



SLOVENSKI STANDARD
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Proizvodi in sistemi za zaščito in popravilo betonskih konstrukcij - Definicije, zahteve, kontrola kakovosti ter ocenjevanje in preverjanje nespremenljivosti lastnosti (AVCP) - 3. del: Beton in malta za popravila

Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and AVCP - Part 3: Repair concrete and mortars

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Definitionen, Anforderungen, Qualitätsüberwachung und AVCP - Teil 3: Instandsetzungsbeton und -mörtel

Produits et systèmes pour la protection et la réparation des structures en béton - Définitions, exigences, maîtrise de la qualité et EVCP - Partie 3 : Béton et mortiers de réparation

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Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and AVCP - Part 3: Repair concrete and mortars

Produits et systèmes pour la protection et la réparation des structures en béton - Définitions, exigences, maîtrise de la qualité et EVCP - Partie 3 : Béton et mortiers de réparation

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 104.

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Foreword

This document (prEN 1504-3:2015) has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Regulation (EU) No. 305/2011.

For relationship with Regulation (EU) No. 305/2011, see informative Annex ZA which is an integral part of this document.

This document will supersede EN 1504-3:2005.

The main technical changes that have been made in this new edition are as follows:

- a) clarification of the scope;
- b) implementation of additional principles realizable with repair mortars;
- c) implementation of classes with regard to constituents;
- d) clarification of addressed essential characteristics for intended uses;
- e) implementation of additional essential characteristics in Table 1;
- f) clarification of the necessary range of identification tests;
- g) implementation of additional identification characteristics in Table 2;
- h) differentiation between essential characteristics in relation to physical properties or durability;
- i) elimination of assignment of mortar classes to structural or non-structural repair;
- j) replacement of test method for frost resistance (CEN/TS 12390-9);
- k) introduction of additional performance criteria e.g. flexural strength according to EN 1015-11;
- l) revision of 6.5 Reaction to fire;
- m) revision of Annex B and Annex C;
- n) revision of Annex ZA according to CPR.

EN 1504 consists of the following parts under the general title *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and AVCP*:

- *Part 1: Definitions*
- *Part 2: Surface protection products and systems for concrete*
- *Part 3: Repair concrete and mortars* (the present document)
- *Part 4: Structural bonding*

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- *Part 5: Concrete injection*
- *Part 6: Anchoring of reinforcing steel bar*
- *Part 7: Reinforcement corrosion protection*
- *Part 8: Quality control and assessment and verification of the constancy of performance (AVCP)*
- *Part 9: General principles for the use of products and systems*
- *Part 10: Site application of products and systems and quality control of the works*

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Introduction

This document gives specifications for products and systems to be used for the structural and non-structural repair of concrete structures. The test methods to which the specifications refer are the subject of separate standards.

Repair mortars are used as methods for the following principles defined in EN 1504-9:

- Principle 3 (CR): Concrete restoration
 - 3.1 Hand applied mortar
 - 3.2 Recasting with concrete or mortar
 - 3.3 Spraying concrete or mortar
- Principle 4 (StS): Structural strengthening
 - 4.4 Adding mortar or concrete
- Principle 5 (PR): Increasing physical resistance
 - 5.3 Adding mortar or concrete
- Principle 6 (RC): Resistance to chemicals
 - 6.3 Adding mortar or concrete
- Principle 7 (PRP): Preserving or restoring passivity
 - 7.1 Increasing cover with additional mortar or concrete
 - 7.2 Replacing contaminated or carbonated concrete

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1 Scope

It covers repair mortars and concretes, possibly used in conjunction with other products and systems, to restore or to replace defective concrete and to protect reinforcement, necessary to extend the service life of a concrete structure exhibiting deterioration.

The repair methods covered by this document are the following:

- concrete restoration by applying repair mortars by hand;
- concrete restoration by recasting with concrete;
- concrete restoration by spraying on mortar or concrete;
- concrete strengthening by adding mortar or concrete;
- improving physical resistance by application of overlays of mortar or concrete;
- improving chemical resistance by application of overlays of mortar or concrete;
- restoring passivation by increasing cover by adding mortar or concrete;
- restoring passivation by replacing carbonated cover by adding mortar or concrete.

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.

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 480-14, *Admixtures for concrete, mortar and grout — Test methods — Part 14: Determination of the effect on corrosion susceptibility of reinforcing steel by potentiostatic electro-chemical test*

EN 520, *Gypsum plasterboards — Definitions, requirements and test methods*

EN 934-1, *Admixtures for concrete, mortar and grout — Part 1: Common requirements*

EN 1015-11, *Methods of test for mortar for masonry — Part 11: Determination of flexural and compressive strength of hardened mortar*

EN 1015-17, *Methods of test for mortar for masonry — Part 17: Determination of water-soluble chloride content of fresh mortars*

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

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*

EN 1504-9, *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*

EN 1542, *Products and systems for the protection and repair of concrete structures — Test methods — Measurement of bond strength by pull-off*

EN 1766, *Products and systems for the protection and repair of concrete structures — Test methods — Reference concretes for testing*

EN 1767, *Products and systems for the protection and repair of concrete structures — Test methods — Infrared analysis*

EN 1770, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of the coefficient of thermal expansion*

EN 1877-1, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 1: Determination of epoxy equivalent*

EN 1877-2, *Products and systems for the protection and repair of concrete structures — Test methods — Reactive functions related to epoxy resins — Part 2: Determination of amine functions using the total basicity number*

EN 12190, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of compressive strength of repair mortar*

EN 12192-1, *Products and systems for the protection and repair of concrete structures — Granulometry analysis — Part 1: Test method for dry components of premixed mortar*

EN 12617-4, *Products and systems for the protection and repair of concrete structures — Test methods — Part 4: Determination of shrinkage and expansion*

GEN/TS 12390-9, *Testing hardened concrete — Part 9: Freeze-thaw resistance — Scaling*

EN 12620, *Aggregates for concrete*

EN 13036-4, *Road and airfield surface characteristics — Test methods — Part 4: Method for measurement of slip/skid resistance of a surface: The pendulum test*

EN 13057, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of resistance of capillary absorption*

EN 13294, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of stiffening time*

EN 13295, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of resistance to carbonation*

EN 13395-1, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of workability — Part 1: Test for flow of thixotropic mortars*

EN 13395-2, *Products and systems for the protection and repair of concrete structures — Test methods - Determination of workability — Part 2: Test for flow of grout or mortar*

EN 13395-3, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of workability — Part 3: Test for flow of repair concrete*

EN 13395-4, *Products and systems for the protection and repair of concrete structures — Test methods - Determination of workability — Part 4: Application of repair mortar overhead*

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EN 13412, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of modulus of elasticity in compression*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13584, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of creep in compression for repair products*

EN 13687-1, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of thermal compatibility — Part 1: Freeze-thaw cycling with de-icing salt immersion*

EN 13687-2, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of thermal compatibility — Part 2: Thunder-shower cycling (thermal shock)*

EN 13687-4, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of thermal compatibility — Part 4: Dry thermal cycling*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 14306, *Thermal insulation products for building equipment and industrial installations — Factory made calcium silicate (CS) products — Specification*

EN 14647, *Calcium aluminate cement — Composition, specifications and conformity criteria*

EN ISO 1182, *Reaction to fire tests for products — Non-combustibility test (ISO 1182:2010)*

EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716:2010)*

EN ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content (ISO 3251)*

EN ISO 9239-1, *Reaction to fire tests for floorings — Part 1: Determination of the burning behaviour using a radiant heat source (ISO 9239-1:2010)*

EN ISO 9514, *Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing (ISO 9514:2005)*

EN ISO 11358-1, *Plastics — Thermogravimetry (TG) of polymers — Part 1: General principles (ISO 11358)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2010)*

ISO 390, *Products in fibre-reinforced cement — Sampling and inspection*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1504-1, EN 1504-8, EN 1504-9 and the following apply.

3.1

bonding agent

component of a repair system used to promote adhesion of a repair mortar or concrete to a concrete substrate, for the purposes of achieving a permanent bond, which is not affected by moisture and strong alkali in service

3.2

stiffening time

time beyond which the workability of a hydraulic or polymer modified hydraulic cement repair concrete or mortar is lost

3.3

capillary absorption

ability of the repair product or system to absorb water without application of hydrostatic pressure

3.4

thermal compatibility

property of a repair product or system, when bonded onto a prepared concrete substrate, to accommodate repeated rapid cyclic changes in temperature

4 Requirements for constituent materials

4.1 Basic requirements

Constituent materials for repair mortar/concrete shall not contain harmful ingredients in such quantities as may be detrimental to the durability of the concrete or cause corrosion of the reinforcement and shall be suitable for the intended use as repair mortars/concretes or repair mortar systems for concrete structures.

4.2 Product classes

For concrete structures repair materials the following classes apply:

CM 1 repair mortar product or system containing constituents according to EN 197-1, EN 12620, type I or II-additions, admixtures or fibres;

CM 2 repair mortar product or system containing constituents according to CM 1 allowing the addition of standardized binders (e.g. according to EN 14647);

CM 3 repair mortar product or system containing constituents according to CM 2 allowing the addition of hydraulic or latent hydraulic or pouzzolanic binder and aggregates;

CM 4 repair mortar product or system containing polymer binder.

5 Performance characteristics for intended uses

Table 1 lists the performance characteristics of products and systems for structural and non-structural repair which are required for intended uses according to the principles and methods defined in EN 1504-9.

Performance characteristics for “all intended” uses refer to the usually minimum required properties for the addressed repair method according to this standard. This does not affect the content of the declaration of performance by the product manufacturer with regard to the number of declared performance characteristics or the no performance determined (NPD) option. Performance characteristics for “certain intended” uses are

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effective for ensuring the performance of repair products or systems, e.g. in particular climatic conditions (frost, moisture, sea water, de-icing salt) or special mechanical stresses.

Performance characteristics which are required for “all intended” uses are marked with ■. All other performance characteristics which are marked with □ may be required for “certain intended” uses.

The repair system shall be selected based on an assessment of the actual or potential causes of deterioration and consideration of the appropriate principles and methods for protection and repair specified in EN 1504-9.

Table 1 — Performance characteristics of repair concrete and mortars related to the principles and methods defined in EN 1504–9

Performance characteristic	Principle				
	3	4	5	6	7
	Method				
	3.1, 3.2, 3.3	4.4	5.3	6.3	7.1, 7.2
Compressive strength ^a	■	■	■	■	■
Chloride ion content	■	■	■	■	■
Adhesive bond ^{a, b, c}	■	■	■	■	■
Shrinkage / Expansion	□	□	□	□	□
Durability	iTech STANDARD PREVIEW (standards.iteh.ai)				
a) Carbonation resistance	■	■	□	■	■
b) Thermal compatibility	oSIST prEN 1504-3:2015 https://standards.iteh.ai/catalog/standards/sist/30602af0-95d5-4b4c-b5cd-8f7dcd00b5e2/osist-pren-1504-3-2015				
according to EN 13687–1, EN 13687–2 or EN 13687–4 ^{a, c}	□	□	□	□	□
Frost resistance	□	□	□	□	□
Elastic modulus	□	■	□	□	□
Coefficient of thermal expansion	□	□	□	□	□
Capillary absorption (water permeability) ^a	□	□	□	□	□
Corrosion behaviour	□	□	□	□	□
Flexural strength	□	□	□	□	□
Freeze–thaw resistance without de-icing agent of mortar	□	□	□	□	□
Freeze–thaw resistance with de-icing agent of mortar	□	□	□	□	□
Creep in compression	□	□	□	□	□
Skid resistance	□	□	□	□	□
■ characteristic for “all intended” uses □ characteristic for “certain intended” uses					
^a Performance characteristics related to method 3.3 shall be tested on sprayed test specimen, see EN 1504–10. ^b If overhead application is intended the product shall be tested according to EN 13395–4. ^c If bonding agent is necessary for the use of any applied mortar it should be tested as a system with regard to the bond-strength tests.					