', an innovative new sacrificial zinc anode for treating concrete suffering from chloride attack. Even significant concentrations of active chlorides can be treated with absolute confidence. The zinc anode (encased in a sleeve to facilitate electrochemical migration of chloride ions) is attached directly to the rebar and is designed to corrode whilst leaving the rebar intact.

For further information contact 01827 262222.  
ENQUIRY NO: 401

### THORO CP RESOLVES BERTH OF THE BLUES

Since 1993 the Public Services Department of Jersey, working for Jersey Harbour, had commissioned studies on the state of London Berth and possible remedial measures. The structure was suffering from high levels of chloride-induced corrosion from the ingress of sea salts, which had led to rust staining, delamination and spalling.

Concrete Repairs Ltd. won the contract to carry out trials and install a cathodic protection system. Thoro CP60, a highly durable anode for impressed current cathodic protection of steel reinforced concrete structures, was chosen for its ease of application, and was installed to the soffits, beams and caps, totalling some 1,520m<sup>2</sup>. Benefits include long maintenance free life; high conductivity; good vapour permeability; thin layer, one-coat, wet spray application resulting in low rebound; and no mesh anode net required. The system is now fully installed and commissioned.

For further information contact 0161 794 7411 ENQUIRY NO: 403

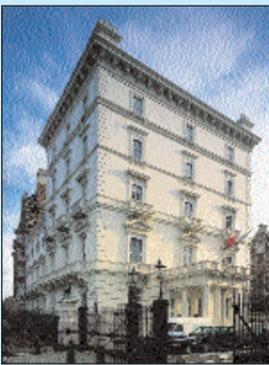


### STRETCHING THE BOUNDARIES OF EUROPE

SBD's highly elastomeric, anti-carbonation coating 'Santane EFL' has been successfully used to refurbish the external facade of the prestigious French Embassy in Knightsbridge. The Heritage Division of Makers Industrial called on the expertise of SBD when the existing specification for the project, which called for the removal of existing finishes, was proving impossible to carry out without damage to the underlying render.

Isolated re-profiling of existing repairs was carried out with SBD's Renovex P Filler before the new High-Tec coating was applied. Santane's ability to be applied over all existing coatings, fine cracking and re-profiling work saved the client considerable expenditure and disruption while completely satisfying English Heritage's requirements to avoid any material alteration to the facade.

For further information contact 01525 718877 ENQUIRY NO: 404

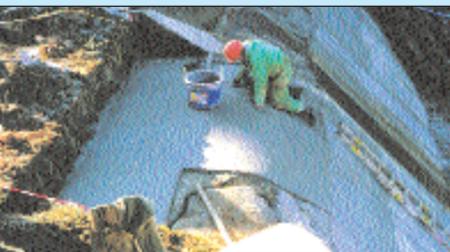


### NEW LEASE OF LIFE FOR VICTORIAN AQUEDUCTS

Several Victorian aqueducts and tunnels in the East of Scotland have been refurbished and waterproofed using a range of concrete repair materials manufactured by Flexcrete Limited.

Work on the 'Talla Aqueduct', which supplies over half of the clean water used in Edinburgh city, involved repairs to six mass concrete aqueducts and adjoining tunnels. Monomix, an advanced lightweight cementitious mortar, was applied to the aqueduct roofs, the concrete arches and the tunnel lining. In areas that were allowing water to seep into the tunnels, Cementitious Coating 851 was applied to the concrete lining to waterproof and damp-proof the concrete. Polymer modified Cementitious Coating 851 also protects concrete from the effects of freeze/thaw cycles, carbon dioxide and other acid gases.

For further information contact Lisa Holmes on 01772 255024 ENQUIRY NO: 407



# News from CRA Members

### JERSEY ADOPTS NEW CP SYSTEM

Mitcham based specialist contractor, Concrete Repairs Ltd., has recently begun what is believed to be the largest car park cathodic protection contract undertaken to date in the UK. The £2 million project, at Green Street car park in St. Helier, Jersey, is expected to take up to 40 weeks to complete.

The project will be the first in the UK to employ the Zebra Deck Anode System, produced by Norwegian manufacturer - Protector AS. The anode is a coating applied to the top surface of the deck and protected by a compatible deck membrane forming part of the overall system. This extensive project includes column head reinstatement, conventional concrete repair, the application of 13,000m<sup>2</sup> of protective coatings and 10,000 m<sup>2</sup> of new deck membrane.

For further information contact John Drewett on 0181 288 4848. ENQUIRY NO: 402

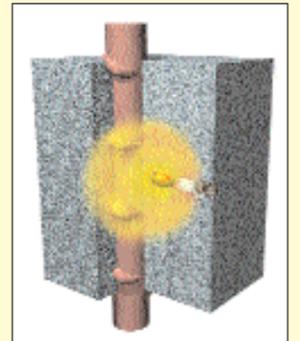


### MARGEL - A FAST AND EFFECTIVE CONCRETE REPAIR REMEDY

Margel DCI 580T, a complex blend of Vapour Phase Inhibitors from Makers Industrial Ltd., is a proven method of installing corrosion inhibitors directly into concrete, adjacent to the embedded steel reinforcement, to tackle the problem of reinforcement corrosion.

Margel contains three phases of inhibitor that are given off as vapours over time. The vapours are transported through the concrete pore structure and adsorbed onto the reinforcing steel. The adsorbed coatings shut out oxygen, one of the fuels of corrosion, thereby preventing the steel from rusting. Margel is simple to install, even in areas with access difficulties and can be placed without the need to remove existing coatings or finishes.

For further information contact Mike Darby on 01487 832288.  
ENQUIRY NO: 405



### MEETING THE SPECIALIST REFINISHMENT NEEDS OF MULTI STOREY CAR PARKS

It is an acknowledged fact that the reputation, security and structural condition of multi-storey concrete car parks leave a lot to be desired by today's motorists, not least women shoppers. Owners and operators alike, in conjunction with specialist concrete refurbishment contractor YOLDINGS Ltd., have actively responded to this situation to provide the secure, well-lit, aesthetically pleasing and safe environments demanded.



YOLDINGS, acting in the role of Principal Contractor, undertakes car park refurbishment works packages as an extension to their core business activity of structural concrete refurbishment and protection - also a primary requirement on car park structures. Additional specialist contract disciplines include, plate bonding/strengthening, anti-carbonation protective/decorative coatings, top and intermediary deck waterproofing, deck and structure jointing, lighting, barrier, security installations and associated works.

For further information contact Bob Berry on 01323 442288  
ENQUIRY NO: 406



### REPEX ONE OF THE FIRST TO INSTALL RENDEROC GALVASHIELD

ISO 9002 accredited refurbishment specialist Repex Ltd. is one of the first contractors to install the Renderoc Galvashield XP system. The unique patented system by Fosroc Ltd. comprises a zinc sacrificial anode embedded within a specifically formulated cementitious mortar with a specific porosity designed to allow corrosion of the anode, whilst avoiding passive film formation. During attack, the steel acts as an electrochemical anode and corrodes preferentially thereby protecting the reinforcement.

On a £500k concrete and brickwork repair contract, REPEX installed hundreds of anodes to protect localised areas containing high chloride levels around patch repairs. The contract also included the removal of 1000m of slip bricks, the installation of stainless steel angle and 10,000 remedial wall ties to help support the exterior cavity wall.

For further information contact Paul Jarvis on 01435 813663. ENQUIRY NO: 409

### £0.25M DENBURY COURT REFINISHMENT INCREASES SAFETY AND SECURITY

ASL Contracts of Wilton, Salisbury, has completed the repair and refurbishment contract of Denbury House, Bow, an accommodation block within the London Borough of Hackney. The tender was for external repairs and strengthening to the 25 private balconies. The 5-storey block also has communal balconies, which needed new brickwork, concrete repairs, re-decoration, protective coatings and re-waterproofing. Bob West, Director of ASL Contracts, said "we successfully completed the contract on time and within the provisional budget of £250,000". The six-month contract was constructed within a scaffolded envelope, ensuring that all tenants had access to their homes at all times.

For further information contact 01722 746300.  
ENQUIRY NO: 410



# CONCRETE REPAIR BUSINESS BACK IN GROWTH

The latest set of 'State-of-Trade' findings, produced by the Concrete Repair Association and relating to the U.K. concrete repair market for the six months - July to December 1998, reveal a significant increase in year-on-year business value in comparison with 1997.

In comparison to 1997, the figures for the whole of 1998 reveal an increase of almost 18% in the value of concrete repair work completed and an increase of more than 10% in the number of contracts completed. This reverses the decline in 1997 and reflects the trend of the years between 1993 and 1996, which had shown progressive growth in this sector.

The figures, produced on a six-monthly basis, are compiled from returns supplied by the Association's contracting members, who between them account for the vast majority of concrete repair work carried out in the U.K. Based upon the returns,

the overall concrete repair market in the U.K. in 1998 is estimated to have been worth in the region of £160m.

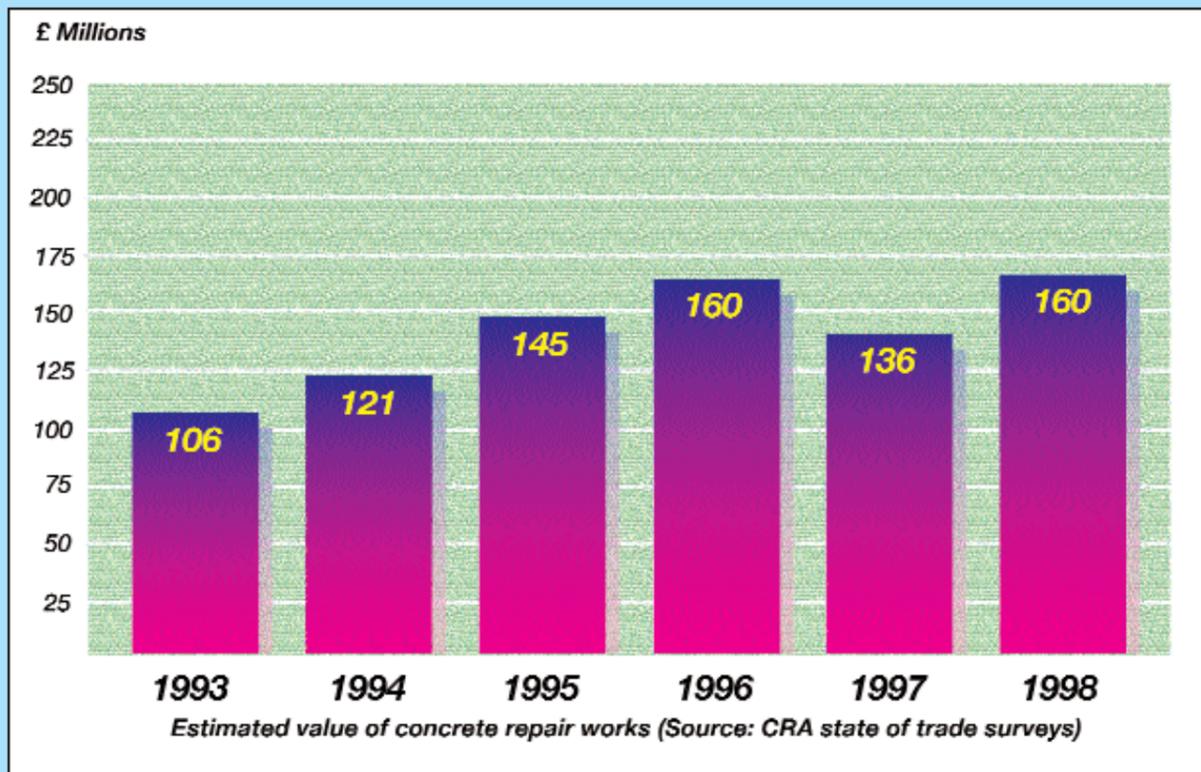
Comparisons between the first and second halves of 1998 show some interesting trends. Contract values for building related

work more than doubled in the second half and civil engineering related work increased by around 19%. The number of contracts won by CRA contractors (and currently being carried out) also increased in the second half and were higher in value, indicating larger value contracts being let.

No appreciable change in the intervals between concrete repair enquiries being received and work being let, was experienced between the two halves. About half the contractor members reported that they continue to operate at less capacity than they would normally

regard as a satisfactory workload and whilst most are optimistic about work volume and value for the forthcoming twelve months, little increase in profit margins is anticipated.

A second survey, carried out among the CRA's product manufacturer members, shows a continuing increase in sales of flowable repair mortars and a year-on-year increase in the sales of hand placed mortars and anti-carbonation coatings. Like the contractor members, manufacturers also reported that whilst more foresee an increase in sales volume and value over the forthcoming twelve months, very few anticipate profit margins to improve.



## GOOD SPECIFICATION - ELEMENTS OF DESIGN

The repair and refurbishment of existing structures has developed in to a sizeable part of the construction industry, with more emphasis now being placed on the maintenance of structures for continued service life. Structures consisting of concrete and masonry are no different. They should not be regarded as maintenance free and a new generation of designers and clients are now adopting whole life concepts in their analysis of the service life of these structures.

In recent years a lot of change has occurred within the refurbishment and concrete repair market. There now exists a better understanding of concrete decay, its causes and the appropriate remedies. The importance of correct and detailed diagnosis of the existing structure and of the repair techniques available is also now well documented. Preparation of concise specifications, however, is still often minimal.

The importance of a well-written specification is often overlooked during

the initial stages of investigation and this can lead to hidden dangers. A poor specification can result in ambiguity within the scope of the work, which can either lead to inaccurate pricing policies at tender stage, or cost over runs during the contract.

*The importance of correct and detailed diagnosis of the existing structure and of the repair techniques available is now well documented. Preparation of concise specifications, however, is still often minimal*

Such costs often result in claims for additional work or as a result of unforeseen conditions. One important pitfall of a poorly produced specification is the compromise in the quality of the repair product specified. The cheapest product is not necessarily the best solution to the problem. Ill conceived specifications can lead to loose fluffy material parameters being included and the option for poor quality materials being incorporated within the works. This can lead to problems with defects and ongoing contractual difficulties

between the client, contractor and product manufacturer. The question of who is to blame is robustly contested.

So what are the features and benefits of a well-crafted specification? The main

feature is the clarity of the document with a concise and specific statement of purpose. The specification should be written to define the levels of performance required by the materials and the mode of application should also be made clear. Specifications should refer to known standards and materials specification should make

reference to European Technical Approval (ETA) systems like the British Board of Agrément (BBA), WIMLAS certification, or similar. Advice should be sought from material suppliers, such as members of the CRA, who will provide guidance at all levels of the specification process to get it right first time. The specification should be a fair document giving the opportunity for different materials to be considered in the light of known and fair levels of performance. Often poor specifications

contain inaccurate or wild performance parameters for materials, which can lead to confusion among contractors and embarrassment with the specifier. The benefits of a well-crafted and clear specification are threefold. Firstly, the opportunity of receiving accurate pricing statements from contractors at the tender stage; secondly, it facilitates easier supervision of the works; and thirdly, it reduces the risk of cost over-runs, or contractual claims during the construction phase.

All the elements in the design process are important. A concise technically correct specification is essential if a quality project is required.

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