

# **Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity —**

**Part 9: General principles for the use of  
products and systems**

ICS 01.040.91; 91.080.40

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

This Draft for Development, having been prepared under the direction of the Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on 15 December 1997

© BSI 04-1999

ISBN 0 580 28645 2

Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

# Contents

|                    |      |
|--------------------|------|
|                    | Page |
| National foreword  | ii   |
| Foreword           | 2    |
| Text of ENV 1504-9 | 5    |

# National foreword

This Draft for Development is the English language version of ENV 1504-9:1997. The UK participation in its preparation was entrusted by Technical Committee B/517, Concrete, to Subcommittee B/517/8, Protection and repair of concrete structures, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

## Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

ENV 1504-9:1997 results from a programme of work undertaken by the European Committee for Standardization to make available a common set of standards for repair and protection of concrete structures.

ENV 1504-9:1997 provides guidance on possible methods of repair. Other parts of EN 1504 will provide specifications for the most widely used materials for repair and protection. Some repair methods (e.g. cathodic protection) will be the subject of other European Standards. Some repair methods are not, as yet, the subject of any standard. Users of this pre-standard will need to confirm the suitability and appropriateness of any particular repair method in any specific repair application.

## This publication is not to be regarded as a British Standard

An ENV or European Prestandard is made available for provisional application, but does not have the status of a European Standard. The aim is to use the experience gained to modify the ENV so that it can be adopted as a European Standard (EN).

Users of this document are invited to comment on its technical content, ease of use and any ambiguities or anomalies. These comments will be taken into account when preparing the UK national response to CEN on the question of whether the ENV can be converted to an EN.

Comments should be sent in writing to the Secretary of BSI Subcommittee B/517/8 at BSI, 389 Chiswick High Road, London, W4 4AL, quoting the document reference, the relevant clause and, where possible, a proposed revision, within 2 years of the issue of this document.

## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 24 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 9: General principles for the use of products and systems

Produits et systèmes pour la protection et la réparation de structures en béton —  
Définitions, prescriptions, maîtrise de la qualité et évaluation de la conformité —  
Partie 9: Principes généraux d'utilisation des produits et systèmes

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken —  
Definitionen, Anforderungen,  
Qualitätsüberwachung und Beurteilung der Konformität — Teil 9: Allgemeine Grundsätze für die Anwendung von Produkten und Systemen

This European Prestandard (ENV) was approved by CEN on 1996-11-22 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

# CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Central Secretariat: rue de Stassart 36, B-1050 Brussels**

## Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 104

“Concrete-Performance, production, placing and compliance criteria”, the secretariat of which is held by DIN.

It has been prepared by Sub-committee 8 “Products and systems for the protection and repair of concrete structures (Secretariat AFNOR).

This European Prestandard is a part of a series of Standards dealing with products and systems for the repair and the protection of concrete structures. The other parts of this Standard are:

EN 1504-1, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: General scope and definitions*<sup>1)</sup>.

EN 1504-2, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 2: Surface protection systems*<sup>1)</sup>.

EN 1504-3, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 3: Structural and non structural repair*<sup>1)</sup>.

EN 1504-4, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 4: Structural bonding*<sup>1)</sup>.

EN 1504-5, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 5: Concrete injection*<sup>1)</sup>.

EN 1504-6, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 6: Grouting to anchor reinforcement or to fill external voids*<sup>1)</sup>.

EN 1504-7, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 7: Reinforcement corrosion prevention*<sup>1)</sup>.

EN 1504-8, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 8: Quality control and evaluation of conformity*<sup>1)</sup>.

EN 1504-10, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 10: Site application of products and systems and quality control of the works*<sup>1)</sup>.

The content of this Prestandard may be subject to modification in details depending on finalisation of EN 1504-2 to EN 1504-7. This is the reason for publishing it as an ENV.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

---

<sup>1)</sup> This document is in preparation.

# Contents

|                                                                                                           | Page | Page                                                                                                           |
|-----------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------|
| Foreword                                                                                                  | 2    | Annex A (informative) 14                                                                                       |
| Introduction                                                                                              | 5    | Annex B (informative) 17                                                                                       |
| 1 Scope                                                                                                   | 5    | Foreword 17                                                                                                    |
| 2 Normative references                                                                                    | 6    | Introduction 17                                                                                                |
| 3 Definitions                                                                                             | 6    | B.1 Scope 17                                                                                                   |
| 3.1 active coatings for concrete                                                                          | 6    | B.2 Normative references 17                                                                                    |
| 3.2 active coatings for reinforcement                                                                     | 6    | B.3 Definitions 17                                                                                             |
| 3.3 barrier coatings for concrete                                                                         | 6    | B.4 Minimum requirements before protection or repair 17                                                        |
| 3.4 barrier coatings for reinforcement                                                                    | 6    | B.5 Objectives of protection and repair 19                                                                     |
| 3.5 defect                                                                                                | 6    | B.6 Procedures leading to the choice of products and systems 20                                                |
| 3.6 design life                                                                                           | 6    | B.7 Properties of products and systems required for compliance with the principles of protection and repair 23 |
| 3.7 maintenance                                                                                           | 6    | B.8 Maintenance following the completion of protection or repair 24                                            |
| 3.8 passive/passivity                                                                                     | 6    | B.9 Health, safety and the environment 24                                                                      |
| 3.9 protection                                                                                            | 7    | Figure 1 — Common causes of defects 8                                                                          |
| 3.10 repair                                                                                               | 7    | Figure B.1 — The phases of repair projects 18                                                                  |
| 3.11 service life                                                                                         | 7    | Table 1 — Principles and Methods related to defects in concrete 10                                             |
| 3.12 substrate                                                                                            | 7    | Table 2 — Principles and Methods related to reinforcement corrosion 11                                         |
| 4 Minimum requirements before protection and repair                                                       | 7    | Table A.1 — Properties of products and systems required for intended uses 14                                   |
| 4.1 General                                                                                               | 7    |                                                                                                                |
| 4.2 Safety                                                                                                | 7    |                                                                                                                |
| 4.3 Assessment of defects and their causes                                                                | 7    |                                                                                                                |
| 5 Objectives of protection and repair                                                                     | 8    |                                                                                                                |
| 5.1 General                                                                                               | 8    |                                                                                                                |
| 5.2 Options                                                                                               | 8    |                                                                                                                |
| 5.3 Factors to be considered when choosing options                                                        | 8    |                                                                                                                |
| 5.4 Choice of appropriate action                                                                          | 9    |                                                                                                                |
| 6 Basis for the choice of products and systems                                                            | 9    |                                                                                                                |
| 6.1 General                                                                                               | 9    |                                                                                                                |
| 6.2 Principles of protection and repair                                                                   | 9    |                                                                                                                |
| 7 Properties of products and systems required for compliance with the principles of protection and repair | 12   |                                                                                                                |
| 7.1 General                                                                                               | 12   |                                                                                                                |
| 7.2 Application conditions are specified in pr EN 1504-10                                                 | 12   |                                                                                                                |
| 7.3 Required properties of products and systems                                                           | 12   |                                                                                                                |
| 7.4 Methods which do not make use of specific products and systems                                        | 13   |                                                                                                                |
| 8 Maintenance following completion of protection or repair                                                | 13   |                                                                                                                |
| 9 Health, safety and the environment                                                                      | 13   |                                                                                                                |



## Introduction

Protection and repair of concrete structures require complex design work. This Prestandard defines the principles for protection and repair of concrete structures which have suffered or may suffer damage or deterioration and gives guidance on the selection of products and systems which are appropriate for the intended use.

This Prestandard identifies key stages in the repair process:

- assessment of the condition of the structure;
- identification of the causes of deterioration;
- deciding the objectives of protection and repair;
- selection of the appropriate principle(s) of protection and repair;
- selection of methods;
- definition of properties of products and systems;
- specification of maintenance requirements following protection and repair.

This Prestandard includes an Annex A (Informative) which will be subject to modification on the finalisation of other parts and may become normative when this Prestandard is converted into an EN.

This Prestandard contains an Annex B (Informative) which provides guidance and background information on the normative text. The contents of this annex are numbered in the same way as the normative text to facilitate reference, but prefixed with “B”.

## 1 Scope

This Prestandard sets out basic considerations for specification of protection and repair of plain and reinforced concrete structures with products and systems, which are specified in the EN 1504 series of Standards or any other relevant EN or European Technical Approval.

This Prestandard includes:

- a) the need for inspection, testing and assessment before, during and after repair;
- b) protection from, and repair of defects caused by, the influence of the environments defined in EN 206 or other chemical substances;
- c) the repair of defects from such causes as mechanical damage, differential settlement, loading (including seismic and impact loading), biological attack, inadequate construction or use of unsuitable construction materials;
- d) protection and repair in order to decrease the progress of alkali-silica reaction;

e) meeting the required structural capacity in repair by:

- 1) replacement or addition of embedded or external reinforcement;
- 2) filling of external voids between elements to ensure structural continuity;

f) meeting the required structural capacity by replacement or addition of concrete;

g) waterproofing as an integral part of protection and repair;

h) protection and repair of pavements, runways, hard standings and floors, as an integral part of protection and repair;

i) methods of protection and repair including:

- 1) treating cracks;
- 2) restoring passivity to reinforcement;
- 3) reducing the rate of corrosion of reinforcement by limiting moisture content;
- 4) reducing the rate of corrosion of reinforcement by electrochemical methods;
- 5) controlling corrosion of reinforcement with coatings;
- 6) protection and repair of pavements, runways, hard standings and floors, as an integral part of protection and repair.

This Prestandard does not cover special applications which include but are not limited to the examples listed below:

- j) repair of concrete structures damaged by fire;
- k) products and systems applied for any purpose other than the protection or repair of concrete structures;
- l) repair of defects of existing post-tensioned systems;

The general principles, however, can be applied to such applications.

Site application such as:

- m) the preparation of the concrete or reinforcement before application of products and systems;
- n) the minimum requirements as to environmental conditions for storage and application of products and systems;
- o) controlling the quality of the repair work,

are not covered by this Prestandard but by 1504-10.