
**Structural intervention of
existing concrete structures using
cementitious materials —**

**Part 3:
Bottom-surface (soffit) underlaying**

*Intervention structurelle sur les structures en béton existantes
utilisant des matériaux cimentaires —*

Partie 3: Recouvrement de la surface inférieure (soffite)





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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 pre-stressed concrete*, Subcommittee SC 7, *Maintenance and repair of concrete structures*.

A list of all parts in the ISO 5091 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

As a repairing and strengthening method, attaching of cementitious material layer to surface of existing concrete structures has been widely accepted. Since the cementitious layer does not have enough tensile strength, tension reinforcement is generally placed in the cementitious layer. There are two types of attaching way. For the first way, the cementitious layer is attached either on top surface or bottom surface of horizontal concrete members, especially slabs, while, for the second way, the cementitious layer is attached to jacket vertical concrete members, especially columns. There has not been any ISO standard on design, execution, and maintenance for this method with attaching cementitious layer. The ISO 5091 series serves as the first ISO standard for the intervention by attaching cementitious material layer with tension reinforcement inside.

At the same time, the ISO 5091 series is the first ISO standard developed for a specific intervention method, which conforms to the umbrella code, ISO 16311, especially ISO 16311-3 and ISO 16311-4.

The ISO 5091 series consists of four parts. ISO 5091-1 provides the issues common to all three parts, while ISO 5091-2, 3 and 4 provide the issues specific to each attaching way of cementitious material layers.

Generally, polymer hydraulic cement mortar (PCM) is used as the underlaying material. This is because PCM bonds well with the existing members and has large tensile strain at cracking, and makes the penetration of degradation factors less likely. As reinforcing materials, reinforcing steel, welded wire mesh, FRP grid are used.

Bottom-surface (soffit) underlaying has evolved as a strengthening method for fatigue of RC decks. drawing attention because of examples of applications like the one shown in [Figure 1](#). The members that are currently repaired or strengthened using this method include RC decks, tunnel linings, box culverts, waterways and beams. In this document, the latest information about the design and construction of the bottom-surface (soffit) underlaying method using underlaying materials has been collected and the best possible standards are presented.

The ISO 5091 series can serve as a practical standard for construction industry, such as client, design consultant and general contractor, to apply the structural intervention with externally attached cementitious layer. Additional technical information, which is not provided explicitly in the ISO 5091 series, needs to be provided in each application case with consideration of the provisions of the ISO 5091 series.

Structural intervention of existing concrete structures using cementitious materials —

Part 3: Bottom-surface (soffit) underlaying

1 Scope

This document specifies the standards for design and construction using the bottom-surface (soffit) underlaying method. Bottom-surface (soffit) underlaying is a method whereby reinforcing materials are placed on the bottom surface of the slabs or beams whose performance is lower than required and the improvement of durability, serviceability, safety and other performance of the members is achieved by the integrity between the reinforcing materials and existing members.

This document specifies structural intervention of existing concrete structures using cementitious materials design and execution principles, and strategies for defects and on-going deterioration including, but not limited to:

- a) mechanical actions, e.g. fatigue, impact, overloading, movement caused by settlement, blast, vibration, and seismic actions;
- b) chemical and biological actions from environments, e.g. sulfate attack, alkali-aggregate reaction;
- c) physical actions, e.g. freeze-thaw, thermal cracking, moisture movement, salt crystallization, fire, and erosion;
- d) reinforcement corrosion;
- e) original construction defects that remained unaddressed from the time of construction.

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 5091-1:2023, *Structural intervention of existing concrete structures using cementitious materials — Part 1: General principles*

ISO 22966, *Execution of concrete structures*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>