Steel Fiber Reinforced Concrete Behavior Modelling and Design Springer Transactions In Civil And Environmental Engineering

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Steel Fiber Reinforced Concrete

This book discusses design aspects of steel fiber-reinforced concrete (SFRC) members, including the behavior of the SFRC and its modeling. It also examines the effect of various parameters governing the response of SFRC members in detail. Unlike other publications available in the form of guidelines, which mainly describe design methods based on experimental results, it describes the basic concepts and principles of designing structural members using SFRC as a structural material, predominantly subjected to flexure and shear. Although applications to special structures, such as bridges, retaining walls, tanks and silos are not specifically covered, the fundamental design concepts remain the same and can easily be extended to these elements. It introduces the principles and related theories for predicting the role of steel fibers in reinforcing concrete members concisely and logically, and presents various material models to predict the response of SFRC members in detail. These are then gradually extended to develop an analytical flexural model for the analysis and design of SFRC members. The lack of such a discussion is a major hindrance to the adoption of SFRC as a structural material in routine design practice. This book helps users appraise the role of fiber as reinforcement in concrete members used alone and/or along with conventional rebars. Applications to singly and doubly reinforced beams and slabs are illustrated with examples, using both SFRC and conventional reinforced concrete as a structural material. The influence of the addition of steel fibers on various mechanical properties of the SFRC members is discussed in detail, which is invaluable in helping designers and engineers create optimum designs. Lastly, it describes the generally accepted methods for specifying the steel fibers at the site along with the SFRC mixing methods, storage and transport and explains in detail methods to validate the adopted design. This book is useful to practicing engineers, researchers, and students.

On Shear Behavior of Structural Elements Made of Steel Fiber Reinforced Concrete

This book sheds light on the shear behavior of Fiber Reinforced Concrete (FRC) elements, presenting a thorough analysis of the most important studies in the field and highlighting their shortcomings and issues that have been neglected to date. Instead of proposing a new formula, which would add to an already long list, it instead focuses on existing design codes. Based on a comparison of experimental tests, it provides a thorough analysis of these codes, describing both their reliability and weaknesses. Among other issues, the book addresses the influence of flange size on shear, and the possible inclusion of the flange factor in design formulas. Moreover, it reports in detail on tests performed on beams made of concrete of different compressive strengths, and on fiber reinforcements to study the influence on shear, including size effects. Lastly, the book presents a thorough analysis of FRC hollow core slabs. In fact, although this is an area of great interest in the current research landscape, it remains largely unexplored due to the difficulties encountered in attempting to fit transverse reinforcement in these elements.

Fibre Reinforced Cementitious Composites

This book discusses the latest research developments in this rapidly expanding area. The book is split into two parts. The first part is concerned with the mechanics of fibre reinforced brittle matrices and the implications for cementitious systems. In the second part the authors describe the various types of fibre-cement composites, discussing production processes, mechanical and physical properties, durability and applications. Two new chapters have been added, covering fibre specification and structural applications. Fibre Reinforced Cementitious Composites will be of great interest to practitioners involved in modern concrete technology and will also be of use to academics, researchers and graduate students.

High Performance Fiber Reinforced Cement Composites

High Performance Fiber Reinforced Cement Composites (HPFRC) represent a class of cement composites whose stress-strain response in tension undergoes strain hardening behaviour accompanied by multiple cracking, leading to a high strain prior to failure. The primary objective of this International Workshop was to provide a compendium of up-to-date information on the most recent developments and research advances in the field of High Performance Fiber Reinforced Cement Composites. Approximately 65 contributions from leading world experts are assembled in these proceedings and provide an authoritative perspective on the subject. Special topics include fresh and hardening state properties; self-compacting mixtures; mechanical behavior under compressive, tensile, and shear loading; structural applications; impact, earthquake and fire resistance; durability issues; ultra-high performance fiber reinforced concrete; and textile reinforced concrete. Target readers: graduate students, researchers, fiber producers, design engineers, material scientists.

Flexural Behavior of Steel Fiber Reinforced Prestressed Concrete Beams and Double Punch Test for Fiber Reinforced Concrete

Flexural Behavior of Steel Fiber Reinforced Prestressed Concrete Beams and Double Punch Test for Fiber Reinforced Concrete. Netra Bahadur Karki 2012 Steel fibers have widely been used in the past to reinforce brittle materials in many nonstructural applications such as pavement, tunneling lining, etc. On the basis of numerous previous studies, ACI 318-11 [2011] has recently accepted steel fiber as a minimum shear reinforcement replacement with minimum 0.75% volume fraction for both reinforced concrete and prestressed concrete members. However, not much previous research has talked about the flexural behavior of fiber reinforced concrete (FRC). As per ACI 318-11 for tension-controlled sections, the net tensile strains in the outermost layer of steel, et, should be greater than or equal to 0.005 and for the moment redistribution in continuous beam the section should sufficiently ductile (et [greater or equal to] 0.0075). For this, the sections should have small longitudinal reinforcement ratio which ultimately leads to an inefficient beam section with a large cross-sectional area. In contrast, the use of smaller concrete cross sections can lead to a diminished ductile flexural behavior as well as premature shear failure. In this context, the use of steel fiber reinforced concrete could be a potential solution since fiber can increase both the concrete shear strength and it’s usable compressive strains. However limited previous researches on the flexural behavior of SFRC beams are available and most of them are of small scales and concentrated only basically for shear behavior. To the best of our knowledge, the large-scale prestressed fiber reinforced concrete beam specimens have yet to be studied for flexure behavior. In this project, six large scale prestressed concrete beams with or without steel fiber along with some material test were performed. Our experimental investigations indicated that even with inclusion of small percentage volume fraction of steel fiber (VF = 0.75%) could not only increase the ductility and shear strength of the SFRC beam but also change the failure pattern by increasing usable strain in concrete and steel. A modification on the limit for c/dt ratio and [phi] factor for design of flexural member given in current ACI could be proposed which could imply...
Yield-line Theory-Knud Winstup Johansen 1962

Behavior of Plain and Steel Fiber Reinforced Concrete Under Multiaxial Stress-Siyed S. Tawaan 1995

Flexural Behavior of Steel-fiber-reinforced Concrete Beams-Panat Kungsuwan 2001

The Strength and Behavior of Steel Fiber-reinforced Concrete Under Combined Tension-compressed Loading-Roger W. Meier 1983

Studies in the Behavior of Steel Fiber Reinforced Concrete-Shahin Abdelhamid Mansour 1984

Concrete and Concrete Structures-M. Y. H. Bangash 1989-01-01

Construction Materials-Marios Soutsos 2017-10-10 This established textbook provides an understanding of materials' behaviour through knowledge of their chemical and physical structure. It covers the main classes of construction materials: metals, concrete, other ceramics (including bricks and masonry), polymers, fibre composites, bituminous materials, timber, and glass. It provides a clear and comprehensive perspective on the whole range of materials used in modern construction, to form a must-have for civil and structural engineering students, and those on courses such as architecture, surveying and construction. It begins with a Fundamentals section followed by a section on each of the major groups of materials. In this new edition: - The section on fibre composites FRP and FRC has been completely restructured and updated. - Typical questions with answers to any numerical examples are given at the end of each section, as well as an instructor’s manual with further questions and answers. - The links in all parts have also been updated and extended, including links to free reports from The Concrete Centre, as well as other online resources and material suppliers’ websites. - and now with solutions manual and resources for adopting instructors on https://www.crcpress.com/9781498741101

Composite Structures-I. H. Marshall 2012-12-06 The papers contained herein were presented at the First International Conference on Composite Structures held at Paisley College of Technology, Paisley, Scotland, in September 1981. This conference was organised and sponsored by Paisley College of Technology in association with The Institution of Mechanical Engineers and The National Engineering Laboratory (UK). There can be little doubt that, within engineering circles, the use of composite materials has revolutionised traditional design concepts. The ability to tailor-make a material to suit prevailing environmental conditions whilst maintaining adequate reinforcement to withstand applied loading is unquestionably an attractive proposition. Significant weight savings can also be achieved by virtue of the high strength-to-weight and stiffness-to-weight characteristics of, for example, fibrous forms of composite materials. Such savings are clearly of paramount importance in transportation engineering and in particular aircraft and aerospace applications. Along with this considerable structural potential the engineer must accept an increased complexity of analysis. All too often in the past this has dissuaded the designer from considering composite materials as a viable, or indeed better, alternative to traditional engineering materials. Inherent prejudices within the engineering profession have also contributed, in no small way, to a certain wariness in appreciating the merits of composites. However, the potential benefits of composite materials are inescapable. The last two decades have seen a phenomenal increase in the use of composites in virtually every area of engineering, from the high technology v vi Preface aerospace application to the less demanding structural cladding situation.

The Fatigue Behavior of Steel-fiber-reinforced Concrete-Claire G. Ball 1967

Cyclic behavior of steel fiber reinforced concrete. From material to seismic columns. Ediz. Italiane e Inglese-Federica Germano 2014

Development Testing and Analysis of Steel Fiber-reinforced Concrete Mine Support Members-Grant Lamont Anderson 1979

Behaviour of Self Consolidating Steel Fiber Reinforced Concrete Beams Under Reversed Cyclic Loading-Nima Aghniaey 2013

Shear-fatigue Behavior in Steel Fiber Reinforced Concrete Beams-Kae-Hwan Kwak 1990

Shear Behavior of High Strength Steel Fiber Reinforced Concrete Columns-Nima Aghniaey 2013


Aging concrete: from very early ages to decades-long durability Advances in material modelling of plane concrete Analysis of reinforced concrete structures Steel-concrete interaction, fibre-reinforced concrete, and masonry

Dynamic behaviour: from seismic retrofit to impact simulation Computational Modelling of Concrete Structures is of special interest to academics and researchers in computational concrete mechanics, as well as industry experts in complex nonlinear simulations of concrete structures.

The Strength and Behavior of Steel Fiber-Reinforced Concrete Under Combined Tension-Compression Loading-R. W. Meier 1983 The addition of steel fibers to concrete-type materials has been shown to improve many of the engineering properties of those materials. Notable among them is an enhancement in the tensile
strength of an otherwise weak and brittle material. Although much is known about the tensile strength of steel-fiber reinforced concrete (SFRC) under one-dimensional state of stress, little is known with regard to the strength behavior under multi-dimensional tension-compression loading. This is attributed to a lack of suitable equipment for simultaneously applying tensile and compressive stresses. The research program described herein is focused on developing such equipment to study the behavior of SFRC under combined loadings. A review of the state-of-the-art research on the tensile strength of SFRC is given and a review of various methods of applying tensile stresses to concrete specimens is presented. The problem is to be overcome in applying a pure principal tensile stress are discussed.

Experimental and Theoretical Investigations of Steel-Fibrous Concrete-Jacek Tejchman 2010-10-01 Concrete is still the most widely used construction material since it has the lowest ratio between cost and strength as compared to other available materials. However, it has two undesirable properties, namely: low tensile strength and large brittleness that cause the collapse to occur shortly after the formation of the first crack. To improve these two negative properties and to achieve a partial substitute of conventional reinforcement, an addition of short discontinuous randomly oriented steel fibres can be practiced among others. In spite of positive properties, fibrous concrete did not find such acknowledgment and application as usual concrete. There do not still exist consistent dimensioning rules due to the lack sufficient large-scale static and dynamic experiments taking into account the effect of the fibre orientation. The intention of the book is twofold: first to summarize the most important mechanical and physical properties of steel-fibre-added concrete and reinforced concrete on the basis of numerous experiments described in the scientific literature, and second to describe a quasi-static fracture process at meso-scale both in plain concrete and fibrous concrete using a novel discrete lattice model. In 2D and 3D simulations of fibrous concrete specimens under uniaxial tension, the effect of the fibre volume, fibre distribution, fibre orientation, fibre length, fibrous bond strength and specimen size on both the stress-strain curve and fracture process was carefully analyzed.

Fibre Reinforced Concrete: Improvements and Innovations II-Pedro Serena 2021-09-04 This volume highlights the latest advances, innovations, and applications in the field of fibre-reinforced concrete (FRC), as presented by scientists and engineers at the RILEM-fib X International Symposium on Fibre Reinforced Concrete (BEFIB), held in Valencia, Spain, on September 20-22, 2021. It discusses a diverse range of topics concerning FRC: technological aspects, nanotechnologies related with FRC, mechanical properties, long-term properties, analytical and numerical models, structural design, codes and standards, quality control, case studies, Textile-Reinforced Concrete, Geopolymers and UHPPFRC. After the symposium postponement in 2020, this new volume concludes the publication of the research works and knowledge of FRC in the frame of BEFIB from 2020 to 2021 with the successful celebration of the hybrid symposium BEFIB 2021. The contributions present traditional and new ideas that will open novel research directions and foster multidisciplinary collaboration between different specialists.

Shear Behavior of Steel Fiber Reinforced Concrete Beams Under Monotonic and Cyclic Loads-June Suh 1990


Shear Behavior of Steel Fiber Reinforced Concrete (SFRC)-Chun Nan Lim 2006

Structural Concrete-M. Nadim Hassoun 2012-05-01 Emphasizing a conceptual understanding of concrete design and analysis, this revised and updated edition builds the student’s understanding by presenting design methods in an easy to understand manner supported with the use of numerous examples and problems. Written in intuitive, easy-to-understand language, it includes SI unit examples in all chapters, equivalent conversion factors from US customary to SI throughout the book, and SI unit design tables. In addition, the coverage has been completely updated to reflect the latest ACI 318-11 code.

Development Testing and Analysis of Steel Fiber-reinforced Concrete Mine Support Members-Anthony T. Iannacchione 1979

Fleuralx fatigue behavior of steel fiber reinforced concrete-Mahmund Rida Galihoued 1982

Behavior of UHPC Structural Members subjected to Pure Torsion-Mohammed Ismail 2015-01-01 Ultra High Performance Concrete (UHPC) is characterized by a very high compressive strength which may reach more than 200 MPa. The behavior of this material under tension and compression actions has been established to be very brittle in nature. Discontinuous fibers (normally steel fibers) are usually added to the UHPC mix to introduce ductility. In order to investigate the beneficial effects of using fiber reinforced UHPC in structural members subjected to torsion, a series of experimental tests on 17 UHPC beams subjected to pure torsion were carried out. The test beams consisted of plain UHPC beams, UHPC beams reinforced with steel fibers only, UHPC reinforced with steel fibers and different combinations of traditional longitudinal and transverse reinforcement. The plain UHPC beams showed very brittle behavior, whereas the UHPC beams with steel fibers only showed a post cracking ductile behavior. The addition of little steel fiber volume (e.g. 0.5 %) to the plain UHPC beams enhanced the ductility. The enhancement at the ultimate capacity amounts to about 20 %. Meanwhile, the steel fibers with 0.9 % by volume showed much enhanced ductility and a maximum enhancement of the torsional carrying capacity up to 32 %. The addition of moderate steel fiber volume (e.g. 0.9 %) to composite steel fiber and traditional reinforcement (either longitudinal or transverse) accomplished an effective post cracking torsional carrying mechanism. The steel fibers shows a tendency to replace the missing type of traditional reinforcement, however this should be confirmed by more tests and by using higher steel fiber volumes. A series of experimental tests on fiber reinforced UHPC prisms to investigate the post cracking shear strength and stiffness of the used UHPC mix (e.g. M30) was conducted. The results of these tests revealed that this fine grained UHPC mix has a weak post cracking shear behavior. The results of these tests were used later in the Finite Element (F.E) model. An analytical model based on the well known thin-walled tube analogy was developed in order to estimate the torsional carrying capacity of beams under pure torsion having different combinations of steel fibers and traditional reinforcement. The comparison between the test and model results showed very good agreement for all cases. A finite element model based on calibrated small scale tests was developed using ATENA F.E. package to predict the full load-deformation behavior of the test beams. The predictions of the model show very good agreement with the test results.

Application of Steel Fiber Reinforced Concrete to Buried Structures- 2005 Attributes associated with the addition of steel fibers may have significant effects for the unique structural mechanism of large buried concrete structures such as culverts and bridges. CANDE, software developed under the sponsorship of FHWA in 1976, is recognized as the primary design and analysis tool for buried structures in the United States. Although CANDE models the behavior of reinforced concrete, it does not currently include an option for modeling steel fiber reinforced concrete (SFRC). The reported research focuses on the development of a new material type for CANDE that includes the effects of steel fibers in the concrete. An experimental and analytical approach was used to modify the CANDE finite element program and test the accuracy of the model. The research outcome is new input options to model the behavior of SFRC in the CANDE program needed to accurately predict the structural capabilities of SFRC buried structures.

Fibre Reinforced Concrete: Improvements and Innovations-Pedro Serena 2020-11-06 This volume highlights the latest advances, innovations, and applications in the field of fibre reinforced concrete (FRC) and discusses a diverse range of topics concerning FRC: rheology and early-age properties, mechanical properties, codes and standards, long-term properties, durability, analytical and numerical models, quality control, structural and Industrial applications, smart FRC’s, nanotechnologies related to FRC, textile reinforced concrete, structural...
design and UHPFRC. The contributions present improved traditional and new ideas that will open novel research directions and foster multidisciplinary collaboration between different specialists. Although the symposium was postponed, the book gathers peer-reviewed papers selected in 2020 for the RILEM-fib International Symposium on Fibre Reinforced Concrete (BEFIB).

**Fibre Reinforced Cement and Concretes** - R.N. Swamy 1989-09-13

This volume consists of papers presented at the International Conference on Recent Developments in Fibre Reinforced Cements and Concretes, held at the School of Engineering, University of Wales College of Cardiff, UK, 18-20 September 1989.

**The Shear Behavior of Steel-fiber-reinforced Concrete** - Edward L. Jenkins 1969

**Steel Fiber Reinforced Concrete Under Concentrated Load** - Fanbing Song 2019-07-01

**Fiber Reinforced Concrete** - James I. Daniel 1994

**Experimental Investigation on Behavior of Steel Fiber Reinforced Concrete (SFRC)** - Chuanbo Wang 2006

**Constitutive Modeling and Flexural Analysis of Steel Fiber Reinforced Concrete for Structural Applications** - Cha-Don Lee 1990

**Structural Applications of Steel Fiber Reinforced Concrete Analysis and Design** - Abdeslam Reklaoui 1988

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**Use of Steel Fiber Reinforced Concrete for Blast Resistant Design** - Deidra Kalman 2010

Reinforced concrete is a common building material used for blast resistant design. Adding fibers to reinforced concrete enhances the durability and ductility of concrete. This report examines how adding steel fibers to reinforced concrete for blast resistant design is advantageous. An overview of the behavior of blasts and goals of blast resistant design, and advantages of reinforced concrete in blast-resistant design, which include mass and the flexibility in detailing, are included in the blast resistant design section. The common uses for fiber-reinforced concrete, fiber types, and properties of fiber reinforced concrete varying with fiber type and length, and concrete strength are discussed in the fiber-reinforced concrete section. Two studies, Very High-Strength Concrete for Use in Blast-and-Penetration Resistant Structures and Blast Testing of Ultra-High Performance Fiber and FRP-Retrofitted Concrete Slabs, are reviewed. Lastly, the cost, mixing and corrosion limitations of using steel fiber-reinforced concrete are discussed. Reinforced concrete has been shown to be a desirable material choice for blast resistant design. The first step to designing a blast resistant reinforced concrete structure is to implement proper detailing to ensure that structural failures will be contained in a way that preserves as many lives as possible. To design for the preservation of lives, a list of priorities must be met. Preventing the building from collapse is the first of these priorities. Adding steel fibers to concrete has been shown to enhance the concrete's post-crack behavior, which correlates to this priority. The second priority is reducing flying debris from a blast. Studies have shown that the failure mechanisms of steel fiber reinforced concrete aid in reducing flying debris when compared to conventional reinforced concrete exposed to blast loading. The major design considerations in designing steel fiber reinforced concrete for blast resistant design include: the strength level of the concrete with fiber addition, fiber volume, and fiber shape. As research on this topic progresses, the understanding of these factors and how they affect the strength characteristics of the concrete will increase, and acceptance into the structural design industry through model building codes may be possible.