SLOVENSKI STANDARD
SIST EN 1504-9:2008

01-december-2008

Nadomeġļa:
SIST ENV 1504-9:1998

Proizvodi in sistemi za zaġļito in popravilo betonskih konstrukcij - Definicije, zahteve, kontrola kakovosti in ovrednotenje skladnosti - 9. del: Sploġna naļela za uporabo proizvodov in sistemov

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

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Begriffe, Anforderungen, Qualitätskontroll, Konformitätsbewertung - Teil 9: Allgemeine Grundsätze für den Einsatz von Produkten und Systemen

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

Ta slovenski standard je istoveten z: **EN 1504-9:2008**

ICS:

01.040.91	Gradbeni materiali in gradnja (Slovarji)	Construction materials and building (Vocabularies)
91.080.40	Betonske konstrukcije	Concrete structures

SIST EN 1504-9:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1504-9

September 2008

ICS 01.040.91; 91.080.40

Supersedes ENV 1504-9:1997

English Version

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, exigences et 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 Standard was approved by CEN on 27 July 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 1504-9:2008: E

Contents

Page

Foreword

This document (EN 1504-9:2008) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by March 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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

This document supersedes ENV 1504-9:1997.

Modifications to ENV 1504-9:1997 are:

a) Status of document changed form pre-standard to standard;

b) Editorial and technical modifications in those cases where necessary.

This document is one part of the European Standard on “Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity”. The other parts are listed below:

— *Part 1: Definitions*

— *Part 2: Surface protection systems for concrete*

— *Part 3: Structural and non-structural repair*

— *Part 4: Structural bonding*

— *Part 5: Concrete injection*

— *Part 6: Anchoring of reinforcing steel bar*

— *Part 7: Reinforcement corrosion protection*

— *Part 8: Quality control and evaluation of conformity*

— *Part 10: Site application of products and systems and quality control of the works*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Protection and repair of concrete structures require complex design work. This European Standard 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 European Standard identifies key stages in the repair process:

- assessment of the condition of the structure;
- identification of the causes of deterioration;
- deciding the options for 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 European Standard contains an Annex A (Informative) which provides guidance and background information on the Normative text.

1 Scope

This Part of EN 1504 sets out basic considerations for specification of protection and repair of reinforced and unreinforced concrete structures (including, for example, pavements, runways, floor slabs and pre-stressed structures) using products and systems specified in other Parts of the EN 1504 series or any other relevant European Standard or European Technical Approval. This European Standard covers atmospherically exposed, buried and submerged structures.

This European Standard includes:

a) the need for inspection, testing and assessment before and after repair;

b) protection from causes of defects and their repair in concrete structures. Causes of such defects may include:

1) mechanical actions, e.g. impact, overloading, movement caused by settlement, blast, vibration and seismic actions;

2) chemical and biological actions from environments, e.g. sulphate attack, alkali aggregate reaction;

3) physical actions, e.g. freeze-thaw, thermal cracking, moisture movement, salt crystallisation and erosion;

4) fire damage;

5) reinforcement corrosion resulting from:

i) physical loss of the protective concrete cover;

ii) chemical loss of alkalinity in the protective concrete cover as a result of reaction with atmospheric carbon dioxide (carbonation);

iii) chloride (or other chemical) contamination of the concrete;

iv) stray electrical currents conducted or induced in the reinforcement from neighbouring electrical installations.

c) repair of defects caused by inadequate design, specification or construction or use of unsuitable construction materials;

d) providing the required structural capacity by:

1) replacement or addition of embedded or external reinforcement;

2) filling of cracks and voids within or between elements to ensure structural continuity;

3) replacement or addition of concrete or whole elements;

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

f) principles and methods of protection and repair, for example those listed in Table 1.

Site application is covered in Part 10 of this European Standard.

Further background information on the scope of this European Standard is given in Annex A (Informative).

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 206-1, *Concrete — Part 1: Specification, performance, production and conformity*

EN 1504-1:2005, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: Definitions.*

EN 1504-2:2004, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 2: Surface protection systems for concrete*

EN 1504-3:2005, *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*

EN 1504-4:2004, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 4: Structural bonding*

EN 1504-5:2004, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 5: Concrete injection*

EN 1504-6:2006, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 6: Anchoring of reinforcing steel bar*

EN 1504-7:2006, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 7: Reinforcement corrosion protection*

EN 1504-8:2004, *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*

EN 1504-10:2003, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1504-1, EN 1504-2, EN 1504-3, EN 1504-4, EN 1504-5, EN 1504-6, EN 1504-7, EN 1504-8, EN 1504-10 and the following apply.

3.1
defect
unacceptable condition that may be in-built or the result of deterioration or damage

3.2
design life
intended useful period of service under expected conditions of use of the concrete structure

3.3
maintenance
recurrent or continuous measures that provide repair and/or protection

3.4
passivity
state in which steel in concrete does not spontaneously corrode due to a protective oxide film

NOTE See A.3.

3.5
protection
measure that is intended to prevent or reduce the development of defects in the structure

3.6
repair
measure that is intended to rectify defects in the structure

3.7
service life
period over which the intended performance is achieved

NOTE See A.3.

3.8
substrate
surface on which a protection or repair material is to be applied

NOTE See A.3.

4 Minimum requirements before protection and repair

4.1 General

Clause 4 outlines procedures that shall be undertaken to assess the current condition of a concrete structure before protection and repair.

General guidance is given in Annex A (informative).

4.2 Health and Safety

The risks to health and safety from falling debris or local failure due to removing materials, and the effect of deterioration upon the mechanical stability of the concrete structure shall be assessed.

Where the concrete structure is considered to be unsafe, appropriate action shall be specified to make it safe before other protection or repair work is undertaken, taking into account any additional risks that may arise from the repair work itself. Such action may include local protection or repairs, the installation of support or other temporary works, or partial or even complete demolition.

4.3 Assessment of defects and their causes

An assessment shall be made of the defects in the concrete structure, their causes, and of the ability of the concrete structure to perform its function.

The process of assessment of the structure shall include but not be limited to the following:

a) the visible condition of the existing concrete structure;

b) testing to determine the condition of the concrete and reinforcing steel;

c) the original design approach;

d) the environment, including exposure to contamination;

e) the history of the concrete structure, including environmental exposure;

f) the conditions of use, (e.g. loading or other actions);

g) requirements for future use.

The nature and causes of defects, including combinations of causes, shall be identified and recorded (see Figure 1).

NOTE Further guidance on the effect of design and construction errors on the durability of the structure is given in A.4.3.

The approximate extent and likely rate of increase of defects shall then be assessed. An estimate shall be made of when the member or concrete structure would no longer perform as intended, with no protection or repair measures (other than maintenance of existing systems) applied.

The results of the completed assessment shall be valid at the time that the protection and repair works are designed and carried out. If, as a result of passage of time or for any other reason, there are doubts about the validity of the assessment, a new assessment shall be made.

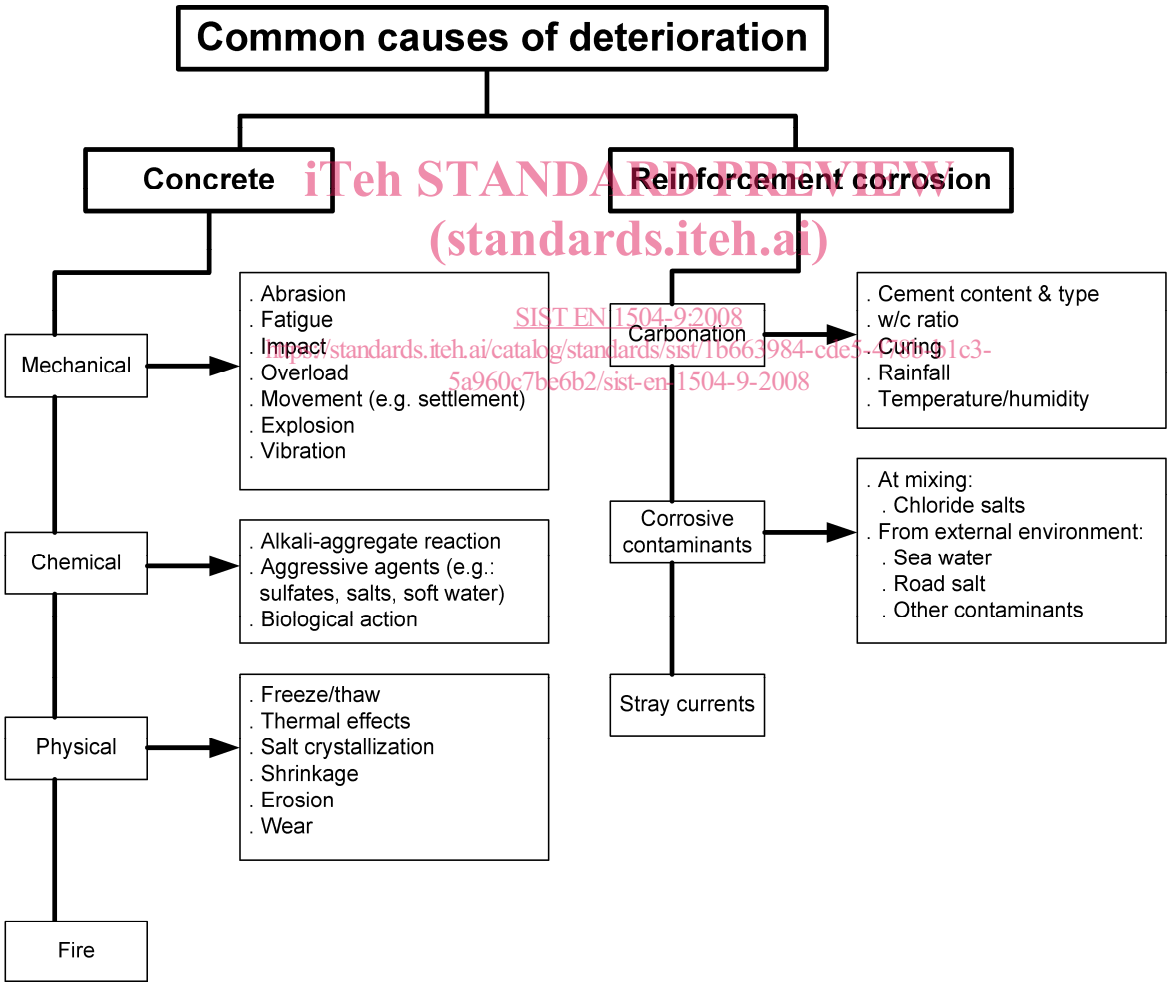

Figure 1 — Common causes of defects

5 Protection and repair within a structure management strategy

5.1 General

Clause 5 identifies options and factors to be considered when choosing a strategy for the management of the structure.

5.2 Options

The following structure management options shall be taken into account in deciding the appropriate action to meet the future requirements for the life of the structure:

a) do nothing for a certain time but monitor;

b) re-analyse the structural capacity, possibly leading to downgrading in function;

c) prevent or reduce further deterioration;

d) strengthen or repair and protect all or part of the concrete structure;

e) reconstruct or replace all or part of the concrete structure;

f) demolish all or part of the concrete structure.

5.3 Factors

Factors to be considered when choosing a management strategy include but are not limited to the following categories:

a) Basic

1) The intended use and remaining service life of the structure;

2) the required performance of the structure;

NOTE This may include, for example, fire resistance and watertightness.

3) the likely service life of the protection and repair works;

4) the required availability of the structure, permissible interruption to its use and opportunities for additional protection, repair and monitoring work;

5) the number and cost of repair cycles acceptable during the design life of the concrete structure;

6) the comparative whole life cost of the alternative management strategies, including future inspection and maintenance or further repair cycles;

7) properties and possible methods of preparation of the existing substrate;

8) the appearance of the protected and repaired structure.

b) Structural

1) actions during and after implementation of the strategy;

2) actions how they will be resisted.

c) Health and safety

1) The consequences of structural failure;

2) health and safety requirements;

3) the effect on occupiers or users of the structure and on third parties.

d) Environmental

1) The exposure environment of the structure and whether it can be changed locally (check in accordance with EN 206-1);

2) the need or opportunity to protect part or all of the concrete structure, from weather, pollution, salt spray, etc, including protection of the substrate during the repair work.

5.4 Choice of appropriate strategy

The choice of strategy for the structure shall be based on the above assessment of the structure client requirements, and relevant provisions (e.g. safety requirements) valid in the place of execution. All protection and repair works undertaken as part of a structure management strategy shall comply with this European Standard.

A protection and repair principle or principles shall be chosen according to Clause 6, that is:

a) appropriate to the type, cause or combination of causes and to the extent of the defects;

b) appropriate to the future service conditions.

6 Basis for the choice of protection and repair principles and methods

6.1 General

Clause 6 specifies the basic principles which shall be used, separately or in combination, to protect or repair concrete structures.

NOTE Methods which do not use products and systems covered by EN 1504-1 to -7 are addressed in 7.2.

6.2 Principles and methods of protection and repair

6.2.1 General

The principles of protection and repair are based on chemical, electrochemical or physical principles that can be used to prevent or stabilise the deterioration of concrete or electrochemical corrosion on the steel surface, or to strengthen the concrete structure.

Table 1 contains examples of protection and repair methods which apply the principles. Only methods which comply with the principles shall be selected, taking into account any possible undesirable consequences of applying a particular method or combination of methods under the specific conditions of the individual repair.

Other methods not described in this European Standard may be used if there is documented evidence that they comply with one or more principles.