Deflection Calculation Of Rc Beams Finite Element

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New Partial Interaction Models for Bolted-Side-Plated Reinforced Concrete Beams
Non-Metallic (FRP) Reinforcement for Concrete Structures
Static and Dynamic Shear Behavior of Uniformly Loaded Reinforced Concrete Deep Beams
Time-Dependent Behaviour of Concrete Structures
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Reinforced Concrete
Deformation of Concrete Structures
Design Handbook for Reinforced Concrete Elements, 2 Edition
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Design of Prestressed Concrete to AS3600-2009
International Conferences, MAS and ASNT 2012, Held in Conjunction with GST 2012, Jeju Island, Korea, November 28-December 2, 2012. Proceedings
Futures in Mechanics of Structures and Materials
Design Theory and Examples, Fourth Edition
Design of Reinforced Concrete
Structural Elements for Architects and Builders: Design of Columns, Beams, and Tension Elements in Wood, Steel, and Reinforced Concrete, 2nd Edition
Concrete Engineering; for Engineers, Architects and Contractors
Duration of Load
Reinforced Concrete Design to Eurocodes
A New Model for Deflections of FRP-reinforced Concrete Beams
Nonlinear Finite Element Analysis of Composite and Reinforced Concrete Beams
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Proceedings of the Second International RILEM Symposium CRC Press
This dissertation, "New Partial Interaction Models for Bolted-side-plated Reinforced Concrete Beams" by Lingzhi, Li, □□□, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: Existing reinforced concrete (RC) beams often need to be strengthened due to material deterioration or a change in usage. The bolted side-plating (BSP) technique, i.e., attaching steel plates to the side faces of RC beams using anchor bolts, effectively enhances the bearing capacity without significant loss in deformability thus receives wide acceptance. However, as a newly developed technique, only limited information is available in literature, which mainly focused on the overall load-deflection performance of lightly reinforced BSP beams. Little studies have been conducted on the partial interaction between steel plates and RC beams which is closely related to the performance of BSP beams. The longitudinal and transverse slips, which control the degree of partial interaction, have yet to be determined precisely. Accordingly, in this thesis, extensive experimental, numerical and theoretical studies on BSP beams are presented. The experimental behaviour of BSP beams was investigated. For the first time, special effort was put in precisely measuring the profiles of longitudinal and transverse slips. In order to investigate the behaviour of BSP beams under other load cases and beam geometries, a nonlinear finite element analysis was conducted. The numerical method is more economical and capable of overcoming the difficulty in measuring the transverse slips precisely. A new approach to evaluating the transverse bolt shear force was also developed through a parametric study. New partial interaction models were developed by isolating and considering the longitudinal and the transverse partial interaction separately. A longitudinal slip model was developed based on the BSP beam section analysis, in which different strains of steel plates and RC beams were considered but the difference in deflection hence the difference in curvature was not taken into account. Meanwhile, a piecewise linear model was also proposed for the transverse slip and bolt shear transfer by introducing Winkler's model and defining the transverse slip as the difference in deflection. Formulas for the slips, the plate forces, the strain and the curvature factors that indicate the degree of partial interaction, were also deduced. Furthermore, these formulas allow us to evaluate the effect of partial interaction in the BSP strengthening design. A numerical program was originally developed to evaluate the performance of BSP beams with partial interaction. The balance between strengthening effect and strengthening efficiency was also achieved by a parametric optimization study, which would simplify the design procedure of BSP strengthening significantly. According to the numerical and theoretical results, a new design approach for BSP beams, which needs only minor modification to existing design formula for RC beams, was proposed to aid engineers in designing this type of BSP beams and to ensure proper details for desirable performance. Compared to the conventional design methods that assume a full interaction between steel plates and RC beams, this new method not only retains the features such as ease of use and fast calculation, but also yields results that are more reliable. DOI: 10.5353/th_b5089963 Subjects: Concrete beams Reinforced concrete
New Partial Interaction Models for Bolted-Side-Plated Reinforced Concrete Beams McGraw-Hill Companies
fib Bulletin 40 deals mainly with the use of FRP bars as internal reinforcement for concrete structures. The background of the main physical and mechanical properties of FRP reinforcing bars is presented, with special emphasis on durability aspects. For each of the typical ultimate and serviceability limit states, the basic mechanical model is given, followed by different design models according to existing codes or design guidelines. Composite FRP materials are still relatively new in construction and most engineers are unfamiliar with their properties and characteristics. The second chapter of this bulletin therefore aims to provide practising engineers with the necessary background knowledge in this field, and also presents typical products currently available in the international market. The third chapter deals with the issue of durability and identifies the parameters that can lead to deterioration, which is necessary information when addressing design issues. A series of parameters is used to identify the allowable stress in the FRP after exposure for a specified period of time in a specific environment. The bulletin covers the issues of Ultimate Limit States (primarily dealing with flexural design), Serviceability Limit States (dealing with deflections and cracking), Shear and Punching Shear and Bond and Tension Stiffening. It provides not only the state-of-the-art but also in many cases ideas for the next generation of design guidelines. The final chapter deals with the fundamental issue of design philosophy. The use of these new materials as concrete reinforcement has forced researchers to re-think many of the fundamental principles used until now in RC design. The bulletin ends with a discussion of a possible new framework for developing partial safety factors to ensure specific safety levels that will be flexible enough to cope with new materials.
Non-Metallic (FRP) Reinforcement for Concrete Structures John Wiley & Sons
The design of structures in general, and prestressed concrete structures in particular, requires considerably more information than is contained in building codes. A sound understanding of structural behaviour at all stages of loading is essential. This textbook presents a detailed description and explanation of the behaviour of prestressed concret
Static and Dynamic Shear Behavior of Uniformly Loaded Reinforced Concrete Deep Beams fib Fédération internationale du béton
The range of fibre-reinforced polymer (FRP) applications in new construction, and in the retrofitting of existing civil engineering infrastructure, is continuing to grow worldwide. Furthermore, this progress is being matched by advancing research into all aspects of analysis and design. The Second International Conference on FRP Composites in
Time-Dependent Behaviour of Concrete Structures CRC Press
Serviceability failures of concrete structures involving excessive cracking or deflection are relatively common, even in structures that comply with code requirements. This is often as a result of a failure to adequately account for the time-dependent deformations of concrete in the design of the structure. The serviceability provisions embodied in codes of practice are relatively crude and, in some situations, unreliable and do not adequately model the in-service behaviour of structures. In particular, they fail to adequately account for the effects of creep and shrinkage of the concrete. Design for serviceability is complicated by the non-linear and inelastic behaviour of concrete at service loads. Providing detailed information, this book helps engineers to rationally predict the time-varying deformation of concrete structures under typical in-service conditions. It gives analytical methods to help anticipate time-dependent cracking, the gradual change in tension stiffening with time, creep induced deformations and the load independent strains caused by shrinkage and temperature changes. The calculation procedures are illustrated with many worked examples. A vital guide for practising engineers and advanced students of structural engineering on the design of concrete structures for serviceability and provides a penetrating insight into the time-dependent behaviour of reinforced and prestressed concrete structures.
2nd fib Congress in Naples Italy Vol1 CRC Press
François de Larrard is Scientific Director of the R&D centre of the LafargeHolcim group and Scientific Director of the French national project Recybéton. He formerly spent almost thirty years at IFSTTAR (formerly LCPC). He has been granted both the Robert l'Hermite medal and the G.H. Tattersall award by RILEM, and is author of two books, including Concrete Mixture-Proportioning which is also published by Taylor & Francis.

FRP Reinforcement in RC Structures A New Model for Deflections of FRP-reinforced Concrete BeamsFiber reinforced polymer has recently become a popular replacement for steel rebar, used to reinforce concrete. Therefore much research is taking place to help develop and propose methods for best approximating the response of FRP reinforced members, to make them comparable to steel reinforced members. With this popularity comes multiple approaches to FRP deflection calculations. However, this study is significant, because it investigates the cracking moment equation adopted by ACI 318, in conjunction with state of the art deflection calculation methods. Specifically this research compares four deflection calculation methods. The first approach is proposed by Bischoff and implemented by ACI 440 in its latest revision. The second deflection calculation method is proposed by Rasheed et al. The third calculation is also suggested by Bischoff, as it is specific to four point bending. The fourth calculation method is proposed by this specific research and seeks to find a median between both the Bischoff and Rasheed equations. This fourth technique will be referred to as the Rasheed-Jacobs method, proposed to create a more conservative and relevant method for investigating the effect of cracking moment on the deflection calculations. This research was done with the help of Dr. Shawn Gross, and the database he had previously built through his investigation on FRP reinforced beams. Gross's database shows results for 106 samples tested using the actual experimental cracking moment as well as the ultimate moment capacity values. Of these 106 samples, 56 independent samples were used to investigate three different moment levels of 0.333Mn, 0.400Mn, and 0.467Mn. From this research, Gross's database was used to calculate the cracking moment of FRP reinforced beams based on ACI 318-08. A program was developed that uses the Gross database samples to calculate the cracking moment and deflection with the Rasheed, Bischoff, and Bischoff2 models as well as the new Rasheed-Jacobs model. This program calculates the Rasheed-Jacobs results, and then graphs the findings against the deflection values from the Rasheed, Bischoff, Bischoff2 models. These graphs showed very similar patterns amongst all four models, with the Rasheed-Jacobs results mainly falling on the more conservative side. However, when looking at the predicted deflection verse the Gross experimental deflection, the best results came from the 0.467Mn moment level, which shows consistent correlation while the lower moment levels are being less predictable using the cracking moment based on the ACI equation. It can reasonably be said that the 0.467M[subscript]n shows the best correlation between the four methods and the experimental results, because it is farther away from the actual nominal cracking moment of the FRP reinforced concrete beams.Deformation of Concrete Structures
This highly successful textbook has been comprehensively revised for two main reasons: to bring the book up-to-date and make it compatible with BS8110 1985; and to take into account the increasing use made of microcomputers in civil engineering. An important chapter on microcomputer applications has been added.

A Study on the Deflections of Reinforced Concrete Beams CRC Press
This book presents new guidelines for the control of cracking in massive reinforced and prestressed concrete structures. Understanding this behavior during construction allows engineers to ensure properties such as durability, reliability, and water- and air-tightness throughout a structure’s lifetime. Based on the findings of the French national CEOS.fr project, the authors extend existing engineering standards and codes to advance the measurement and prediction of cracking patterns. Various behaviors of concrete under load are explored within the chapters of the book. These include cracking of ties, beams and in walls, and the simulation and evaluation of cracking, shrinkage and creep. The authors propose new engineering rules for crack width and space assessment of cracking patterns, and provide recommendations for measurement devices and protocols. Intended as a reference for design and civil engineers working on construction projects, as well as to aid further work in the research community, applied examples are provided at the end of each chapter in the form of expanded measurement methods, calculations and commentary on models.

Concrete Recycling CRC Press
This fourth edition of a bestselling textbook has been extensively rewritten and expanded in line with the current Eurocodes. It presents the principles of the design of concrete elements and of complete structures, with practical illustrations of the theory. It explains the background to the Eurocode rules and goes beyond the core topics to cover the design of foundations, retaining walls, and water retaining structures. The text includes more than sixty worked out design examples and more than six hundred diagrams, plans, and charts. It suitable for civil engineering courses and is a useful reference for practicing engineers.

Control of Cracking in Reinforced Concrete Structures FIB - Féd. Int. du Béton
Design of Reinforced Concrete, 10th Edition by Jack McCormac and Russell Brown, introduces the fundamentals of reinforced concrete design in a clear and comprehensive manner and grounded in the basic principles of mechanics of solids. Students build on their understanding of basic mechanics to learn new concepts such as compressive stress and strain in concrete, while applying current ACI Code.

Concrete Beams with Openings Springer
Futures in Mechanics of Structures and Materials is a collection of peer-reviewed papers presented at the 20th Australasian Conference on the Mechanics of Structures and Materials (ACMSM20, University of Southern Queensland, Toowoomba, Queensland, Australia, 2 - 5 December 2008) by academics, researchers and practicing engineers mainly from Austral

Proceedings of the 2nd International Conference on FRP Composites in Civil Engineering - CICE 2004, 8-10 December 2004, Adelaide, Australia CRC Press
Fibre reinforced plastics are increasingly being used as replacements for steel reinforcement in concrete structures. The reinforcement can be untensioned, or it can be in the form of prestressing tendons. It is also suitable for gluing onto the outside of a structure to improve flexural or shear performance. This book provides up-to-date research results to give engineers confidence in their design methods.

Computer Applications for Modeling, Simulation, and Automobile CRC Press
Providing both an introduction to basic concepts and an in-depth treatment of the most up-to-date methods for the design and analysis of concrete of structures, "Design of Prestressed Concrete" will service the needs of both students and professional engineers.

Reinforced Concrete Beams, Columns and Frames CRC Press
Fiber reinforced polymer has recently become a popular replacement for steel rebar, used to reinforce concrete. Therefore much research is taking place to help develop and propose methods for best approximating the response of FRP reinforced members, to make them comparable to steel reinforced members. With this popularity comes multiple approaches to FRP deflection calculations. However, this study is significant, because it investigates the cracking moment equation adopted by ACI 318, in conjunction with state of the art deflection calculation methods. Specifically this research compares four deflection calculation methods. The first approach is proposed by Bischoff and implemented by ACI 440 in its latest revision. The second deflection calculation method is proposed by Rasheed et al. The third calculation is also suggested by Bischoff, as it is specific to four point bending. The fourth calculation method is proposed by this specific research and seeks to find a median between both the Bischoff and Rasheed equations. This fourth technique will be referred to as the Rasheed-Jacobs method, proposed to create a more conservative and relevant method for investigating the effect of cracking moment on the deflection calculations. This research was done with the help of Dr. Shawn Gross, and the database he had previously built through his investigation on FRP reinforced beams. Gross's database shows results for 106 samples tested using the actual experimental cracking moment as well as the ultimate moment capacity values. Of these 106 samples, 56 independent samples were used to investigate three different moment levels of 0.333Mn, 0.400Mn, and 0.467Mn. From this research, Gross's database was used to calculate the cracking moment of FRP reinforced beams based on ACI 318-08. A program was developed that uses the Gross database samples to calculate the cracking moment and deflection with the Rasheed, Bischoff, and Bischoff2 models as well as the new Rasheed-Jacobs model. This program calculates the Rasheed-Jacobs results, and then graphs the findings against the deflection values from the Rasheed, Bischoff, Bischoff2 models. These graphs showed very similar patterns amongst all four models, with the Rasheed-Jacobs results mainly falling on the more conservative side. However, when looking at the predicted deflection verse the Gross experimental deflection, the best results came from the 0.467Mn moment level, which shows consistent correlation while the lower moment levels are being less predictable using the cracking moment based on the ACI equation. It can reasonably be said that the 0.467M[subscript]n shows the best correlation between the four methods and the experimental results, because it is farther away from the actual nominal cracking moment of the FRP reinforced concrete beams.

Instantaneous and Long-time Deflections of Reinforced Concrete Beams FIB - Féd. Int. du Béton
Intended as a companion volume to the author's Limit State Design of Reinforced Concrete (published by Prentice-Hall of India), the Second Edition of this comprehensive and systematically organized text builds on the strength of the first edition, continuing to provide a clear and masterly exposition of the fundamentals of the theory of concrete design. The text meets the twin objective of catering to the needs of the postgraduate students of Civil Engineering and the needs of the practising civil engineers as it focuses also on the practices followed by the industry. This text, along with Limit State Design, covers the entire design practice of revised Code IS456 (2000). In addition, it analyzes the procedures specified in many other BIS codes such as those on winds, earthquakes, and ductile detailing. What's New to This Edition Chapter 18 on Earthquake Forces and Structural Response of framed buildings has been completely revised and updated so as to conform to the latest I.S. Codes 1893 (2002) entitled Criteria for Earthquake Resistant Design of Structures (Part I - Fifth Revision). Chapters 19 and 21 which too deal with earthquake design have been revised. A Summary of elementary design of reinforced concrete members is added as Appendix. Valuable tables and charts are presented to help students and practising designers to arrive at a speedy estimate of the steel requirements in slabs, beams, columns and footings of ordinary buildings.

Reinforced Concrete American Concrete Institute
This book comprises the refereed proceedings of the International Conferences, MAS and ASNT 2012, held in conjunction with GST 2012 on Jeju Island, Korea, in November/December 2012. The papers presented were carefully reviewed and selected from numerous submissions and focus on the various aspects of modeling and simulation, and automotive science and technology.

Deformation of Concrete Structures CRC Press
Develops simple theories to help students understand the fundamental principles of reinforced concrete design. Incorporates current Code requirements, as well as design formulas, design charts and design examples which will prove useful both to students and practising engineers.

Design Handbook for Reinforced Concrete Elements, 2 Edition Common Ground Publishing
This book compiles state-of-the-art information on the behavior, analysis, and design of concrete beams containing transverse openings. Discussions include the need, effects, and classification of openings as well as the general requirements for fulfilling design pure bending, combined bending, and shear - illustrated with numerical examples torsion alone or in combination with bending and shear large rectangular openings as well as opening size and location on beam behavior methods for analyzing ultimate strength and serviceability requirements effects of torsion in beams large openings in continuous beams and their effects on possible redistribution of internal forces as well as guidelines and procedures for the design of such beams effect of prestressing on the serviceability and strength of beams with web openings design against cracking at openings and ultimate loads Concrete Beams with Openings serves as an invaluable source of information for designers and practicing engineers, especially useful since little or no provision or guidelines are currently available in most building codes.

Engineering and Contracting Woodhead Publishing
This new edition of a highly practical text gives a detailed presentation of the design of common reinforced concrete structures to limit state theory in accordance with BS 8110.

Engineering News Linus Learning
Dealing with a wide range of non-metallic materials, this book opens up possibilities of lighter, more durable structures. With contributions from leading international researchers and design engineers, it provides a complete overview of current knowledge on the subject.