Fly ash in cement and concrete

Richard Helmuth

Skokie, Illinois, Portland Cement Association, 1987. 229 × 150 mm. pp. iv, 203. Typeset, illustrated, paperback. ISBN 0 89312 085 5. Price \$45.00.

The three stated objectives of this excellent little book are: (1) to provide a good summary of the technical literature on fly ash; (2) to show both the adequacy and the limitations of current test methods and specifications with respect to the use of fly ash with cement in concrete; and (3) to identify research needs.

It is an admirable review of the mass of published literature on fly ash—over 330 references are cited—and will be of value both to the technologist/engineer who needs to understand more clearly the nature and characteristics of fly ash, and to the researcher who wants a critical assessment of the state of knowledge of the material. Dr Helmuth's presentation of each topic is clear and concise, and gives just enough information to allow the reader to get the 'feel' of the known and undecided aspects of each topic.

The historical, economic and technical background to the use of fly ash is covered in an introductory chapter. Three chapters explain the generation of fly

ash from coal, and the composition, morphology and physical properties of fly ashes. The behaviour of fresh fly ash–cement–water mixtures is then considered. A chapter on hydration of Portland cement is followed by one on pozzolanic reaction chemistry.

The characteristics influencing pozzolanic reactivity and chemical methods to assess reactivity are reviewed in Chapters 9 and 10. Durability considerations (soundness, sulphate resistance, alkali aggregate reaction control, frost resistance, permeability and durability) are considered in Chapter 11, and the final chapter, a critical summary of the whole subject, includes a list of priorities for future research.

The book will not provide solutions to everyday problems in the use of fly ash, but will help to raise the level of understanding of the material so that the problems can be tackled from a more fundamental basis.

J. N. CLARKE

Concrete Durability: A Multibillion-Dollar Opportunity

Report to the National Materials Research Board and the National Research Council by the Committee on Concrete Durability: Needs and Opportunities

Washington, D.C., USA, National Academy Press, 1987. pp. xii, 93. Reproduced typewriting, paperback. Report NMAB-437. (Available from the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314, USA.)

This report is the outcome from a two year study by a panel of eminent engineers and scientists led by Jan Skalny. The report addresses the many aspects of concrete durability that collectively contribute to the economic worth of a structure to the community. It is acknowledged that concrete structures are not always as durable as they could be. The reasons range from 'first-cost' economics with inadequate regard for proper maintenance; lack of awareness and understanding by architects and designers of the service loads on the structures, particularly from the environment; the introduction of new or modified materials without proper research relative to service use; inadequate specifications most of which rely on concrete 28 day strengths and finally the absence of proper quality control and quality assurance procedures. The effects of many of these parameters interact, 'first cost' economies forcing savings in material costs that can be made when the concrete specifications are just and only just met.

The report carefully considers each of these topics in turn and then seeks ways to do better in the future. Not surprisingly, the committee were unable to find a total solution and concluded that a properly integrated, multi-disciplinary cement and concrete research establishment was needed to make certain *all* of the relevant factors were correctly considered.

However, the committee fully realize that solutions to our problems are needed now and that existing knowledge needs to be made available, perhaps using expert systems, if the existing infrastructure is to be maintained in its best possible state. In other words, the potential degradation must be addressed and deferred or at worst be repaired.

With new work, better specifications enforced by QC and QA are needed now.

One way to make progress is advocated whereby the contractors have legal liability to guarantee structural performance for an agreed period, using construction bonds to underwrite the guarantee.