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Guest Editorial

The idea of having a Special Issue of the Cement and Concrete Composites Journal devoted to the general area of developments in the field of toughness characteristics was advanced some two years ago. A number of possible authors were contacted at that time with a publication date of mid 1995 in mind. The delay of some 12 months in the appearance of the Special Issue is entirely the fault of the author here who wishes to apologise publicly to the authors who have contributed to the Special Issue and also those who were contacted some two years ago but had to decline the invitation due to the then short time-scale envisaged for the preparation of this Issue.

Readers who are familiar with both FRC and the application of Fracture Mechanics to concrete will realise that most of the authors who have contributed to this Special Issue have a foot in each camp. Hence, it is not surprising that some of the notions which have been developed within the fracture community should also be advanced in the general area of FRC. The above statement should not be viewed in a negative sense since the FRC community is significantly more advanced in the development of Codes and Standards than the fracture community. Whereas the fracture community is still divided on which of three Draft RILEM Standards to use, the FRC community has already developed many Codes and Standards in Europe, North America and Japan. Both communities have much to gain by interaction with each other.

Much of what follows in this Editorial has been summarised from the introductory sections of one of the papers in this Special Issue. The main area covered by the papers herein are related to toughness of FRC composites which is not the simplest of terms to define. The toughness of FRC composites is generally considered as their energy absorption capacity, conventionally characterised by the area under some portion of the load–displacement curve obtained from flexure tests using a four-point loading arrangement. A review of the general features and methods of interpretation of results from four-point loading tests was given earlier in the Journal by Gopalaratnam and Gettu (**12**, 1995, 239–54) and is recommended reading before reading the papers collected in this Special Issue.

A review of toughness and toughness measurement is timely with the significant developments currently taking place in the development of high performance concretes. Such materials follow the general trend in materials whereby increasing strength is accompanied by increasing brittleness. The simplest method of enhancing the toughness in such materials is by the inclusion of fibres in the matrix. The performance of high strength fibre reinforced materials can only be fully described by the use of both strength and toughness parameters.

The developments of FRC composites during the last thirty years has coincided with a revolution in the methods of testing concrete in research laboratories. Whereas the 1960s saw the introduction of stiff

testing machines to replace the traditional load-controlled machines, the last decade has seen the gradual increase in the use of closed-loop servo-hydraulic machines to test concrete specimens. In such machines the opening of the crack mouth (in the fracture test) can be used to control the fracture process. Hence, in such tests, the crack mouth opening displacement (CMOD) can be used directly as a measure of the response of the test specimen. In view of these developments, it is timely to reconsider the appropriateness of some of the current methods of measurement required in existing Codes and Standards for evaluating the toughness of FRC composites. It is hoped that the enclosed collection of papers will stimulate a constructive discussion regarding the future of toughness measurements.

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