ELSEVIER

*Cement & Concrete Composites* **20** (1998) iii–iv


# Guest Editorial

The benefits from the use of admixtures are becoming increasingly obvious and the last decade has seen a wide interest in many aspects of admixtures. Concrete is no longer just a mixture of cement, sand and stone, but has matured in to a mixture of admixtures. Admixtures chemically alter the rate of cement hydration and or, the nature of the hydration products. Research on the influence of admixtures on the chemistry of the aqueous phase has demonstrated that admixtures can be used to control the type of products formed so that many properties can be designed into concrete. The correct combination of admixtures can produce concrete that is custom-made for the paritcular job at hand.

In addition to the well established applications (water reduction, retardation, acceleration and air entrainment) chemical admixtures are used for a wide range of special purposes. Included in this category are both conventional admixtures used in unusual ways and special admixtures designed for specific applications. This issue describes both the established uses and the special applications in a manner that will make the practicing engineers and architects take a new look at the potential of these materials which are now integral components of the concrete.

The aim of this special issue is to present diverse applications of admixtures. The various papers give an account of the scope, function, mechanism and attributes of each admixture. Many of the examples chosen to illustrate the character of admixtures are those that the authors have known at first hand or, those that they felt were particularly instructive. They present the reader with objective information on the theory and practice relating to admixture use.

Specific problems with concreting in cold and hot environments, practical implications, and the manner in which admixtures can be used to overcome the limitations are dealt in the two papers addressing the use of admixtures under such conditions, through a basic understanding of the effects produced on the cement and concrete.

Repair of concrete structures is now the dominant construction activity. There is an increasing demand for products and techniques that can repair surface damage. In this connection, admixtures that provide volume stability (expansion and shrinkage reducing admixtures), water tightness, icnreased chemical resistance (polymer-based admixtures), antiwashout characteristics for underwater concrete (viscosity inducing admixture) and quick setting accelerators used in shotcrete are finding wide use. Four papers on these subjects present the state of the art.

The factors that control the durability of concrete are the selection of suitable materials and their proportioning followed by effective mixing, handling, placing, compaction, finishing and curing. Many innovative applications of superplasticisers enable the placing of highly fluid concretes that have excellent filling capabilities and also provide a homogeneous concrete. The dramatic improvements to freeze/thaw and chemical resistance through the use of air entraining agents, superplasticisers, alkali/aggregate inhibiting and polymer-based admixtures are discussed in four papers that detail the enhancement of workability, durability and water tightness.

Environmental protection agencies in many countries now classify fresh concrete as a hazardous material. Consequently, the dumping of plastic concrete waste and wash water from ready-mix trucks in landfill sites is banned. Admixture manufacturers responded to this constraint by developing a chemically-based concrete recycling system that stops hydration for desired period and allows reactivation at a given time. The paper describing this system also discusses additional innovative uses for these admixtures.

Selection, specification and control of admixtures should be based on standards that provide test methods and performance specifications by which the material can be judged. The standard should also stipulate a means of identifying materials in successive shipments (from the standpoint of composition and concentration) to give the user some assurance that the material being used is uniform and is the same material as that tested. The paper on international standards discusses these considerations.

With the exception of situations where the chemically induced change may be essential for a given application, admixture selection is based on techno-economic considerations. The paper on economic aspects of admixture use presents a fluid summary of the factors that should be considered in a cost-benefit analysis.

As more chemicals are added to the concrete mix, compatibility becomes the central parameter governing selection. Side effects or reactions between chemicals due to the sequence of addition, cement type, temperature change and batching equipment can all affect performance. The paper on admixture cement interaction has raised particular concern for the wide variability in the dispersing action of superplasticisers with different brands of cement. This variability has been attributed to the form of calcium sulphate in the cement.

Notwithstanding the significant beneficial effects and expanded applications provided by admixtures, it is important to be cognizant of the potential for serious problems presented by the use of a mixture of chemicals in concrete. Compatibility becomes the key issue and verification of field performance through trial batches with materials to be used on the job under field conditions is crucial. It is prudent to remember that admixtures are tools that should be used judiciously, and not for the purpose of covering up deficiencies in the mix.

The authors of this special issue come from both academia and industry. Drawing on their many years of laboratory and field experience, they have explained how admixtures function in today's construction. The effort of these authors and the critical assessment of the papers by the reviewers is gratefully acknowledged.

**Noel P. Mailvaganam**
**Guest Editor**