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Abstract of Proposed Keynote Lecture and Paper

Conference Topics: Products and processes, protection & repair of concrete structures

fib Model Code 2020 and Existing concrete structures - Assessment, through-life care & interventions

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Abstract

The *fib* (*Fédération Internationale du Béton*) is preparing a new *fib Model Code for Concrete Structures*, under the working title of Model Code 2020 (MC2020). The vision is that it will be a single code dealing with both new and existing concrete structures, that is both the design of new structures and the various activities associated with the assessment, interventions upon and the through-life management and care of existing concrete structures. This is an ambitious project which will build upon the achievements of *fib* MC2010 (2013) and its treatment of activities for the conservation / improvement of existing concrete structures.

Numerous aspirational goals have been identified for MC2020. These relate not only to the structural design of new buildings and other constructed assets, but also the structural assessment of existing concrete structures, together with matters relating to durability and service life design / re-assessment through-life, and undertaking interventions to enhance the performance of existing concrete structures or extend their useful life.

Existing concrete structures are often appreciably different entities to the new concrete structures which contemporary design and construction practices create, with the differences generally relating to the age / period when the structures were constructed, the implicit assumptions contained in the codes used for their design and in the supporting material / product standards of those earlier times.

Certain structural materials and components are not used anymore, such as plain or indented reinforcing steel. Consequently, most modern codes and recommendations are based on the assumption that standardised ribbed reinforcing steel bars are used as reinforcement and, accordingly, do not include provisions for use or evaluation of previous types of reinforcing materials.

Depending upon the period of their construction, existing structures may contain obsolete structural details which do not comply with contemporary practices; a situation which may produce sub-optimal behaviour for failure modes associated with shear, punching and torsion in some regions of the structure. Clearly the implications of such structural details need to be evaluated. However, this is not always an easy undertaking and work needs to be undertaken in the MC2020 project to provide assessment guidance that enables proper consideration to be given to the actual structural detailing of an existing concrete structure.

Accordingly making prognoses about the future performance and durability of a structure, especially if it has experienced deterioration and / or is exposed to an aggressive environment, is a difficult task. The activity is made even more challenging if protection, remedial or improvement intervention works have previously been performed on the structure. Thus defining a strategy for managing and caring for such a structure, along with selecting the most appropriate package of protection works / other interventions is a demanding task.

Consequently MC2020 will pay particular attention to issues specific to existing structures including matters such as the effects of material degradation and / or insufficient or deficient detailing of the provided material (ie. those that do not comply with contemporary practice), along with the steps which need to be taken to address these and any other issues which are adversely affecting the performance and / or expected life of the structure.

To advance contemporary practice for the design of new structures and the various activities associated with the through-life management and care of existing concrete structures, MC2020 will incorporate many improvements and extensions to the currently available guidance. These will include:

- Advancement of the principles and provisions for the through-life care of concrete structures
- The development of provisions for the assessment of existing structures / constructed assets
- Models which address deterioration processes not currently addressed in *fib* MC2010, issues such as propagation stage deterioration and the influence of cracking
- Structural (mechanical) models which provide more accurate estimates of the actual strength / bearing capacity of structures, especially as they age / deteriorate
- Structural (mechanical) models for deterioration / damage effects
- Development of models which can provide insight into the durability and prospective behaviour of 'repaired' / 'protected' structures
- Better ways of estimating the change in structural reliability as structures age / deteriorate
- Verification of existing structures by testing, such as the use of proof loading procedures
- Consideration of the use and value of monitoring data / the level of knowledge available for decision making in respect of the through-life management and care of concrete structures
- Updating of the current provisions for the conservation of existing structures / constructed assets, including the selection of appropriate intervention and protection procedures, along with their effective execution.

The improved technical capabilities offered by MC2020 should allow better evaluation of the current condition of existing concrete structures and more realistic prognoses of their future condition /performance. Such advances would enable better judgements to be made about how the structures may behave in service, the level of structural reliability they may be expected to have and what measures / interventions / protections may be appropriate to enhance their performance / extend their useful life. These enhancements will contribute to improving the management and the through-life care of concrete structures.

The paper will overview the ambitions of the MC2020 project, which builds on the achievements of *fib* MC2010, and report how the current provisions for the assessment and conservation of existing concrete structures will be extended and improved.

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