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## Life cycle management of concrete structures

*Gestion du cycle de vie des structures en béton*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

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](http://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 to the end-of-life stages. 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, it was decided to establish in this document 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 the other. It is worth noting that this document also serves as a guideline for other ISO standards. [Table 1](#) lists the relationship between this document and other ISO standards.

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 (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.

**Table 1 — Relationship between this document and other ISO standards**

Planning	Design	Execution	Use	End-of-life
ISO 22040, Life cycle management of concrete structures				
—	[Test method] ISO 1920 series ISO 10406 ISO 17785 ISO 19044 ISO 20290 series			—
—	ISO 14484 ISO 15673 ISO 16204 ISO 19338 ISO 28841 ISO 28842	ISO 12439 ISO 14824 ISO 19595 ISO 22965 ISO 22966	ISO 16311 ISO 16711 ISO/TR 16475 ISO/TS 16774	—
—	ISO 14484 (FRP) ISO 18319 (FRP)			—
ISO 13315 series (Environmental management)				

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