FLEXURAL BEHAVIOUR OF REINFORCED CONCRETE BEAMS MADE WITH COIR OR STEEL FIBRE CONCRETE

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CERTIFICATE

This is to certify that the thesis, entitled 'FLEXURAL BEHAVIOUR OF REINFORCED CONCRETE BEAMS MADE WITH COIR OR STEEL FIBRE CONCRETE' being submitted by Mr. Vishal Chand Jain to the Indian Institute of Technology Delhi in fulfilment of the requirements of the Degree of Doctor of Philosophy, is a record of bonafide research work carried out by him under our guidance and supervision.

To the best of our knowledge, the thesis has reached the requisite standard. The material presented in this thesis has not been submitted in part or full to any other University or Institution for award of a degree or diploma.

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ABSTRACT

The work relates, principally, to the flexural behaviour of R.C. beams made with fibre concrete. The relationship between fibre content and workability of fibre concrete mixes has also been studied, so that workable mixes of specified fibre contents can be made. The work, further, includes study of the stress-strain behaviour of plain and fibre concretes in compression, as this directly influences the behaviour of a R.C. member.

Two types of fibres, namely steel and coir, have been used. Steel fibres have been mostly favoured for structural use. Coir fibres have been chosen because these are relatively inexpensive, are abundantly available in India, and have adequate durability in a cement concrete matrix.

The Experimental Programme included V-B tests of plain and fibre concrete mixes, tests for compressive strength and modulus of rupture, tests to obtain complete stress-strain curves of concrete in compression, and tests of reinforced fibre concrete beams in flexure under a monotonic loading upto failure.

A method has been developed to determine the maximum volume fraction of fibres, which can be included in a given mix for desired workability.

A performance index for fibre concrete, called Ductility Factor, has been postulated. This factor is a measure of the ductility in compression achieved with the addition of fibres. A relation between ductility factor and volume fraction of fibres has been obtained.

The idealised stress-strain curve of fibre concrete has been related to that of plain concrete by a single parameter, namely, the ductility factor of fibre concrete.

Tests on reinforced fibre concrete beams show that, in the range of service loads, addition of steel fibres results in reduced deflections and crack widths, whereas coir fibres produce little influence at this stage. At ultimate load, the beams exhibit increased ductility if the fibre content is less than a critical fibre content whose value depends on percentage of tension steel.

A method has been developed to determine the stiffening effect of fibres in the tension zone of a R.C. beam, which is an extension of the method adopted by British Code, CP110:1972, to estimate curvature of a cracked section.

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