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Environmental management for concrete and concrete structures —

Part 6: Use of concrete structures

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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).

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).

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.

This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 8, *Environmental management for concrete and concrete structures*.

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.

A list of all parts in the ISO 13315 series can be found on the ISO website.

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Introduction

With their extremely long period of use and large size compared with other industrial products, concrete structures undergo damage and deterioration during this period due to a variety of mechanical and environmental actions. Maintenance/remedial activities are therefore carried out during this period of use to maintain their functions and performances. Remedial activities can also be carried out to enhance their functions and performances to adapt to changes in the social circumstances. These activities cause environmental impacts, such as input of resources including repair materials and fuels, greenhouse gas emissions including CO_2, and waste disposal including construction wastewater and concrete rubble. Therefore, environmental management related to maintenance/remedial activities during the period of use of concrete structures is necessary.

For a concrete building, the energy consumed during the period of its use is known to be greater than the energy consumed for activities such as the production of raw materials, production/transportation of concrete, and construction/demolition of the building. Energy consumption for air conditioning, lighting, etc., and the concomitant emission of greenhouse gas are particularly enormous. Though the ISO 13315 series does not directly cover energy efficiency of air conditioning and lighting equipment, it covers the case where reduction in the environmental impacts, such as reduction of energy consumption, is achieved by utilizing the properties of concrete. This include, for instance, mitigation of room temperature changes by the thermal mass property of concrete. It also includes the use of pervious concrete to suppress the heat island phenomenon, which reduces the energy consumption for air conditioning, with the concomitant reduction in the emission of greenhouse gas. On the other hand, hazardous substances can leach or radiate from concrete during the period of use of concrete structures. Therefore, appropriate management of such various environmental influences generated during the period of use of concrete structures is also necessary.

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Environmental management for concrete and concrete structures —

Part 6:
Use of concrete structures

1 Scope

This document provides the principles and procedures of environmental management for maintenance/remedial activities of concrete structures, and environmental management during the operation of concrete structures.

When the environmental design of a concrete structure is to be carried out based on ISO 13315-4, this document provides detailed information on the design for its use stage.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13315-1, *Environmental management for concrete and concrete structures — Part 1: General principles*

ISO 13315-2, *Environmental management for concrete and concrete structures — Part 2: System boundary and inventory data*

ISO 13315-4, *Environmental management for concrete and concrete structures — Part 4: Environmental design of concrete structures*

ISO 14040, *Environmental management — Life cycle assessment — Principles and framework*

ISO 14050, *Environmental management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13315-1, ISO 13315-2, ISO 13315-4, ISO 14040 and ISO 14050 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
maintenance
light work carried out to maintain the functions and performances of concrete and concrete structures

Note 1 to entry: Maintenance includes visual inspection on foot or by car and investigations for diagnosis.

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3.2
remedial activity
construction work carried out to maintain or enhance the functions and performances of concrete and concrete structures

Note 1 to entry: Remedial activities include repair, rehabilitation, refurbishment, renewal, renovation, retrofitting, strengthening, and protection against corrosive agents.

3.3
target remedial activity
remedial activity (3.2) for which environmental consideration is given

3.4
reference remedial activity
conventional standard *remedial activity* (3.2) having the same purpose as the *target remedial activity* (3.3) to be used for comparison in environmental management related to remedial activity

3.5
target concrete structure
target structure
concrete structure for which environmental consideration is given

3.6
reference concrete structure
reference structure
standard (concrete) structure having the same structural and durability aspects as a *target concrete structure* (3.5) or an existing (concrete) structure prior to environmental improvement, to be used for comparison in environmental management related to operation of concrete structures

4 Symbols

Symbols used in this document are as follows:

$P_{\mathrm{trem}}(i)$	expected or attained environmental performance of the target remedial activity expressed as a function of indicator *i*;
$P^{\mathrm{e}}_{\mathrm{trem}}(i)$	expected environmental performance of the target remedial activity expressed as a function of indicator *i*;
$P^{\mathrm{a}}_{\mathrm{trem}}(i)$	attained environmental performance of the target remedial activity expressed as a function of indicator *i*;
$P_{\mathrm{rrem}}(i)$	environmental performance of the reference remedial activity expressed as a function of indicator *i*;
$S_{\mathrm{rem}}(i)$	environmental performance requirement of the remedial activity expressed as a function of indicator *i*;
$R^{\mathrm{a}}_{\mathrm{trem}}(i)$	reduction amount of environmental impact of the target remedial activity in comparison with the reference remedial activity;
$R^{\mathrm{r}}_{\mathrm{trem}}(i)$	reduction rate of environmental impact of the target remedial activity in comparison with the reference remedial activity;
$P_{\mathrm{tco}}(i)$	expected or attained environmental performance of the target (concrete) structure during operation expressed as a function of indicator *i*;
$P^{\mathrm{e}}_{\mathrm{tco}}(i)$	expected environmental performance of the target (concrete) structure during operation expressed as a function of indicator *i*;

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