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Australian Concrete Repair Association

Repairing concrete with know-how

ACRA's Standard Method of Measurement of Concrete Repair

July 2004 edition

Preface

ACRA would like to acknowledge the sources of the various texts used to compile this document, which is designed to provide a uniform and transparent method for measuring concrete repair in Australia, and for some, a more accurate method.

We are grateful to the copyright owners of the following documents for agreeing to allow ACRA to use all or part of their text in the preparation of ACRA's Standard Method of Measurement of Concrete Repair:

- AIQS's Australian Standard Method of Measurement of Building Works, first published in 1959 by the Australian Institute of Quantity Surveyors. The current fifth edition published in 1990, reprinted 1991,1994,1996,1998 and 2000.
- The UK Concrete Repair Association's Standard Method of Measurement for Concrete Repair, first published 1990, revised with addendum 1994, second and current edition 1997.
- The US-based International Concrete Repair Institute's Guideline #03735 Guide for Methods of measurement and Contract Types for Concrete Repair Work first published May 2000.

We have relied heavily on the first two tried and tested documents and have picked up additional ideas not covered by the older documents from the US publication. ACRA has introduced new sections on Electrochemical Remediation.

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Chapter 1

Introduction

If concrete repair is only part of the project the Consultant, Owner or Project Manager should consider using this document in conjunction with the AIQS's Standard Method of Measurement for the other works since the Preamble & Preliminaries of both documents are compatible and overlap.

One of the most contentious issues causing conflict between parties on concrete repair projects is quantity.

Whilst a thorough investigation of concrete deterioration can usually determine the causes accurately, even the most thorough work cannot allow repair quantities to be estimated with anything like the same accuracy.

Three approaches to assessing quantity have traditionally been used. These are:

- Present the structure to contractors, and allow them to make their own estimates.
- Carry out a full survey of the structure, checking for both visible spalls and for drumminess, and present these as an indication of the repair quantity.
- Carry out inspections and testing of representative sections of the structure, and on the basis of the information obtained, predict a likely quantity.

The first approach, whilst popular with building owners, is not fair either to the contractors pricing the work, or even the owners to whom it appeals. This is because an incorrect estimate will either mean that the owners pay too much for the work or the contractor will allow insufficient to cover the cost of doing the work. The latter will put pressure on the contractor to take short cuts, which is not in the long-term best interests of the owners, despite the low price.

The second approach would, on the face of it, seem to be much more satisfactory, given that all of the damage to the structure is noted, and the contractor knows exactly where and how big each of the repairs is.

However, in reality, this approach also falls short, as the client, who has paid a substantial premium for a full audit of the structure, will expect to know precisely how much the work will cost. As has been proven time and again, there will be corrosion under the surface, which is not picked up by this type of audit, or repairs will be larger than the area of delamination indicates. The result is a cost blowout, which comes as a shock to a client given to believe that he had signed a lump sum contract.

A far more realistic expectation for owners of deteriorated structures is that they be given an estimate of the likely repair quantity, with an over or under allowance. This is referred to as a limit of accuracy in construction contracts. This approach allows the client to allocate sufficient funds to cover the work, without unreal expectations. If the investigation work on the structure has been carried out in a sufficiently thorough and systematic manner, the estimate, along with the limits of accuracy, will provide a realistic budget for this type of work.

Many building repair contracts include items other than just concrete repair. Things such as replacement of joint sealants, application of protective coatings or the installation of electrochemical repair techniques are items of work that can be clearly defined both in terms of methodology and quantity. In such cases, it is reasonable to expect contractors to provide fixed prices for the work. It is suggested that caution needs to be exercised only in the breaking out of areas of damage.

This guide has been prepared by the Australian Concrete Repair Association to assist contractors, consultants and building owners alike in understanding the ways in which concrete repair work can be estimated, and subsequently measured. It is intended for use as a working document or model on which pricing schedules can be based. It is unlikely that the guide will be completely appropriate to each aspect of every single job, but the information contained will provide useful tools that can be used as they are, or amended as the project dictates.

The most important rules in preparing documentation for concrete repair contracts are:

1. To ensure that the method specified is the most appropriate to the individual structure, which preferably should be determined once a full and thorough investigation into the causes of deterioration has been carried out.
2. To provide a realistic estimate of the likely value of a repair contract, with cost schedules prepared in such a way that neither the contractor nor the client are unreasonably penalised as quantities fluctuate.
3. To enhance the accuracy of contractors' quotations for the repair work and minimize unpleasant surprises a specimen repair of each principal type relevant to the project should be carried out under the direction of the consultant. Each specimen repair should be well documented to accurately contrast the extent of the repair indicated by the observed/measured symptoms of the deterioration and the extent of the repair that was actually necessary.

This guide will be of more benefit if the preliminary work, including the investigation, is properly and professionally carried out.

Chapter 2

Preamble

2.1 General Rules and Recommendations

2.1.1

The purpose of the Standard Method of Measurement is to provide a uniform basis for the measurement of concrete repair or may be a component of other building works.

Two methods are presented for measuring concrete patch repairs: one based on simple volumetric measurement for smaller projects, the other measured in bands of surface area and depth.

In some countries, repairs to arrises are normally measured separately from repairs to flat surfaces. This differs from normal practice in Australia and no distinction is made in this document between arris and flat repairs.

With reference specifically to the repair items within the method of measurement:

- a) A single item will include work and materials to complete the repair as detailed in the repair specification, e.g. cutting the repair edges square, breaking out the existing concrete, cleaning and protecting reinforcement where exposed, applying the bonding coat, reinstating with repair mortar and curing the mortar.
- b) Repairs may be measured separately according to the orientation of the surface on which they occur, e.g. soffits of slabs are measured separately from vertical surface of walls.

Patch repairs, as their name implies, are usually small individual items and the vast majority of repairs should fall into one of the specified and enumerated categories. However, larger individual repairs are measured by area.

The sub-divisions into different orientations, repair types, areas and depth can

lead to a large number of item descriptions. For instance, when fully using the various depth bands and the area bands and taking account of possible subdivisions for vertical and horizontal surfaces, this can produce in excess of one hundred different items of repair. However, it has been found that the system is simple to operate and it is expected that in practice most projects will be covered by thirty or forty items in total.

2.1.2

The method of measurement given herein shall be applicable to the preparation of the *Schedule of Rates* before the works are commenced equally with the measurement of finished works and variations.

2.1.3

If considered to be necessary to define further the precise nature and extent of the work, more detailed information than is demanded by this document should be given.

2.1.4

The method of measurement given herein shall, if applicable, be overridden by any particular construction detail required by the contract documents.

2.1.5

Concrete repair is often carried out under difficult conditions, including access on or in buildings that are occupied and in use. For more details, refer to Section 2.9 *Work in Difficult Conditions*.

2.2 Schedule of Rates

2.2.1

The contract documents shall adequately describe materials and workmanship in sufficient detail for pricing and shall as accurately as possible represent the quantities of work to be executed.

It is to be recognized that exact quantities cannot be measured in advance of the work being carried out, and that any quantities provided in a *Schedule of Rates* are estimates only. Contractors and consultants alike are recommended to ensure that the Principal is aware that actual quantities will vary from those scheduled.

2.2.2

Where in particular cases the quantity surveyor, consultant or contractor deems it necessary to depart from rules contained in this document, or, where this document contains no rules which can reasonably be applied to the measurement, then, the method of measurement adopted for the particular work or materials involved shall be stated in the *Schedule of Rates* in each instance where it occurs.

2.2.3

Work which cannot be sufficiently accurately measured shall be given separately and described as Provisional and the work shall be so described in the contract documents. Items of Provisional work shall be properly identified as such in the *Schedule of Rates*.

2.3 Measurement

2.3.1

Unless otherwise stated in the *Schedule of Rates*, work shall be measured net as fixed in position.

2.3.2 General Repair

The depth categories are ascribed according to maximum depth of the repair as measured perpendicular to the face of the member and taken within a substantial proportion of the repair area. Localised deeper areas, which in total do not exceed 10% of the area, shall not be taken into account when assessing the repair depth.

Accidental overbreak shall not be included when assessing the depth of a repair.

2.3.3 Arrises

Repairs to arrises are not measured separately from repairs to flat surfaces. Where arrises are present, the rates shall be deemed to include for recreation of the arrises.

2.4 Description

2.4.1

In stating dimensions, the order shall be in the sequence of length, width and depth. Where that sequence is not appropriate or where ambiguity could arise, the dimensions shall be specifically identified.

2.4.2

All dimensions, thicknesses, mass and other relevant information necessary for the proper assessment of items shall be given.

2.4.3

Notwithstanding these rules of measurement, patented or standard proprietary items shall be measured in a manner appropriate to the manufacturer's practice and the manner adopted shall be stated.

2.4.4

Where practicable, descriptions of items or headings to groups of items shall contain reference to their general location in the works.

2.4.5

Unless otherwise stated herein the items in the *Schedule of Rates* shall be deemed to include:

- a) materials and goods including materials required for lapping, jointing and the like and all costs in connection therewith such as conveyance, delivery, unloading, storing, returning packings, handling, hoisting and lowering;
- b) square, splay and circular cutting, raking and rebates;
- c) waste of materials;
- d) labour and all costs in connection therewith including the labour in

drilling, setting, fitting and fixing of materials and goods in position;

- e) establishment costs, overhead costs and profit;
- f) plant and equipment;
- g) taxes, overtime, bonus and incentive payments, duties and royalties;
- h) protection of work against damage except where specific means of protection are stated in the contract documents in which case items shall be given in the appropriate sections.

2.4.6

Unless otherwise stated the forming of ends, angles, returned ends and the like and junctions between straight and raking and or circular work shall be deemed to be included with the work in which they occur.

2.4.7

The description of items may refer to specification clauses or drawing numbers where such reference is of assistance in the description of the measured items. Reference to other documents shall be limited to those, which are particularly identified in the specification or drawings.

2.5 Terminology

2.5.1

Where the method of measurement requires information to be “given” then that information may be included in a heading, sub-heading, preamble or description as appropriate.

2.5.2

Where the method of measurement states “items shall be given for”, these items shall only be given where required by the contract documents. Items shall also be given for additional 'Items' as required by the contract documents.

2.5.3

Where the method of measurement requires work to be given in increments of, for example, 100mm this shall mean:

not exceeding 100mm wide, exceeding 100 and not exceeding 200mm wide, etc.

2.5.4

Where the method of measurement requires work to be given not exceeding a designated width, for example, not exceeding 250mm wide this shall mean: all work up to 250mm wide shall be grouped together and not given in individual widths.

2.5.5

Where work is described as “existing”, it is deemed to have been carried out prior to any new work to be measured as part of *Schedule of Rates*.

2.6 Billing Units

2.6.1

Where the unit of billing is the metre, square metre or cubic metre, quantities may be billed to the full unit, or part of a full unit.

Where the unit of billing is the litre, quantities shall be billed to the full unit, any part of a unit being regarded as a full unit.

2.7 Monetary Sums

2.7.1

Monetary sums and rates shall be designated in the *Schedule of Rates* in the same manner as they are designated in the contract documents.

2.8 Works by Nominated Sub-Contractors & Suppliers

2.8.1

Attendance on and provision of general facilities for nominated sub-contractors for the supply and installation of goods and services shall be as defined in the contract documents and shall be given as an item following each monetary sum or as an integral part of the description of each monetary rate for nominated sub-contractor's work included in the *Schedule of Rates*. Associated construction work shall be measured in accordance with this document and given in the appropriate section.

Fixing materials and goods obtained from nominated sub-contractors and/or suppliers shall be given in accordance with the provisions of the appropriate Section herein. Where the costs of transporting such materials and goods to the site are required to be borne by the contractor, particulars shall be stated.

2.9 Work in Difficult Conditions

2.9.1

Work necessarily requiring execution in an uncommon situation such as in or under water, or in compressed air, or in confined spaces clearly identified in the contract documents shall be described fully with reference to relevant specification clauses and drawings and given separately.

2.9.2

Confined spaces will be as defined by AS2865, the OHS Act 1983, the State WorkCover Authority or otherwise as set out in the Principal's requirements.

2.10 Item Order

It is recommended that the order of billing for items of similar description should be in ascending order of size.

2.11 Work of a Complex Nature

Items of a complex nature unable to be easily described may be referred to a detailed drawing and/or specification clause where appropriate.

2.12 Item Identification

2.12.1

Each *Schedule of Rates* Section, clause, item and note shall be individually and positively identified. Work carried out in or under water shall state whether canal, river or seawater and (where applicable) the mean spring levels of high and low water.

Alterations and work in existing buildings shall be in this category. Handling materials and getting them in or out of such buildings shall be deemed to be in-

cluded with the items. Labour on existing work shall also be in this category.

2.13 Measurement and Prices Clause

A reference shall be inserted in each section of the *Schedule of Rates* drawing attention to the measurement and prices clause in the relevant section of the Standard Method of Measurement. The standard measurement and prices clause shall not be repeated in the *Schedule of Rates* but any amendment to the Standard measurement and prices clauses shall be stated.

2.14 Symbols and Abbreviations

The following symbols and abbreviations are used in this method of measurement:

m	=	metre
m ²	=	square metre
m ³	=	cubic metre
mm	=	millimetre
no	=	number
t	=	tonne
L	=	litre
=	=	equal to or greater than
>	=	greater than
=	=	equal to or less than
<	=	less than
dia	=	diameter
min	=	minimum
max	=	maximum

Chapter 3

Preliminaries

3.1 Names of Project & Parties

The names and addresses of the proprietor, the architect and all consultants including, if relevant, the quantity surveyor.

3.2 Description of the Site

This will advise tenderers to visit the site and inspect trial repairs etc. and inform them where keys may be obtained (if any required) and where documents may be inspected.

3.2.1

It will state where possession of the site is to be handed over in sections at different dates and nominate those dates.

3.2.2

It will describe the position of the site and any particulars as to access.

3.2.3

It will draw attention to any adjacent or abutting buildings and to any limitations on extent or position of working and/or storage space.

3.3 Description of Works

3.3.1

This will state a general description of the works

3.3.2

It will state the height of the building above and below ground level and the number of storeys.

3.3.3

It will state where the works are required to be executed or completed in any specific order or in sections or places.

3.3.4

It will state any restrictions placed upon the execution of the works or upon any type of work included in the contract by

governmental, semi-governmental, local authority or other public authorities.

3.4. Conditions of Contract

3.4.1

This will state particulars of the form and type of contract, stating particulars of the edition to be used and any deviations from the standard form where the general conditions of contract are printed and published as a standard form.

3.4.2

It will state particulars of any obligation or restriction that may be imposed on the contractor by the proprietor in respect of any matter not covered by any clause in the general conditions of contract, whether by way of special conditions of contract, specifications or other means.

3.4.3

It will set out a schedule of the clause headings where any other general conditions of contract are used.

3.4.4

It will set out a schedule of insertions where there is an appendix to the general conditions of contract requiring insertions.

3.5 Tender Conditions

This will state particulars of any conditions.

3.6. Schedule of Rates

3.6.1

This will state whether or not the *Schedule of Rates* form part of the contract.

3.6.2

It will state that measurements are to be in accordance with the Australian Concrete Repair Associations Standard

Method of Measurement for Concrete Repair.

3.7 Contingencies

Will be provided for in the *Schedule of Rates* in the same manner as in the contract documents.

3.8 General Particulars

3.8.1 Contractual conditions

The following particulars shall be provided in respect of any requirements of the contract, except where they are covered by the schedule of insertions or by particulars of any obligation or restriction as aforementioned.

Reference will be made to relevant general or special conditions of contract, specification clause or other documents.

Subdivisions will be provided, where time related, to cover establishment, running and removal costs.

1. working hours
2. rates of wages and prices of materials.
3. sub-letting.
4. progress and final certificates and payments
5. variations
6. dates for commencement and completion.
7. bonus for early completion.
8. liquidated damages.
9. rise and fall.
10. exemption from duty, sales or other taxes.
11. issue and return of documents.
12. discrepancies.
13. submission of priced bills of quantities.
14. contract agreement stamp.
15. payment of taxes.
16. notices, permits, fees
17. liability
18. bonds, guarantees.
19. payment of extra monies.
20. charts, schedules
21. notice board.
22. setting out works.
23. temporary installations.
24. services.
25. telephone calls.
26. temporary screens, fences, hoardings, guardrails, propping, weather protection, etc.
27. temporary roads, tracks, crossings, means of access, etc.
28. temporary sheds, sanitary accommodation, etc.
29. duties and attendance.
30. work outside the contract.
31. supplied goods.
32. samples.
33. testing.
34. advertising.
35. footpath levels.
36. plant and equipment and attendant labour.
37. scaffolding, hoisting.
38. attendance.
39. protection, drying works.
40. cleaning.
41. handing over.
42. defects liability.