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Book review

ADVANCED CIVIL INFRASTRUCTURE MATERIALS—SCIENCE, MECHANICS AND APPLICATIONS

Hwai Chung Wu (ed.) Woodhead Publishing Limited, Cambridge, UK and CRC Press LLC, USA, 2006, ISBN 1-85573-943-7 (Woodhead)/0-8493-3477-2 (CRC), £135·00/$229·95, 360 pp., also available as an e-book

The title of this edited textbook is something of a mouthful and its apparent complexity may confuse or deter some bookshop (or book list) browsers. Actually the book seeks to provide an up-to-date briefing on some important or emerging construction materials; the 'Advanced' in the title refers to the character of the material rather than the level of technology. In his preface, the editor explains the mission: 'concrete is brittle hence vulnerable to cracking, whereas structural steel is heavy and prone to corrosion', so that there is an 'urgent need for more durable construction materials ultimately to replace conventional concrete and steel'. It is a book aimed at graduate and undergraduate students in civil and construction engineering, materials science and architecture.

Each of the seven chapters is written by one or more of ten specialists, all but one of whom are academics. Although it is a book published in the UK and the USA, there are no UK-based authors and seven of the ten authors (including the book editor) represent various universities in the USA, with one author from each of Australia, Canada and Japan.

Two opening and relatively short chapters (29 and 32 pages) address 'advanced' concrete and steel, by far the most abundant structural materials. The former concentrates on 'high performance concrete' and is a concise and readable account, with plenty of leads for other sources of information. The similarly well-written treatment of steel focuses on new alloys, including 'high performance steel' and various new components and systems.

The next four chapters concern the growing use of composite materials, because many promising 'advanced' structural materials are being created by 'synergistically combining two or more constituents'. A first chapter on cement composites (54 pages) opens by justifying the value of these new materials on the basis of a fairly alarming, even alarmist, view of the problem allegedly posed by deterioration of current materials. Two chapters (84 and 31 pages) then cover polymer composites and especially fibre- (or 'fiber' as even the UK-published book persistently spells the word) reinforced polymer composites; the first chapter is a detailed and quite mathematical review of the subject and the second chapter describes applications and especially the use of such materials in the rehabilitation of structures. A final chapter in the group (35 pages) deals with 'engineering wood composites', in which timber is combined with fibre-reinforced polymer composites. These composite chapters form the core of the book and provide a wealth of valuable information on the current state of the subject.

A final and substantial (76-page) chapter tackles a rather separate but admittedly topical subject, 'sustainable materials', and is written by the only non-academic author on the panel. Those who still find this fashionable but also critical subject mysterious will find this chapter a breath of fresh air. Among other things, it is explained that materials can be re-engineered to reduce the amounts by which we 'take' and later 'waste' the Earth's finite resources. Some readers may find the concluding sections of the chapter a little arrogant or pompous, including suggested government policies.

Overall, this publication meets most of its objectives and will be a valuable textbook for many, although the 'emerging' nature of its theme probably implies an early need for updating. There is an effective index that will allow the book to be used as a resource as well as a briefing. One 'high priority' declared in the preface is not consistently realised: there could usefully be more 'real-world' and case study application examples of the various 'advanced' materials being described.

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