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Environmental management for concrete and concrete structures —

Part 1: General principles

Management environnemental du béton et des structures en béton —

Partie 1: Principes généraux

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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 document 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).

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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 prestressed concrete*, Subcommittee SC 8, *Environmental management for concrete and concrete structures*.

This second edition cancels and replaces the first edition (ISO 13315-1:2012), which has been technically revised.

The main changes are as follows:

- the Scope has been revised to be succinct and partially moved to other clauses;
- references to ISO 13315-2 that was subsequently developed have been added to [Figure 1](#), [Figure 2](#), [Clause 3](#) and [4.4.2](#);
- references to ISO 13315-4 that was subsequently developed have been added to [Figure 1](#), [Figure 2](#), [Clause 3](#) and [4.5](#);
- references to ISO 13315-6 that was subsequently developed have been added to [Figure 1](#), [Figure 2](#), [Clause 3](#) and [4.7](#);
- references to ISO 13315-8 that was subsequently developed have been added to [Figure 1](#), [Figure 2](#), [Clause 3](#) and [4.9](#).

A list of all parts in the ISO 13315 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.

Introduction

Environmental issues are serious subjects for the human race. The nature of the problem has been clearly recognized and the concept of "sustainable development" which can be regarded as an environmental revolution, has been created. This concept means development that meets the needs of not only present but also future generations without endangering the natural systems that support life on earth, the atmosphere, the waters, the soils and the living things, and at the same time acknowledging that global economic growth is a basis for future global welfare. The incorporation of the concept of sustainability is necessary in every aspect of social, economic, and cultural activities. The construction industry, which consumes enormous amounts of resources and energy to provide the infrastructure for the diversified activities of mankind, has a strong impact on the environment.

The ISO 14000 series on environmental management for goods and services as a system for improving the impact on the environment has already been published. This series of International Standards provides general rules for assessing the impact on the environment, as well as for environmental labels/declarations based on such an assessment. ISO 21931 and ISO 21930 are formulated to tailor this series to construction works and construction products and services, respectively.

Concrete is widely used as one of the key materials for constructing infrastructures such as buildings, bridges, dams, tunnels, etc., with its consumption being the second largest on the planet after water. While construction activities using concrete naturally entail adverse environmental impacts, they also provide environmental beneficial impacts. Improved infrastructures alleviate traffic congestion and prevent natural disasters. The development of compact cities can control the expansion of adverse environmental impacts. Industrial wastes and byproducts from other industries are used as materials, fuels, and supplementary materials for producing cement. Accurate assessment of environmental impacts is therefore essential for minimizing adverse environmental impacts derived from construction activities using concrete while maximizing beneficial environmental impacts.

Concrete structures consume large amounts of aggregates, cement and steel, which emit large amounts of CO₂ in their production processes. Concrete utilizes industrial waste and byproducts, and uses different aggregates in different regions. Concrete is delivered to the construction site in the form of partially finished products. Concrete structures are built in a wide variety of forms with specific requirements, used in various environments for a long time, and demolished, recycled and disposed of in various forms. The ISO 13315 series is intended to provide the basic rules on environmental management for concrete and concrete structures having such characteristics. It is also intended to contribute to continued improvement of the environmental impacts resulting from the activities related to concrete and concrete structures. This series ensures consistency with the existing environmental ISO 14000 series, as well as ISO 21930 and ISO 21931. [Figure 1](#) shows the relationship between the ISO 13315 series, including those to be established in the future, and other existing ISO standards. [Figure 2](#) shows the basic framework of the ISO 13315 series.

The ISO 13315 series covers all people involved in concrete and concrete structures: owners, designers, concrete manufacturers, constructors, users, certification bodies and those who develop environmental standard specifications.

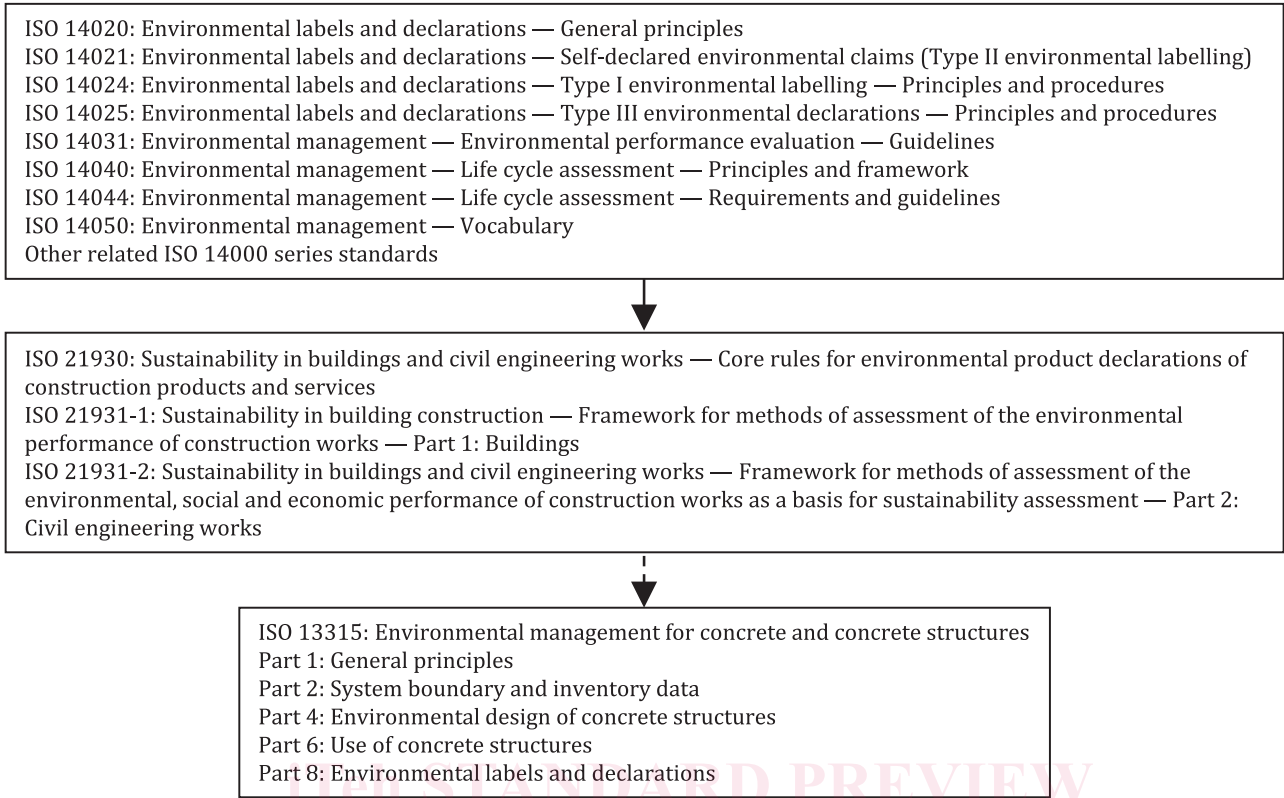


Figure 1 — Relationship between the ISO 13315 series and other existing ISO environmental standards

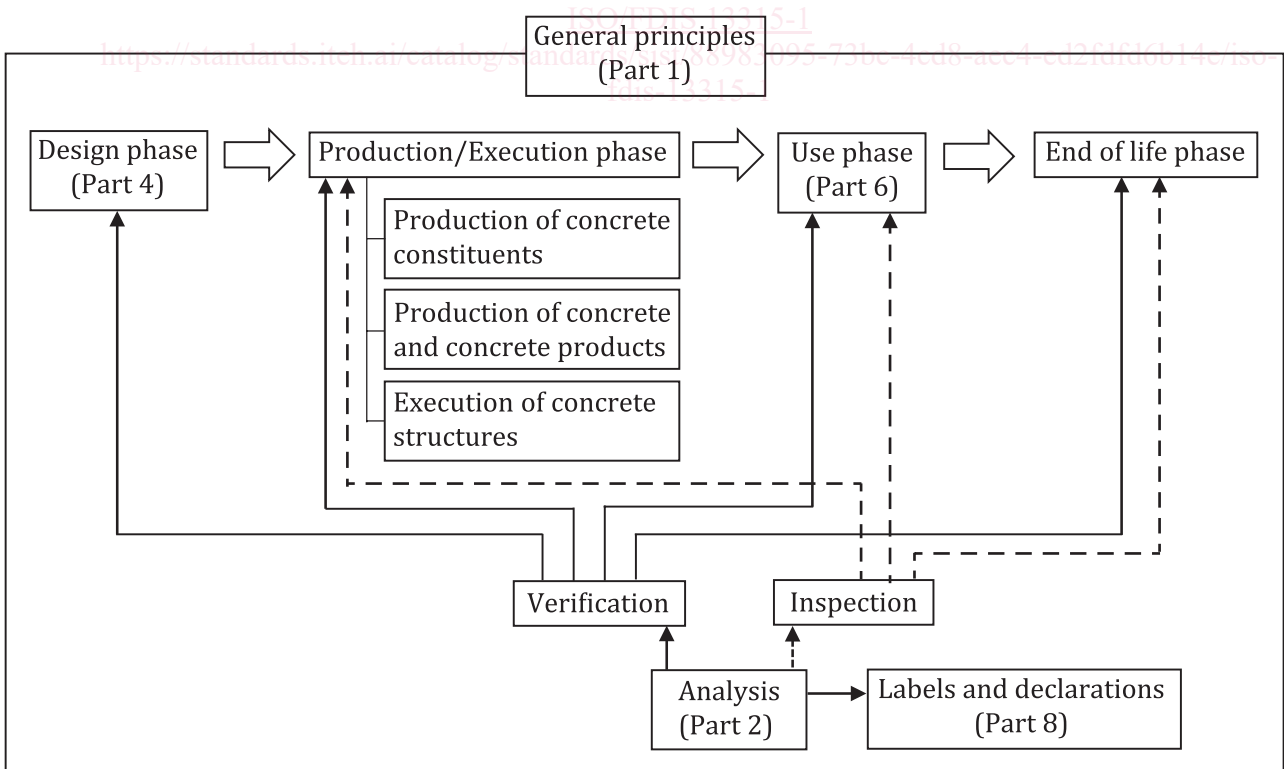


Figure 2 — Basic framework of the ISO 13315 series of standards

Environmental management for concrete and concrete structures —

Part 1: General principles

1 Scope

This document provides a framework and basic rules on environmental management related to concrete and concrete structures. This includes the assessment of the environmental impacts and methods of implementing environmental improvement based on the assessment.

This document is used for the environmental consideration in activities related to the production of concrete constituents, the production, recycling and disposal of concrete, and the design, execution, use and demolition of concrete structures. It is applied for their entire lifecycles, respective stages of the lifecycles, or certain ranges of the lifecycles. This document is applicable to newly produced concrete and newly constructed concrete structures, and also existing concrete and concrete structures.

This document applies to single concretes, concrete families, single concrete structures, and concrete structure complexes. For materials other than concrete, the related ISO standards are applied where available. In the case where no ISO standard is available, such materials are appropriately dealt with referring to this document and the normative references.

This document covers global, regional and local environments. This document does not directly deal with the environmental impacts resulting from the operation of equipment installed in concrete structures. However, the special properties of concrete and concrete structures affecting the operational efficiency of such equipment are considered in this document.

This document covers secondary effects of the production of concrete and execution of concrete structures.

NOTE The secondary effects of the production of concrete include the future possibility of leaching of heavy metals from concrete or the absorption of heavy metals from the environment, the effect of waste treatments on the environment, etc.

This document covers the economic and social effects of environmental consideration in the production of concrete and execution of concrete structures.

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 13315-2, *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 13315-6, *Environmental management for concrete and concrete structures — Part 6: Use of concrete structures*

ISO 13315-8, *Environmental management for concrete and concrete structures — Part 8: Environmental labels and declarations*

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

ISO 14044, *Environmental management — Life cycle assessment — Requirements and guidelines*

ISO 14050, *Environmental management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13315-2, ISO 13315-4, ISO 13315-6, ISO 13315-8 and ISO 14050, and the following apply.

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

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

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

byproduct

secondary substance produced by an industrial process

3.2

client's brief

working document which specifies at any point in time the relevant needs and aims, resources of the client and user, the context of the project and any appropriate design requirements

3.3

concrete demolition material

material generated in demolition of concrete structures

3.4

ecosystem

system of interrelations among nature, animals and human beings

3.5

environmental monetary cost

costs necessary to fulfil environmental requirements

3.6

environmental design

design of a structure in which *environmental impacts* (3.7) are considered

3.7

environmental impact

any change, which can be adverse or beneficial, to the environment, wholly or partially resulting from concrete-related activities

3.8

environmental performance

quantitative or qualitative results of environmental influence from activities related to concrete and concrete structures

3.9 execution

activities carried out for the physical completion of the work, and the inspection and documentation thereof

EXAMPLE Procurement, scaffolding, formwork, reinforcing, concreting, curing, erection of precast elements, etc.

3.10 global environment

environment that is affected by global climate change, ozone depletion, changes in ecosystems, resource use and other factors on a global scale

3.11 inspection

examination to determine whether *environmental performance* (3.8) attained in a product or an activity satisfies specified requirements

3.12 local environment

environment that is affected by noise, vibration, dust and other factors in a built environment

3.13 regional environment

environment that is affected by air pollution, soil contamination, or water pollution on an intermediate scale

EXAMPLE City, province and country.

3.14 sustainability

state in which components of the ecosystem and their functions are maintained for present and future generations

Note 1 to entry: Sustainability is the goal of sustainable development and can result from the application of the concept of sustainable development.

Note 2 to entry: "Components of the ecosystem" includes plants and animals, as well as humans and their physical environment. For humans, this includes a balancing of key elements of human needs: the economic, environmental, social and cultural conditions for societies' existence.

3.15 soil contamination

phenomenon in which soil is polluted by deleterious substances

3.16 verification

process to check whether environmental performances estimated in a product or an activity satisfy specified requirements

3.17 waste

unusable substances emitted from activities related to concrete and concrete structures

3.18 water pollution

phenomenon in which water is polluted by deleterious substances

4 General framework

4.1 General

The concept of sustainability through environmental management shall be considered in various activities related to the production of concrete and execution of concrete structures. In addition to the environmental aspect, sustainability has economic and social aspects which influence one another. Consideration of the environmental aspect can relate to the economic aspect such as environmental monetary cost. Consideration of the environmental aspect can relate to the social aspect, which involves issues of intergenerational ethics, such as securing the quality of society and life, inheritance of tradition and culture, and consensus building for preserving ecosystems. The economic and social aspects of environmental consideration should therefore be clearly recognized in activities related to the production of concrete and execution of concrete structures, and these aspects may be appropriately considered based on the required priorities.

Environmental management of concrete and concrete structures shall be implemented with the aim of minimizing the adverse environmental impacts and maximizing the beneficial environmental impacts.

The objects of environmental management shall include the environmental impacts generated in the entire lifecycle of concrete and concrete structures or its phases including design, production, execution, use and end of life phase.

The basic flow of environmental management for concrete and concrete structures is shown in [Figure 3](#). Environmental management shall be carried out with the plan-do-check-act process at the respective phases of the concrete structures or through the lifecycle. This includes determining or confirming the types and values of environmental performance requirements; analysing the environmental performance of concrete, concrete structures and related activities, and verifying that the environmental performances satisfy or dissatisfy the required values; inspecting actual environmental performance during the respective phases or after them; and taking appropriate measures in the event of problems. The activities and their results shall be documented, and the documents shall be stored.

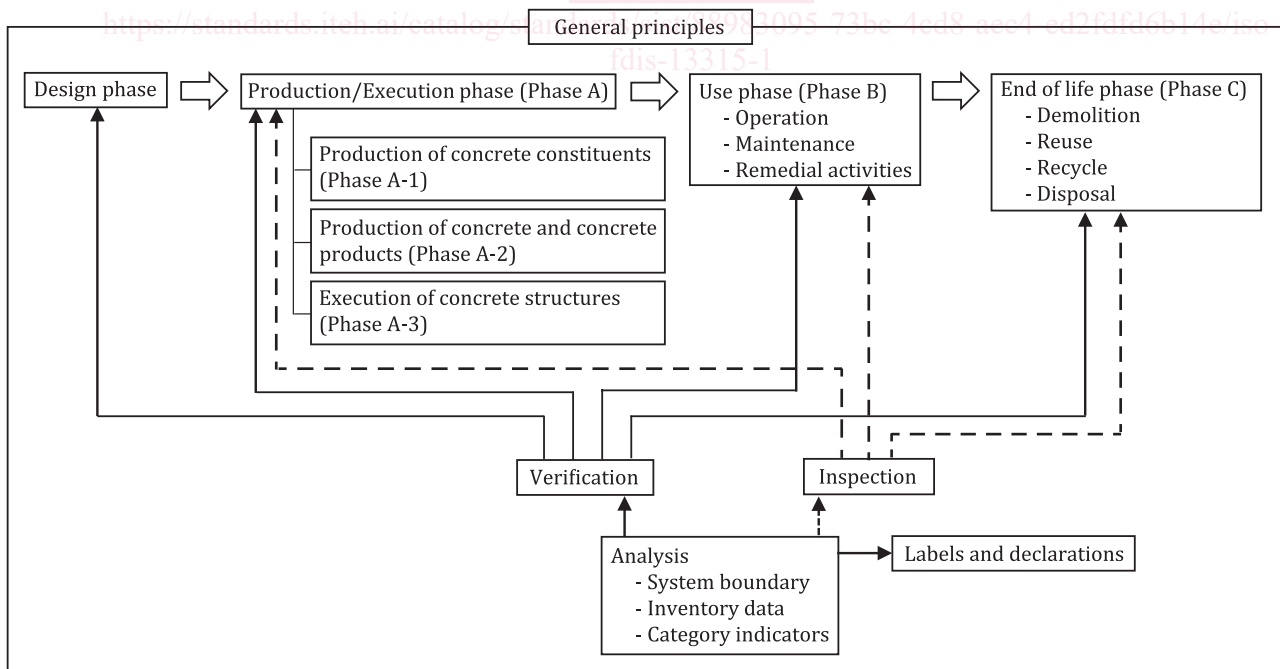


Figure 3 — Basic flow of environmental management for concrete and concrete structures

4.2 Phases in the lifecycle

The lifecycle of concrete and concrete structures consists of the following phases:

- Design phase (see 4.5): phase in which the specifications of concrete structures are determined to satisfy the environmental performance requirements based on the client's brief and legislation, and they are documented.
- Production/execution phase (Phase A, see 4.6): phases including the production of concrete constituents (Phase A-1), the production of concrete and concrete products (Phase A-2), and the execution of concrete structures (Phase A-3).
- Use phase (Phase B, see 4.7): phase of operation and maintenance and remedial activities of concrete structures.
- End of life phase (Phase C, see 4.8): phase of demolition of concrete structures, reuse of some elements, and recycling and disposal of concrete.

4.3 Environmental impact categories

The following items shall be considered as environmental impacts of concrete and concrete structures:

- global climate change;
- natural resources use (materials, water and fuel);
- stratospheric ozone level;
- land use and habitat alteration;
- eutrophication;
- acidification;
- air pollution:
 - photochemical oxidant creation,
 - particulate matter air pollution,
 - other air pollution (toxics, etc.),
 - indoor air pollution;
- water pollution;
- soil contamination;
- pollution due to radioactive substances;
- impacts due to waste generation;
- noise and vibration.

When assessing the environmental impacts, it is necessary to appropriately judge if the range of the impact is limited to the local environment of the concrete structure or whether it reaches the regional or global environment.

NOTE 1 The elements of environmental impacts generated at each phase of the lifecycle of concrete structures are shown in [Annex A](#).

NOTE 2 The indoor pollution of buildings and the environments for workers in concrete producing plants and on concrete structure construction sites are not specifically covered by this document. ISO 16814 is available for reference as a standard for the indoor pollution of buildings.