



SLOVENSKI STANDARD
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Proizvodi in sistemi za zaščito in popravilo betonskih konstrukcij - Definicije, zahteve, kontrola kakovosti in ovrednotenje skladnosti - 4. del: Konstrukcijsko povezovanje

Products and systems for the protection and repair of concrete - Definitions, requirements, quality control and evaluation of conformity - Part 4: Structural bonding

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Definitionen, Anforderungen, Qualitätsüberwachung und Beurteilung der Konformität - Teil 4: Kleber für Bauzwecke (standards.iteh.ai)

Produits et systèmes pour la protection et la réparation des structures en béton - Définitions, exigences, maîtrise de la qualité et évaluation de la conformité - Partie 4 : Collage structural

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91.080.40 Betonske konstrukcije Concrete structures

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EUROPEAN STANDARD
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Products and systems for the protection and repair of concrete - Definitions, requirements, quality control and evaluation of conformity - Part 4: Structural bonding

Produits et systèmes pour la protection et la réparation
des structures en béton - Définitions, exigences,
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Instandsetzung von Betontragwerken - Definitionen,
Anforderungen, Qualitätsüberwachung und
Beurteilung der Konformität - Teil 4: Kleber für
Bauzwecke

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

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 1504-4:2016) 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 will supersede EN 1504-4:2004.

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.

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

- a) new naming and numbering of performance characteristics in Table 1;
- b) new naming and numbering of performance requirements in Tables 3 and 4, in line with Table 1;
- c) new Table 5, performance requirements for bonding fresh concrete to hardened concrete.

EN 1504, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity*, is currently composed with the following parts:

- *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 9: General principles for the use of products and systems;*
- *Part 10: Site application of products and systems and quality control of the works.*

It has been developed by Subcommittee 8 “Products and systems for the protection and repair of concrete structures” (Secretariat AFNOR).

prEN 1504-4:2016 (E)**1 Scope**

This European Standard specifies requirements for the identification, performance (including durability) and safety of structural bonding products and systems to be used for the structural bonding of strengthening materials to an existing concrete structure, including:

- 1) the bonding of external plates of steel or other suitable materials (e.g. fibre reinforced composites) to the surface of a concrete structure for strengthening purposes, including the laminating of fabrics in such applications;
- 2) the bonding of hardened concrete to hardened concrete, typically associated with the use of precast units in repair and strengthening;
- 3) the casting of fresh concrete to hardened concrete using an adhesive bonded joint where it forms a part of the structure and is required to act compositely.

The performance requirements in this part of this European Standard may not be applicable to highly specialized applications in extreme environmental conditions, e.g. cryogenic use, nor do they cover specialized circumstances such as accidental impact, e.g. due to traffic or ice, or earthquake loading where specific performance requirements will apply.

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

<https://standards.iteh.ai/catalog/standards/sist/5bcff6d-bc16-43bd-8cfd-6965cee7337a/osist-prn-1504-4-2016>

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*

ENV 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 1799, *Products and systems for the protection and repair of concrete structures — Test methods — Tests to measure the suitability of structural bonding agents for application to concrete surface*

EN 12188, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of adhesion steel-to-steel for characterisation of structural bonding agents*

EN 12189, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of open time*

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

EN 12192-2, *Products and systems for the protection and repair of concrete structures — Granulometry analysis — Part 2: Test method for fillers for polymer bonding agents*

EN 12614, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of glass transition temperatures of polymers*

EN 12615, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of slant shear strength*

EN 12617-1, *Products and systems for the protection and repair of concrete structures — Test methods — Part 1: Determination of linear shrinkage for polymers and surface protection systems (SPS)*

EN 12617-3, *Products and systems for the protection and repair of concrete structures — Test methods — Part 3: Determination of early age linear shrinkage for structural bonding agents*

EN 12618-2, *Products and systems for the protection and repair of concrete structures — Test methods — Part 2: Determination of the adhesion of injection products, with or without thermal cycling — Adhesion by tensile bond strength*

EN 12636, *Products and systems for the protection and repair of concrete structures — Test methods — Determination of adhesion concrete to concrete*

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 data from reaction to fire tests*

EN 13733, *Products and systems for the protection and repair of concrete structures — Tests methods — Determination of the durability of structural bonding agents*

EN ISO 178, *Plastics — Determination of flexural properties (ISO 178)*

EN ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods (ISO 3451-1)*

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)*

EN ISO 11358, *Plastics — Thermogravimetry (TG) of polymers — General principles (ISO 11358)*

3 Terms and definitions

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

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3.1 structural bonding products and systems
products and systems applied to concrete to provide a durable structural bond to additional applied material

3.2 polymer mortars and polymer concretes
PC
blended mixtures of polymer binder and graded aggregates which set by polymer reaction

3.3 open time
maximum time interval between the completion of mixing of the bonding agent to closing of the joint at which the bond strength requirement defined in this document can be met

3.4 pot life for structural bonding products
period of time taken by the mixed bonding agent to reach a specified temperature in the mixing container

Note 1 to entry: Pot life is an identification test carried out under standard laboratory conditions.

3.5 workable life for structural bonding products
period of time the mixed bonding agent remains workable in the batch quantities used and at the limit of conditions that the material is fit for the purpose of use

4 Performance characteristics for intended uses

Table 1 lists the performance characteristics of structural bonding products and systems which are required for “all intended uses” or “for certain intended uses” according to the “principles” and “methods” defined in ENV 1504-9. 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”.

Performance requirements are given in 5.2.

The properties of the bonding may be adversely affected by fire and therefore appropriate protection measures will need to be taken where fire is anticipated.

Table 1 — Performance characteristics for all and certain intended uses

No	Performance characteristic	Test Method	Principle of repair 4 Structural strengthening (Note 7)		
			Repair method 4.3 Bonded plate reinforcement ^a	Repair method 4.4 Bonded mortar or concrete b	Repair method 3.1 / 3.2 / 3.3 Bonding fresh concrete to hardened concrete ^c
1	2	3	4	5	6
1	Modulus of elasticity in compression	EN 13412	■	■	■
2	Modulus of elasticity in flexure	EN ISO 178	□	□	□
3	Compressive strength	EN 12190		■	■
4	Shear strength steel to steel	EN 12188	■	□	□
5	Adhesion steel to steel: Tensile Strength and Compressive shear	EN 12188	■	□	□
6	Shear strength concrete to concrete	EN 12636	□	■	■
7	Glass transition temperature	EN 12614	■	■	■
8	Coefficient of thermal expansion	EN 1770	■	■	■
9	Shrinkage	EN 12617-1 EN 12617-3	■	■	■
10	Adhesion of plate to plate	EN 12188/ EN 1542	■		
11	Adhesion of plate to concrete	EN 12188/ EN 1542	■		
12	Adhesion of corrosion protected steel to corrosion protected steel ^e	EN 12188/ EN 1542	□		
13	Adhesion of corrosion protected steel to concrete ^e	EN 12636/ EN 1542	□		
14	Adhesion of hardened concrete to hardened concrete	EN 12636 EN 12615		■	□

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15	Adhesion of fresh concrete to hardened concrete ^c	EN 12636 EN 12615		<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Resistance to thermal cycling	EN 13733	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
17	Resistance to moisture cycling	EN 13733	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
18	Open time ^{c f}	EN 12189	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
19	Workable life ^f	EN ISO 9514	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
20	Suitability for application to vertical surfaces and soffits	EN 1799	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Suitability for application to horizontal surfaces	EN 1799	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Suitability for application by injection	EN 12618-2	<input type="checkbox"/>	<input type="checkbox"/>	
23	Suitability for application and curing at low or high temperature ^d	EN 12188 EN 12636 EN 12615	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Suitability for application on wet substrate	EN 12636 EN 12615	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

^a Repair method 4.3 is in accordance with ENV 1504-9. The bonding of external plates to the surface of a concrete structure for strengthening purposes, and the laminating of plates in such applications. An acceptable bond is unlikely to be achieved with stainless steel.

^b Repair method 4.4 is in accordance with ENV 1504-9. The bonding of hardened concrete to hardened concrete typically associated with the use of precast units where it forms a significant part of the structure and is required to act compositely.

Repair method 3.1 / 3.2 / 3.3 is in accordance with ENV 1504-9. The bonding of fresh concrete to hardened concrete where it forms a significant part of the structure and is required to act compositely.

^c Not applicable to injection techniques.

^d Temperatures may be specified by the producer for the intended use.

^e In this context corrosion protection implies the application of a corrosion inhibiting priming coat to mild steel.

^f At minimum, standard and maximum application temperatures.

5 Requirements

5.1 Identification requirements

The manufacturer shall undertake selected representative initial identification tests for the product or system as specified in Table 2. These tests may be used to confirm the composition of the product at any time. Acceptable tolerances are given in Table 2. The manufacturer shall hold the test records.

Table 2 — Identification requirements

Item No	Property	Test Method	Requirement/Tolerance
1	Colour	Visual	Uniform and similar to the description provided by the manufacturer.
2	Granulometry size grading of fillers for polymer bonding agents	EN 12192-2	Declared value \pm 5 %
3	Ash content by direct calcination	EN ISO 3451-1	Declared value \pm 5 % or \pm 1 percentage point of the total product, whichever is the greater.
4	Thermogravimetry of polymers: temperature scanning method.	EN ISO 11358	Declared value \pm 5 % or \pm 1 percentage point of the total product, whichever is the greater.
5	Infrared analysis of the resin and hardener	EN 1767	The positions and relative intensities of the main absorption bands shall match those of the reference spectrum.
6	Pot life	EN ISO 9514	Declared value \pm 20 %
7	Compressive strength	EN 12190	Declared value \pm 20 %

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5.2 Performance requirements

The manufacturer shall undertake initial performance tests on the product in accordance with Table 3 (structural bonding products for bonded plate reinforcement), Table 4 (structural bonding products for bonded mortar or concrete) or Table 5 (structural bonding products for bonding fresh concrete to hardened concrete) and the product shall comply with the requirements.