

# The Fib Model Code For Concrete Structures

## 2010

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the objectives of mc2010 are to a serve as a basis for future codes for concrete structures and b present new developments with regard to concrete structures structural materials and new ideas in order to achieve optimum behaviour mc2010 includes the whole life cycle of a concrete structure from design and construction to conservation assessment maintenance strengthening and dismantlement in one code for buildings bridges and other civil engineering structures design is largely based on performance requirements the chapter on materials is extended with new types of concrete and reinforcement such as fibres and non metallic reinforcements the fib model code 2010 also gives corresponding explanations in a separate column of the document additionally mc2010 is supported by background documents that have already been or will soon be published in fib bulletins and journal articles mc2010 is now the most comprehensive code on concrete structures including their complete life cycle conceptual design dimensioning construction conservation and dismantlement

the international federation for structural concrete fib is a pre normative organization pre normative implies pioneering work in codification this work has now been realized with the fib model code 2010 the objectives of the fib model code 2010 are to serve as a basis for future codes for concrete structures and present new developments with regard to concrete structures structural materials and new ideas in order to achieve optimum behaviour the fib model code 2010 is now the most comprehensive code on concrete structures including their complete life cycle conceptual design dimensioning construction conservation and dismantlement it is expected to become an important document for both national and international code committees practitioners and researchers the fib model code 2010 was produced during the last ten years through an exceptional effort by joost walraven convener delft university of technology the netherlands agnieszka bigaj van vliet technical secretary tno built environment and geosciences the netherlands as well as experts out of 44 countries from five continents

fib bulletin 34 addresses service life design sld for plain concrete reinforced concrete and pre stressed concrete structures with a special focus on design provisions for managing the adverse effects of degradation its objective is to identify agreed durability related models and to prepare the framework for standardization of performance based design approaches four different options for sld are given a full probabilistic approach a semi probabilistic approach partial factor design deemed to satisfy rules avoidance of deterioration the service life design approaches described in this document may be applied for the design of new structures for updating the service life design if the structure exists and real material properties and or the interaction of environment and structure can be measured real concrete covers carbonation depths and for calculating residual service life the bulletin is divided into five chapters 1 general 2 basis of design 3 verification of service life design 4 execution and its quality management 5 maintenance and condition control it also includes four informative annexes which give background information and examples of procedures and deterioration models for the application in sld the format of bulletin 34 follows the ceb fib tradition for model codes the main

provisions are given on the right hand side of the page and on the left hand side the comments note an Italian translation of bulletin 34 is also available contact us for further details

This design code for concrete structures is the result of a complete revision to the former model code 1978 which was produced jointly by CEB and FIP. The 1978 model code has had a considerable impact on the national design codes in many countries. In particular, it has been used extensively for the harmonisation of national design codes and as basic reference for Eurocode 2. The 1990 model code provides comprehensive guidance to the scientific and technical developments that have occurred over the past decade in the safety analysis and design of concrete structures. It has already influenced the codification work that is being carried out both nationally and internationally and will continue to do so.

As part of the preparation for the Fib Model Code for Concrete Structures 2010, Task Group 4.5 Bond Models undertook a major review of rules for bond and anchorage of reinforcement in the CEB-FIP Model Code 1990. This bulletin presents the outcome of that review. It describes the rationale for the revisions and presents the evidence on which the revisions are based. The principle changes in MC2010 include raising the limit on concrete strength that may be used when determining bond resistance to 110 MPa, introduction of a coefficient  $\alpha_4$  to cater for different reinforcement classes and coverage of new construction materials including epoxy coated and headed bars. The format of design rules has been changed to permit more rational treatment of confinement from concrete cover and transverse reinforcement, the contribution of end hooks and bends for tension bars and end bearing to compression laps. New guidance is provided covering a range of construction techniques and service environments and the influence of long term degradation analyses of various aspects of detailing on performance of laps and anchorages have resulted in discontinuation of the proportion lapped factor  $\alpha_6$ , alterations to requirements of transverse reinforcement at laps and have resolved inconsistencies in provisions for bundled bars between major national codes. Apparent inconsistencies in existing rules for lapped joints and anchorages and between the local bond slip model and design rules are also resolved thus allowing integration of application rules and modelling. Finally, the basis for an attempt to introduce simple detailing rules for laps and anchorages is described.

Fib Model Code 2010 represents the state of the art of code type models for structural behaviour of concrete. It comprises constitutive relations and material models together with the most important explanatory notes. However, the underlying normative work i.e. the fundamental data as well as the considerations and discussions behind the formulas could not be given within the model code text based on various experiences gained after the publication of Model Code 1990. This lacking background information will lead in the following to numerous questions arising from model code users. Consequently, the present bulletin claims to conquer this general weakness of codes in a way to guard against any future misunderstandings of the Model Code 2010 related to its Chapter 5.1 Concrete. It discusses the given formulas in connection with experimental data and the most important international literature. The constitutive relations or material models being included in MC1990 and forming the basis and point of origin of the Task Group's work were critically evaluated if necessary and possible adjusted or replaced by completely new approaches. Major criteria have been the physical and thermodynamical soundness as well as practical considerations like simplicity and operability. This state of the art report is intended for practicing engineers as

well as for researchers and represents a comprehensible summary of the relevant knowledge available to the members of the fib task group 8/7 at the time of its drafting besides the fact that the bulletin is a background document for chapter 51 of mc2010 it will provide an important foundation for the development of future generations of code type models related to the characteristics and the behaviour of structural concrete further it will offer insights into the complexity of the normative work related to concrete modelling leading to a better understanding and adequate appreciation of mc2010

the frc 2014 workshop fibre reinforced concrete from design to structural applications was the first aci fib joint technical event the workshop held at polytechnique montreal canada on july 24th and 25th 2014 was attended by 116 participants from 25 countries and 4 continents the first international frc workshop was held in bergamo italy in 2004 at that time the lack of specific building codes and standards was identified as the main inhibitor to the application of this technology in engineering practice ten years after bergamo many of the objectives identified at that time have been achieved the use of fibre reinforced concrete frc for designing structural members in bending and shear has recently been addressed in the fib model code 2010 steel fibre reinforced concrete sfrc has also been used structurally in several building and bridge projects in europe and north america sfrc has been widely used in segmental tunnel linings all over the world members of aci544 and fib tg 4/1 have been involved in writing code based specifications for the design of frc structural members more than fifty papers were presented at the workshop from which forty four were selected for this joint aci fib publication the papers are organised in the document under six themes design guidelines and specifications material properties for design behaviour and design of beams and columns behaviour and design of slabs and other structures behaviour and design of foundations and underground components and finally applications in structure and underground construction projects

selected peer reviewed papers from the 8th international conference on concrete under severe conditions environment and loading consec2016 september 12 14 2016 lecco italy

selected peer reviewed papers from the 10th international symposium on high performance concrete innovation utilization hpc 2014 september 16 18 2014 beijing china

the model code for concrete structures is intended to serve as a basis for future codes it takes into account new developments with respect to concrete structures the structural material concrete and new ideas for the requirements to be formulated for structures in order to achieve optimum behaviour according to new insights and ideas it is also intended as a source of information for updating existing codes or developing new codes for concrete structures at the same time the model code is intended as an operational document for normal design situations and structures

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