fib BULLETIN NO. 91

Title: Floating concrete structures
Year: 2019
Pages: 99
Format approx. DIN A4 (210x297 mm)
ISBN: 978-2-88394-133-5

Abstract:
This bulletin is the first document prepared by TG 1.2 "Concrete structures in marine environments". This theme is considered important for Commission 1, since in the future several applications are forecast in marine environments.

Floating concrete structures allow the use of marine spaces with important developments for urban areas, industrial plants, infrastructures and energy production. In this bulletin a series of applications, projects and conceptual ideas are presented. This should be considered as a document representing the potentialities and the innovations on the use of structural concrete in marine environmental.

The floating structure presented in the bulletin should be of inspiration for new application that will be developed in the nearly future, representing a challenge not only for structural designers, but also for administrations, construction companies and industrial entities.

The use of structural concrete is becoming essential in these kinds of applications, in terms of cost, durability and sustainability.

As Commission 1 chair, I'm very grateful to Tor Ole Olsen and to all members of WP 1.2.1 "Floating concrete structures" for having produced this document that I consider very interesting not only for the *fib* members, but also for concrete community.

fib BULLETIN NO. 92

Title: Serviceability Limit State of Concrete Structures
Year: 2019
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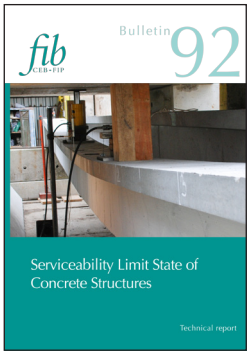
Abstract:
Serviceability limit states are essential for appropriate function and durability of concrete structures. The attention is paid especially to the stress limitation, crack width analysis and deflection analysis. The document provides supplementary information to the *fib* Model Code 2010 (MC2010), where a limited space did not allow for a detailed description of individual procedures. The principles used in MC2010 in chapter 7.6 are explained in detail within this document.

The stress analysis is focused on stresses in concrete and steel including the stress redistribution



due to the long-term load and cracking of reinforced concrete and prestressed concrete elements. Crack width analysis explains the mechanism of cracking under mechanical loading and due to deformation restraint. Cracks in prestressed concrete elements are also discussed. Deflection analyses with different levels of accuracy are described including the shear effects.

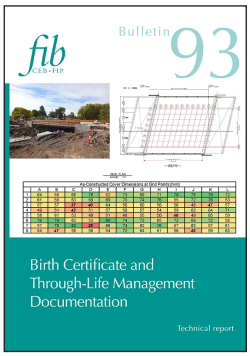
Examples illustrate the practical application of rules defined in the MC2010 of individual serviceability limit states. Simplified and more general methods are used.

An important part of the bulletin shows the development and extension of the serviceability limit states after publishing of the MC2010 and alternative approaches. Special attention is paid to deflections of prestressed concrete beams, shear effects on deflection, slenderness limits and influence of the concrete cover. The final part deals with an application of numerical simulations.

fib BULLETIN NO. 93

Title: Birth Certificate and Through-Life Management Documentation
Year: 2020
Pages: 90
Format approx. DIN A4 (210x297 mm)
ISBN: 978-2-88394-137-3
DOI: doi.org/10.35789/fib.BULL.0093

Abstract:
While it is generally accepted by owners and users that vehicles such as airplanes or cars must be subjected to a pre-defined maintenance plan during their lifetime, this is less obvious in public opinion for engineering structures and buildings. This may be related to the general feeling that "moving objects" should be more sensitive to aging and deterioration than "structures anchored in ground"! This may also relate to the fact that detailed maintenance manuals, which are considered obligatory by insurance companies, are generally for aircraft, boats and cars, but not systematically for civil engineering structures, except for iconic or major projects.



The performance-based approach to the durability design and assessment of concrete structures is also becoming increasingly popular in the construction sector. In recent years, numerous studies have been carried out worldwide in order to better assess the expected properties related to the durability of concrete. This has led to the standardization of test protocols, but also to a better understanding of the

main parameters impacting the overall durability of concrete. Documentation related to durability indicators will then become increasingly necessary for the accurate implementation of a performance-based approach that enables the promotion of sustainable materials.

Durability models have a strong need for relevant in-field data feedback in order to define accurate inputs for modelling both during the design process (gathered from previous projects) and during the follow-up process to allow for re-calibration of inputs and re-assessment of durability expectations by the models if judged necessary.

A framework for data collection was therefore considered extremely importance by the fib Commission 8: Durability, and is the objective of this fib Technical report "Birth-certificate and Through-Life Management Documentation". It is indeed very important to collect relevant data within a comprehensive and standardized format, as now proposed by this fib Bulletin. Thanks to its pre-defined format, compatible with the general fib framework, "Birth-certificate and Through-Life Management Documentation" will definitively be useful to owners for the maintenance plan and intervention strategies of their assets.

This operational technical report will also be very useful for designers, as it should encourage the collection of relevant information in databases to be used for future projects where a realistic assessment of expected properties is considered through largely similar concrete mix designs under given exposure conditions.

The Commission, which deals with durability aspects, hopes that this Bulletin will provide users a valuable tool and perspective on service life management issues.

fib BULLETIN NO. 94

Title: Precast concrete bridge continuity over piers
Year: 2020
Pages: 44
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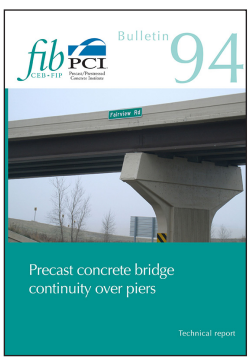
ISBN: 978-2-88394-139-7
DOI: doi.org/10.35789/fib.BULL.0094

Abstract:
Concrete bridges are an important part of today›s road infrastructure. An important part of those concrete bridges is to a large extent prefabricated. Precast concrete enables all the advantages of an industrialized process to be fully utilized. Contemporary concrete mixtures are used to realize high-strength bridge girders and piers that exactly meet the requirements set, both structurally and aesthetically, with a small ecological footprint. Sustainable and durable! On the construction site, there is no need for complex formwork, the execution time is drastically reduced and where road, water and rail traffic on or under the bridge has to be temporarily interrupted, it is only minimally inconvenienced during the execution of the project.



There is a wide variety of prefabricated bridges. In 2004, the *fib* commission on prefabrication already published the Bulletin 29 *Precast concrete bridges* which, in addition to the history of prefabricated bridges, also gave an overview of the different bridge types and structural systems. This document elaborates on one specific structural system: the continuous bridge. Task Group 6.5 „Precast concrete bridges" discusses in detail how to achieve continuity over the piers with precast elements. This bulletin bundles the experiences of experts in the field of bridge design so that less experienced designers would be able to identify the points of attention and make a correct design. In addition to the theoretical considerations, the principles are tested against three realizations in the USA and Europe.

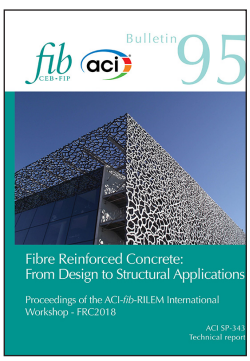
Commission 6 thanks the Co-Conveners Maher Tadros and Hugo Corres and all active members of the Task Group for sharing their knowledge and experience and for the successful realization of this bulletin.

fib BULLETIN NO. 95

Title: Fibre Reinforced Concrete: From Design to Structural Applications.
Proceedings of the ACI-*fib*-RILEM International Workshop - FRC2018
Year: 2020
Pages: 539
Format approx. DIN A4 (210x297 mm)
ISBN: 978-2-88394-141-0

Abstract:
The first international FRC workshop supported by RILEM and ACI was held in Bergamo (Italy) in 2004. At that time, a lack of specific building codes and standards was identified as the main inhibitor to the application of this technology in engineering practice. The workshop aim was placed on the identification of applications, guidelines, and research needs in order for this advanced technology to be transferred to professional practice.

The second international FRC workshop, held in Montreal (Canada) in 2014, was the first ACI-*fib* joint technical event. Many of the objectives identified in 2004 had been achieved by various groups of researchers who shared a common interest in extending the application of FRC materials into the realm of structural engineering and design. The aim of the workshop was to provide the State-of-the-Art on the recent progress that had been made in term of specifications and actual



applications for buildings, underground structures, and bridge projects worldwide.

The rapid development of codes, the introduction of new materials and the growing interest of the construction industry suggested presenting this forum at closer intervals. In this context, the third international FRC workshop was held in Desenzano (Italy), four years after Montreal. In this first ACI-*fib*-RILEM joint technical event, the maturity gained through the recent technological developments and large-scale applications were used to show the acceptability of the concrete design using various fibre compositions.

The growing interests of civil infrastructure owners in ultra-high-performance fibre-reinforced concrete (UHPFRC) and synthetic fibres in structural applications bring new challenges in terms of concrete technology and design recommendations. In such a short period of time, we have witnessed the proliferation of the use of fibres as structural reinforcement in various applications such as industrial floors, elevated slabs, precast tunnel lining sections, foundations, as well as bridge decks. We are now moving towards addressing many durability-based design requirements by the use of fibres, as well as the general serviceability-based design. However, the possibility of having a residual tensile strength after cracking of the concrete matrix requires a new conceptual approach for a proper design of FRC structural elements.

With such a perspective in mind, the aim of FRC2018 workshop was to provide the State-of-the-Art on the recent progress in terms of specifications development, actual applications, and to expose users and researchers to the challenges in the design and construction of a wide variety of structural applications.

Considering that at the time of the first workshop, in 2004, no structural codes were available on FRC, we have to recognize the enormous work done by researchers all over the world, who have presented at many FRC events, and convinced code bodies to include FRC among the reliable alternatives for structural applications. This will allow engineers to increasingly utilize FRC with confidence for designing safe and durable structures.

Many presentations also clearly showed that FRC is a promising material for efficient rehabilitation of existing infrastructure in a broad spectrum of repair applications. These cases range from sustained gravity loads to harsh environmental conditions and seismic applications, which are some of the broadest ranges of applications in Civil Engineering.

The workshop was attended by researchers, designers, owner and government representatives as well as participants from the construction and fibre industries. The presence of people with different expertise provided a unique opportunity to share knowledge and promote collaborative efforts. These interactions are essential for the common goal of making better and sustainable constructions in the near future.

The workshop was attended by about 150 participants coming from 30 countries. Researchers from all the continents participated in the workshop, including 24 Ph.D. students, who brought their enthusiasm in FRC structural applications.

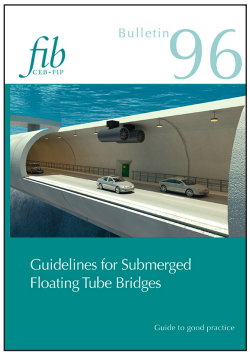
For this reason, the workshop Co-chairs sincerely thank all the enterprises that sponsored this event. They also extend their appreciation for the support provided by the industry over the last 30 years which allowed research centers to study FRC materials and their properties, and develop applications to making its use more routine and accepted throughout the world. Their important contribution has been essential for moving the knowledge base forward.

Finally, we appreciate the enormous support received from all three sponsoring organizations of ACI, *fib* and Rilem and look forward to paving the path for future collaborations in various areas of common interest so that the developmental work and implementation of new specifications and design procedures can be expedited internationally.

fib BULLETIN NO. 96

Title: Guidelines for Submerged Floating Tube Bridges.
Guide to good practice
Year: 2020
Pages: 119
Format approx. DIN A4 (210x297 mm)
ISBN: 978-2-88394-143-4

Abstract:
This bulletin is a guidelines document for "Submerged Floating Tube Bridges", that represents an innovation in Marine Concrete Structures. This theme is considered important for Commission 1 since in the future several applications are forecast in marine environments.



Submerged Floating Tube Bridges are a solution that can be proposed to solve different problems in passing water constrains as lakes and fiords, reducing the impact and allowing several economic advantages.

The guidelines certainly will boost the application of Submerged Floating Tube Bridges since the document is useful not only for designers but also for construction companies, owners and public administrations.

As guidelines, the bulletin gives wide information on the design, construction and management of these structures, allowing all the users to be confident in promoting the use of Submerged Floating Tube Bridges.

As Commission 1 Chair, I'm very grateful to Arianna Minoretti and to all members of WP 1.2.2 "Submerged Floating Tube Bridges", for having produced this document that I consider very interesting not only for the *fib* members but also for the concrete community.