

Book review

Advanced materials and techniques for reinforced concrete structures

Mohamed A. El-Reedy

CRC Press (Taylor & Francis Group), 2008. ISBN 978-142008891-2, £78.99, 318 pp.

The author describes this publication as a guide book and handbook aimed at achieving buildings that are aesthetically pleasing and structurally sound. This is a demanding and challenging aim at a time when buildings are arising all over the world with radical architecture and high performance requirements.

The book comprises 318 pages split into eight referenced chapters, 125 tables, 185 figures, 174 references and a 9-page index. It is split into three main parts dealing with:

- (a) project control issues
- (b) modern materials options
- (c) structural integrity management and advanced maintenance planning.

The book begins by presenting the objective of matching the design vision with materials and techniques aimed at achieving that vision. The book highlights the difficulties in applying codes developed in one country for adoption in another that has different cultures and weather patterns. Judgements can be made on a risk-based approach that addresses the probability of failure and those factors that affect the probability with an emphasis on high-rise constructions.

Chapters 2 and 3 are concerned with reinforced concrete structures and the loads that they have to accommodate that are derived from international codes.

Defining the type of structure and the load capacity and its retention over time is fundamental to a building's retained well-being. Types of structural systems are given with visual examples of exceptional iconic structures in the USA and the Middle East.

There are useful tabulations giving different materials types and their self weights and comment is made on the different codes dealing with live and sustained loads with live load variations in particular. There is considerable emphasis on earthquake loads and capacity reduction factors.

Chapter 4 deals with concrete materials and test procedures covering compressive strength, workability, importance of cement grading and aggregate testing. This is accompanied by useful exemplar tables embracing recycled aggregate concrete. The chapter closes with a section on non-destructive testing for hardened concrete.

Chapter 5 is very comprehensive and deals with mix design with an emphasis on strength and workability. There is much tabulated information representing practice and concern expressed about the availability of quality control on sites. The author makes the comment that it very often isn't! This would appear to be an area of contention between supplier and user. Conditions for acceptance/rejection of concrete mix as delivered against the actual achieved and specified are identified. While the author describes what are personal experiences and opinions, there is more than a grain of truth in the comments made about current practices.

Chapter 6 – an extended statement on special concretes – is very welcome. There is concern, and quite rightly so, on compliance with the attainment of high strength and accompanied durability. High-temperature tolerance of concrete and early strength increases not being reflected in 28 strength values are discussed along with practical advice on maintaining concrete temperature during placing and curing. The use of silica fume in sack/powder form to reduce concretes' permeability is outlined and issues of usage under hot temperature conditions, where evaporation rate can exceed the rate of bleed with consequential problems, are presented. The point is emphasised that it is important to maintain moisture in the concrete not only under these extreme conditions but as best practice.

There is a section on self-compacted concrete, lightweight aggregate and cellular concrete and an extended section on advanced materials for concrete protection.

This covers rebar coatings, fibre-reinforced polymer rebars and a long section on cathodic protection.

Chapter 7 is unusual in that it dwells on the concrete industry itself. There is concern with high-quality concrete and recent American, British and Egyptian standards and codes are discussed. Cautionary words are given on the placing and fixing of reinforcement, the right and wrong ways of pouring, compacting and curing concrete, and the avoidance of temperature gradients.

The book concludes with a chapter on the integrity and management of structures. There should be plans for maintenance and a commitment to monitor and evaluate the working performance of structures. Such aspirations are of course limited by budget restraints.

Again there is an emphasis on the monitoring of

retained strength, but many buildings are repaired because they are unsightly rather than non-functional. Some space is given to the 'time to repair' concept for corroding reinforced concrete structures and examples are given.

Repair and inspection strategies and optimisation are covered including cost appraisal as related to various parts of a structure, for example columns as opposed to slabs. The author contends that risk assessment is equal to the product of probability of failure times its consequences.

The book will appeal to both junior and senior engineers concerned with achieving both functional and efficient structures.

PETER C. HEWLETT