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Book review

SELF-COMPACTING CONCRETE

Geert De Schutter, Peter J. M. Bartos, Peter Domone and John Gibbs. Whittles Publishing, Dunbeath, UK, 2008, ISBN 978-1904445-30-2, £85.00, 312 pp.

Self-compacting concrete (SCC) is one of the most significant recent advances in concrete technology. Mechanical vibration was, in itself, a major advance in the early twentieth century but it brought with it a number of problems including noise, vibration induced health problems for operatives and, arguably, some loss in concrete performance. Removing the need for vibration avoids all of these problems and brings many advantages including reduced labour costs and better surface finishes.

This book provides badly needed and comprehensive information on every aspect of SCC. The need for this is illustrated on a major site known to the reviewer where SCC was tried for the first few months but rejected due to persistent problems with surface quality and the high cost. The book makes few assumptions about the prior knowledge of the reader and thus, sometimes of necessity, covers some basic concrete technology.

Chapters 1 and 2 introduce the topic and outline the various European Union-funded research projects which helped bring the technology from Japan, where it was developed, to Europe. Chapter 3 discusses the materials used in SCC including the viscosity-modifying admixtures which are vital to avoid segregation in most mix designs.

Chapter 4 describes the concept of rheology of concrete and the apparatus that is used to measure it. The chapter also describes a comprehensive series of international trials to compare different rheometers but unfortunately makes no mention of the new rheometers developed at ICAR at the University of Texas.

Chapter 5 gives a comprehensive description of a wide range of test methods which have been developed for SCC to replace the slump test, which is inappropriate. Many of the tests are very effective but it remains to be seen which will become industry standards.

Chapter 6, the mix design chapter, has a useful summary for readers who have not read previous chapters. It then describes a number of rather complex methods that can be used.

Practitioners who are considering the use of SCC would be well advised to read this and ensure that adequate time and resources are allocated to understanding and implementing the material. Designing SCC is not just a matter of minor changes from current methods.

Chapter 7 describes the construction processes which are, by comparison with the mix design, very simple. This is where the advantages of SCC lie. An improved surface finish can be expected but the authors caution against expecting perfection.

A summary of basic cement chemistry with a full discussion of the Powers model is given in chapter 8. The need for this is not clear and it does not appear to be required for the hydration model of SCC which is subsequently presented. This chapter does, however, provide a good description of the hydration processes of SCC and concludes that the hardened concrete has microstructural properties which are normally better than conventional concrete. This is reflected in the conclusions to chapter 9 which indicate that the mechanical properties are also generally superior.

Chapter 10 on durability again covers a number of topics which relate to all concretes. More standard derivations are given including the integration of Fick's law for a single ion without ion–ion interactions or adsorption. Nevertheless a range of data is presented which shows that the durability of SCC will normally be superior to conventional concrete. The very low permeabilities which are achievable even make the authors caution about the possibility of explosive spalling and recommend the normal precaution of including polypropylene fibres when saturated concrete is exposed to a risk of very rapid heating.

The book finishes with a chapter on standards (a work in progress), the potential benefits of SCC (of which there are many) and some good case studies.

This book is highly recommended to all who are using SCC and also to all users of concrete who are not using SCC so they can find out what they are missing. The conclusion sections at the ends of the individual chapters are particularly useful.

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