

Book review

Corrosion of steel in concrete, 2nd edn

J. P. Broomfield

Taylor & Francis, 2007, ISBN 978 041 533 404 4, £75.00, 278 pp.

This book was first published in 1997. This second edition is a useful update, reflecting changes in both understanding and practice over the last decade. There are 11 chapters covering fundamentals of steel corrosion in concrete under atmospheric conditions, evaluation and monitoring, repair and rehabilitation but also modelling design and a look to the future. The publication is complemented by a short appendix containing useful sources of information dealing with steel corrosion in concrete plus a combined glossary and index. Each chapter is individually referenced.

The introductory chapter, while short, is very much to the point, putting present and future corrosion problems in context. Problems there most certainly are, both financially and in engineering terms.

Chapters 2 and 3 cover fundamentals and the various corrosion reactions that occur depending on the ambient conditions. It is important that the basic chemistry be understood and Broomfield covers that ground fleetingly but well.

Chapters 4 and 5 deal with evaluation, testing and monitoring. Techniques, equipment and interpretation are covered in detail. Interpretation is important if decisions to repair or to destroy are to be made. These chapters offer sensible guidance. The reader may be surprised by the extensive range of diagnostic equipment that is available. With some, cautious interpretation is essential: not for the faint hearted!

Chapters 6 and 7 deal with repair and rehabilitation (the treatments). The boundary between substrate and repair material is critical, with surface preparation being of paramount importance. Chemical and physical aspects are important for lasting repair. These are easy to achieve in the laboratory but very difficult on site. Fig. 6-7 shows a cross-section of a waterproofing system that has some nine interfaces (including that to air) from eight overlays. Each layer is applied separately

and yet depends one upon the other. There is ample opportunity for things to go wrong.

Chapter 7 deals specifically with electrochemical repair options such as cathodic protection, realkalisation and electro-osmosis. The last two are relative newcomers. By applying electrical potential to the steel it will generate hydroxyl ions, putting into reverse the carbonation process that removed them to begin with.

Chapter 8 addresses the choice of which rehabilitation method to use, dealing with carbonation and chloride ingress and taking regard of what was presented in previous chapters. The choice is somewhat bewildering. Each structure is unique and the conditions surrounding deterioration equally so. Project planning approaches are given that aid method selection, do not guarantee the outcome but can extend the life of a structure.

The role of EN 1504 (Parts 1–10) is described in some detail but the specifier is left to make a best judgement choice. On balance, selection of method is something of a lottery and best left to those who have in-depth experience and interpretative skills.

Chapter 9 deals with modelling and the quantification of performance predictions covering carbonation and chloride ingress rates. From the engineering and property ownership standpoint the aim is to determine service life. This is an important but rather short chapter (17 pages) and reflects an active but developing area of work and one that will be added to.

Chapter 10 covers design for durability. The basics for longevity are well established but not always achieved in practice. Should design take regard of likely repair options?

The author highlights the merit of using fusion-bonded epoxy-coated rebars in the United States and the growth since they were first used in 1973. Such adoption has not occurred on the same scale in Europe. Why not? Are doubts over maintained adhesion justi-

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fied? The pros and cons are given. Other techniques such as waterproof membranes for bridge decks, penetrating sealers, non-ferrous rebars, corrosion inhibitors and cathodic protection are mentioned.

The problem is that, from a feast of options, how do you select the most appropriate for a given situation? This requires knowledge and experience, both of which the book provides in good measure.

The concluding chapter is a positive look to future developments, categorising the options by way of codes and standards being dominant.

As to readership, this publication should appeal to practising engineers, surveyors, specifiers and those who have invested in ownership of buildings and their retained well-being.

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