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Life cycle management of concrete structures —

Part 2: Structural planning and design stage

ISO/TC 71

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This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*.

A list of all parts in the ISO 22040 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

A concrete structure passes through different stages during its life: from the planning, design, execution and use stages to the end-of-life stage. Due to its long life, it involves different parties at each stage. This implies that it is essential to transfer important information from one stage to another in an appropriate form. However, in reality, no appropriate system has been developed regarding the basic concept and specific methods to achieve this and manage the life cycle of the structure in a consistent manner (life cycle management).

Such lack of an appropriate system creates limitations in durability management of concrete structures, which has been recognized as a serious problem in the field of concrete technologies. This means that the prerequisites at the design stage are not managed appropriately and that execution-induced problems are not ascertained and documented. Regarding the former, there has not been a system for clarifying a long-term maintenance program based on conditions elaborated at the design stage and ensuring its continuation in an appropriate form. Regarding the latter, since a number of uncertain elements exist in the construction of a concrete structure, the quality of construction does not always match the prerequisites of design. Therefore, construction involves factors impairing the durability of the structure in quite a few cases. This suggests that confirmation of completion of the structure and documentation of the procedure to completion are essential for ensuring its performance in its life cycle. It can also become necessary to alter the design conditions of a concrete structure in the use stage. In such a case, basic information regarding the original design becomes essential, but it is often not retained in an appropriate form. As a result, it takes much work to retrieve basic information of the existing structure. Moreover, the design and execution need to be based on uncertainty to a certain extent. For appropriate management of a structure, it is therefore extremely important to keep all basic information at each stage.

Some standards, regarding the life cycle of infrastructure, have already been developed. The pertinent standards are the ISO 15686 series. The ISO 15686 series is relevant to the service life planning of new and existing buildings and cover a part of the planning process. In the ISO 15686 series, service life estimation applies principally to the estimation of residual service lives of components of a building that are already in service, and to the selection of components for, and the detailing of, repairs and new work. While a part of basic philosophy of these standards can be applied, it is difficult or rather impossible to fully apply these documents to the life cycle management of concrete structures without misunderstanding because these standards only deal with buildings with replaceable components including ancillaries. This document covers any kind of concrete structures.

A standard is, therefore, necessary regarding the basic concept and specific procedures for methods of managing concrete structures in view of the current problems, in order to rationally control concrete structures throughout their life cycle and more reliably ensure functioning of future documents. With this as a background, ISO 22040 was developed to establish the key principles, framework and procedures for appropriately implementing life cycle management (LCM) in which planning, design, execution, use and end-of-life of a structure are appropriately connected one after another. Based on it, this document focuses on the management of structural planning and design stages in details as the overall life cycle management of concrete structures.

A structure is constructed with its own purposes. It generally includes protecting people from disasters and ensuring a comfortable and safe life. A structure is required to maintain its functions and performance to achieve these purposes. The introduction of LCM for a structure contributes to all aspects of sustainability while maintaining the functions and performances to fulfil its purposes.

Sustainability is the goal of sustainable development. It refers to any state of the global system in which the needs of the present are met without compromising the ability of future generations to meet their own needs. The concept of sustainability is continually evolving. Understanding and achieving a balance between environmental, social and economic aspects, ideally in mutually supporting ways, is considered essential for making progress towards achieving sustainability. The achievement of sustainability is now recognized as one of the most important considerations in all human activities (see ISO Guide 82).

A concrete structure inherently has a planned life when it is well designed, executed and maintained under proper life cycle management based on sustainability framework.

