
**Performance guidelines for design
of concrete structures using fibre-
reinforced polymer (FRP) materials**

*Lignes directrices de performance pour la conception des structures
en béton utilisant des polymères renforcés de fibres (PRF)*



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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 6, *Non-traditional reinforcing materials for concrete structures*.

Introduction

Continuous fibre-reinforced polymer (FRP) materials are being widely applied to concrete structures. FRP materials have many advantages, such as a high strength/weight ratio and immunity to corrosion. FRP materials are available in a variety of geometries, including rod, grid, plate, sheet, strand, etc.

ISO/TC 71/SC 6 was established to develop standards for non-traditional reinforcing materials such as FRP. This International Standard describes the general performance requirements for concrete structures with the use of FRP materials. It is an umbrella-type document with general provisions and guidelines and lists the regional consensus guidelines/standards that are deemed to satisfy this International Standard. The regional guidelines/standards are generally more prescriptive in nature and vary somewhat from region to region.

This International Standard should be intended to provide wide latitude in terms of general requirements for performance verification and assessment of concrete structures with the use of FRP materials. It should be used, therefore, in conjunction with sound engineering judgment.

Performance guidelines for design of concrete structures using fibre-reinforced polymer (FRP) materials

1 Scope

This International Standard provides general principles for the verification and assessment of the performance of concrete structures with the applications of different FRP systems varying from internal FRP reinforcements/tendons, external FRP tendons, externally bonded FRP sheets/plates, to near-surface mounted FRP reinforcement. It can be used for the international harmonization of the design of un-reinforced, conventionally reinforced, and pre-stressed concrete structures with the use of the above-mentioned FRP systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2394, *General principles on reliability for structures*

ISO 10406-1, *Fibre-reinforced polymer (FRP) reinforcement of concrete — Test methods — Part 1: FRP bars and grids*

ISO 10406-2, *Fibre-reinforced polymer (FRP) reinforcement of concrete — Test methods — Part 2: FRP sheets*

ISO 19338, *Performance and assessment requirements for design standards on structural concrete*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19338, ISO 10406-1, ISO 10406-2, and ISO 2394 and the following apply.

3.1

bonding

attachment between FRP and substrates

3.2

concrete substrate

concrete or any cementitious material used to repair or replace the original concrete

Note 1 to entry: The substrate can consist entirely of original concrete, entirely of repair materials, or of a combination of original concrete and repair materials.

3.3

debonding

separation at the interface between the substrate and the near-surface mounted or externally bonded FRP materials

3.4

FRP material

assembly of dissimilar materials with a polymeric matrix and continuous fibre reinforcement of aramid, carbon, glass, etc.