

Draft for Public Comment



DPC no.: 00/103366 DC

Head office

389 Chiswick High Road
London W4 4AL
Telephone: 020 8996 9000
Fax: 020 8996 7400
www.bsi.org.uk

Date: 26/04/00

Origin: E

Latest date for receipt of comments: end of July 2000

Project no.: 1991/07144

Responsible committee: B/517/8 Protection and Repair of Concrete

Interested committees: CB/1; B/2; B/11; B/517; B/517/3; B/525/2; B/525/WG1; B/544/6

Draft: prEN 1504-2

Title: **Products and Systems for the Protection and Repair of Concrete Structures –
Definitions, requirements, quality control and evaluation of conformity –
Part 2: Surface Protection Systems**

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND ITS EXPIRY DATE FOR COMMENTS.**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. **See overleaf for information on commenting.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Customer Services, at the Head Office address above, telephone 020 8996 9001, fax 020 8996 7001, e-mail orders@bsi.org.uk.

NOTE British, international and foreign standards are also available from Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from the responsible committee secretary.

Cross-references

The British Standards which implement international or European publications referred to in this draft may be found by referring to the British Standards Online Service on the BSI website under the 'International Relationship' information. This information is also available within the BSI catalogue (paper version) and the BSI Standards Electronic Catalogue (CD).

The Online Service can also be used to find information on draft standards related to international or European publications.

Responsible BSI committee Secretary: Anita Attra

Direct tel: 020 8996 7603

E-mail address: anita.attra@bsi.org.uk

No. 28, 26/04/00

i

Commenting on drafts

Introduction

This draft standard is based on European discussions in which the UK took an active part. Your comments on this draft are welcome and will assist in the preparation of the consequent British Standard. If no comments are received to the contrary, then the UK will approve this draft and implement it as a British Standard. Comment is particularly welcome on national legislative or similar deviations that may be necessary.

Even if this draft standard is not approved by the UK, if it receives the necessary support in Europe, the UK will be obliged to publish the official English Language text unchanged as a British Standard and to withdraw any conflicting standard.

UK vote

Please indicate whether you consider the UK should submit a negative (with reasons) or positive vote on this draft.

Format

The guidance given below is intended to ensure that all comments receive efficient and appropriate attention by the responsible BSI committee. **Annotated drafts are not acceptable and will be rejected.**

Each comment shall make one point only, be clearly separated from the others and be structured as follows in clause order:

- clause/sub-clause;
- paragraph/table/figure number;
- type of comment (general, technical or editorial);
- comment (with rationale);
- proposed change.

Submission

All comments should be submitted to the committee secretary at the Head Office address, preferably electronically via e-mail or on diskette (MS-DOS compatible, 1.44 megabytes). Comments should be compatible with Version 6.0 or Version 97 of Microsoft® Word for Windows™, if possible; otherwise comments in ASCII text format are acceptable. Any comments not submitted electronically should still adhere to the format requirements given above. No acknowledgement will normally be sent.

Microsoft and MS-DOS are registered trademarks, and Windows is a trademark of Microsoft Corporation.

Table for submission of comments

Please use the attached table for submission of comments.
A blank electronic version of this table can be downloaded from the BSI web site at <http://www.bsi.org.uk/bsi/products/standards/development/public-comment.xhtml> or it is available from the committee secretary.

| | | |
|--------------|-------------------------|-----------------------|
| Draft no: | Project no.: 1991/07144 | DPC no.: 00/103366 DC |
| Short title: | Commentator: | Date: |

| Clause/ subclause | Paragraph/ Figure/ Table | Type of comment (General/ technical/editorial) | Comment (with rationale) | Proposed change |
|----------------------|--------------------------------|--|--|--|
| Examples: | | | | |
| 3.1 | 1st definition | Editorial | Definition is ambiguous and needs clarifying. | Amend to read '... so that the mains connector to which no connection ...' |
| 6.4 | 2nd paragraph | Technical | The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK, giving rise to misleadingly high results. | Delete reference to UV photometer. |

00/103366DC

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 1504-2

March 2000

ICS

English version

Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection 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 2: Systèmes de protection de surface

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Definitionen, Anforderungen, Qualitätsüberwachung und Beurteilung der Konformität - Teil 2: Oberflächenschutzsysteme

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.

This draft European Standard was established by CEN 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 Central Secretariat has the same status as the official versions.

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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

© 2000 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. prEN 1504-2:2000 E

001103366DC

| Contents | Page |
|---|-----------|
| Foreword | 3 |
| Introduction | 4 |
| 1 Scope | 4 |
| 2 Normative references | 4 |
| 3 Definitions | 8 |
| 3.1 Hydrophobic impregnation | 8 |
| 3.2 Impregnation | 8 |
| 3.3 Coating | 8 |
| 4 Performance characteristics for intended uses | 9 |
| 4.1 General | 9 |
| 4.2 How to choose appropriate product or system | 9 |
| 5 Requirements | 11 |
| 5.1 Identification requirements | 11 |
| 5.2 Performance requirements | 12 |
| 6 Sampling | 12 |
| 7 Quality control | 12 |
| 8 Marking and labelling | 12 |
| Annex ZA (informative) Harmonized clauses, attestation of conformity and CE marking | 21 |
| Annex A (informative) Examples of how to use the classification system of three individual cases | 23 |

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104 „Concrete - Performance, production, placing and compliance“, the Secretariat of which is held by DIN.

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

The text of the draft standard is to be submitted to enquiry.

This standard does not supersede any other European standard.

This European standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Construction Products Directive (89/106/EC). For relationship with EU Directive, see informative annex ZA, which is an integral part of this standard.

This European Standard is one of a series of standards on products and systems for the repair and protection of concrete structures as listed below:

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

prEN 1504-3¹⁾

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

prEN 1504-4¹⁾

Products and systems for the protection and repair of concrete structures - Definitions - Requirements - Quality control and evaluation of conformity - Part 4: Structural bonding

prEN 1504-5¹⁾

Products and systems for the protection and repair of concrete structures - Definitions - Requirements - Quality control and evaluation of conformity - Part 5: Concrete injection

prEN 1504-6¹⁾

Products and systems for the protection and repair of concrete structures - Definitions - Requirements - Quality control and evaluation of conformity - Part 6: Grouting to ancor reinforcement or to fill external voids

prEN 1504-7¹⁾

Products and systems for the protection and repair of concrete structures - Definitions - Requirements - Quality control and evaluation of conformity - Part 7: Reinforcement corrosion protection

prEN 1504-8¹⁾

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

prEN 1504-10¹⁾

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

ENV 1504-9²⁾

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

¹⁾) This document is in preparation

²⁾) EN 1504-1 and ENV 1504-9 will have to be modified when adopted as EN according to finalisation of this standard

00/103366X

Introduction

This European Standard gives specifications for products and systems for the repair and protection of concrete structures. The test methods to which the specifications refer are the subject of separate standards.

Surface protection systems are used as "methods" for the following "principles" presented in ENV 1504-9²⁾:

| | |
|-----------------------|---|
| for Principle 1 (IP): | Ingress Protection |
| | 1.1 hydrophobic impregnation (H) |
| | 1.2 impregnation (I) |
| | 1.3 coating (C) |
| for Principle 2 (MC): | Moisture Control |
| | 2.1 hydrophobic impregnation (H) |
| | 2.2 coating |
| for Principle 5 (PR) | Physical Resistance / Surface Improvement |
| | 5.1 coating (C) |
| | 5.2 impregnation (I) |
| for Principle 6 (RC): | Resistance to Chemicals |
| | 6.1 coating (C) |
| for Principle 8 (IR): | Increasing Resitivity |
| | 8.1 Limiting moisture content with: |
| | - hydrophobic impregnation (H) |
| | 8.2 coating (C) |

1 Scope

This standard specifies requirements for the identification, performance (including durability aspects) and safety of products and systems to be used for surface protection of concrete, to increase the durability of concrete and reinforced concrete structures, as well as for new concrete as for maintenance and repair work.

The standard therefore also includes special properties by the surface protective measure.

The protective surface measures ("methods") covered in this standard are the following:

- hydrophobic impregnation;
- impregnation;
- coating.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. Normative references are cited at the appropriate places in the text and the relevant publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references this European Standard refers to the latest edition of the publication.

prEN 1062-2

Paints and varnishes - Coating materials and coating systems for exterior masonry - Part 2: Determination and classification of water-vapour transmission rate (permeability)

prEN 1062-6

Paints and varnishes - Coating materials and coating systems for exterior masonry - Part 6: Determination of carbon dioxide permeability

prEN 1062-7 (104-842)

Paints and varnishes - Coating materials and coating systems for exterior masonry - Part 7: Determination of crack bridging ability

prEN 1062-11

Paints and varnishes - Coating materials and coating systems for exterior masonry - Part 11: Methods of conditioning before testing

prEN 1504-8 (104-800-8)

Products and systems for the protection and repair of concrete structures - Part 8: Sampling, evaluation of conformity, marking and labelling

prEN 1877-1

Reactive functions related to epoxy resins – Part 1: Determination of epoxy equivalent

prEN 1877-2

Reactive functions related to epoxy resins – Part 2: Determination of amine functions using the total basicity number

prEN 1878

Products and systems for the protection and repair of concrete structures – Test methods - Thermogravimetry of polymers - Temperature scanning method

prEN 12192-1

Products and systems for the protection and repair of concrete structures - Test methods - Granulometry size grading - Part 1: Method for dry components of premixed mortar

prEN 12617-1

Products and systems for the protection and repair of concrete structures – Test methods - Shrinkage of polymer binders - Part 1: Determination of linear shrinkage for polymers and surface protecting systems (SPS)

prEN 13529

Products and systems for the protection and repair of concrete structures – Test methods - Resistance to high chemical attack

prEN 13578

Products and systems for the protection and repair of concrete structures – Test methods - Compatibility on wet concrete

prEN 13579

Products and systems for the protection and repair of concrete structures – Test methods – Drying test for hydrophobic porelining impregnation

prEN 13580

Products and systems for the protection and repair of concrete structures – Test methods - Water absorption and resistance to alkali test for hydrophobic porelining impregnation

prEN 13581

Products and systems for the protection and repair of concrete structures – Test methods - Determination of loss of mass after freeze-thaw salt stress-testing of impregnated hydrophobic concrete

prEN 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

prEN 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)

prEN 13687-3

Products and systems for the protection and repair of concrete structures – Test methods - Determination of thermal compatibility - Part 3: Thermal cycling without de-icing salt impact

prEN 13687-5

Products and systems for the protection and repair of concrete structures – Test methods - Determination of thermal compatibility - Part 5: Resistance to temperature shock

prEN 00227-114

Surface characteristics - Test methods - Measurement of skid resistance of a surface: Pendulum Test

00/103366DC

prEN 00303018

Screed material and floor screeds- Part 2: Screed materials – properties and requirements

prEN 00303008

Methods of test for screed materials - Determination of wear resistance (Böhme)

EN 1062-3

Paints and varnishes - Coating materials and coating systems for exterior masonry - Part 3: Determination and classification of liquid-water transmission rate (permeability)

EN 1081

Antistatic behaviour

EN 1240

Adhesives - Determination of hydroxyl value and/or hydroxyl content

EN 1242

Adhesives - Determination of isocyanate content

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 1542

Products and systems for the protection and repair of concrete structures - Test methods - Pull-off test

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 12190

Products and systems for the protection and repair of concrete structures - Test methods - Determination of compressive strength

ENV 1504-9¹⁾

Products and systems for the protection and repair of concrete structures - Part 9: General Principles for use of products and systems

ENV 206

Concrete - Performance, production, placing and compliance criteria.

ENV 1992-1-1 : 1991

Eurocode 2; design of concrete structures; part 1-1: general rules and rules for buildings

EN ISO 1517

Surface-drying test - Ballotini method (ISO 1517:1973)

EN ISO 2409

Paints and varnishes - Cross-cut test (ISO 2409:1992)

EN ISO 2431

Paints and varnishes - Determination of flow time by use of flow cups (ISO 2431:1993, including Technical Corrigendum 1:1994)

EN ISO 3219

Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate (ISO 3219:1993)

EN ISO 3251

Paints and varnishes - Determination of non-volatile matter of paints, varnishes and binders for paints and varnishes (ISO 3251:1993)

¹⁾ This document is in preparation

- EN ISO 3451-1
Plastics - Determination of ash - Part 1: General methods (ISO 3451-1:1997)
- EN ISO 9514
Paints and varnishes - Determination of the pot-life of liquid systems - Preparation and conditioning of samples and guidelines for testing (ISO 9514:1992)
- ISO 868
Plastics and ebonite. Determination of indentation hardness by means of a durometer (Shore hardness)
- ISO 2811-1
Paints and varnishes - Determination of density - Part 1: Pycnometer method
- ISO 2811-2
Paints and varnishes - Determination of density - Part 2: Immersed body (plummet) method
- ISO 2812-1
Paints and varnishes - determination of resistance to liquids - part 1: general methods
- ISO 4628-1
Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defect – Part 1: General principles and rating scheme
- ISO 4628-2
Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defect – Part 2: Designation of degree of blistering
- ISO 4628-4
Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defect – Part 4: Designation of degree of cracking of coatings
- ISO 4628-5
Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defect – Part 5: Designation of degree of flaking
- ISO 6272
Paints and varnishes - falling-weight test
- ISO 7784-2
Paints and varnishes - Determination of resistance to abrasion - Part 2: Rotating abrasive rubber wheel method
- ISO 11358
Plastics - Thermogravimetry (TG) of polymers- General principles

00/103366DX

3 Definitions

For the purpose of this standard the following methods and definitions apply in addition to the definitions given in EN 1504-1 and in ENV 1504-9:

3.1 Hydrophobic impregnation

Treatment of concrete to produce a water-repellent surface. The pores and capillaries are not filled, but only covered. No film is produced. The visual appearance of the concrete surface remains nearly unaffected.

Note: Active compounds can be, e. g. Silan, Siloxan.

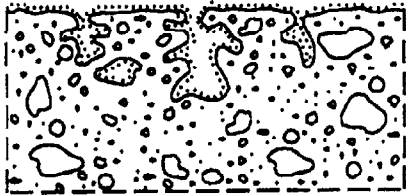


Figure 1: Example of typical hydrophobic impregnation

3.2 Impregnation

Treatment of concrete to reduce the surface porosity. The pores and capillaries are partially filled. Usually, this treatment results in a discontinuous, thin film of 10 µm to 100 µm thickness, on the concrete surface.

Note: Binders can be, e. g. organic polymers.

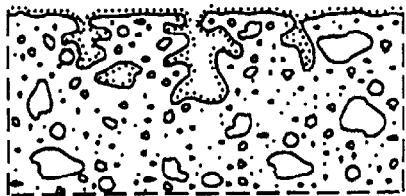


Figure 2: Example of typical impregnation

3.3 Coating

Treatment to produce a continuous protective layer on the surface of concrete. Thickness is typically of 0,1 mm to 5,0 mm.

Note: Binders can be, e. g. organic polymers, organic polymers with cement as a filler.



Figure 3: Example of typical coating

4 Performance characteristics for intended uses

4.1 General

Table 1 is an overview of performance characteristics of products and systems which are possible for „all and certain intended uses“ according to the „principles“ and „methods“ defined in ENV 1504-9. Performance characteristics which are compulsory for „all intended uses“ are marked with ■. All other performance characteristics which are marked with □ may become necessary for „certain intended uses“ = certain fields of application.

Tables 3.1, 3.2 and 3.3 are listings of all performance characteristics and requirements for each method.

The preparation of the test samples shall be carried out horizontal or vertical depending of the application in use.

According to the definitions and the summary in table 1 there are only three „methods“ for the different „principles“ for which „Surface Protection Systems (SPS)“ are necessary.

4.2 How to choose appropriate product or system

1. „Assessment „ of defects, their classification and causes (diagnosis).
2. On base of the assessment the „principle(s)“ for protection and repair of the concrete structure has(have) to be chosen.
3. When the „principle(s)“ is(are) defined the appropriate „method“ (Hydrophobic impregnation, impregnation and coating) to fulfill one or several principle(s) has to be chosen. The corresponding squares ■ represent basic compulsory characteristics (see table 1).
4. Based on the diagnosis further characteristics for the products and systems to be used have to be established, if they are justified for the certain intended use.
5. The „requirements for the set of characteristics of the products and systems for the intended use are given in the corresponding table (see table 3.1, 3.2 and 3.3).

Note: Details are given in EN 1504-9.

00/103366DC

Table 1: Performance characteristics of products and systems which are possible for „all and certain intended uses“ acc. to the „principles“ and „methods“ defined in ENV 1504-9

| No. Acc. to Table A.1 of ENV 1504-9 | Test methods defined in | Performance Characteristics | Principles Methods | 1. Ingress protection | | | 2. Moisture control | | 5. Physical Resistance | | 6. Chemical Resistance | | 8. Increasing resistivity | |
|-------------------------------------|------------------------------|--|--------------------|-----------------------|---------|--------------------------|---------------------|---------|------------------------|---------|------------------------|---------|---------------------------|--|
| | | | | 1.1 (H) | 1.2 (I) | 1.3 (C) | 2.1 (H) | 2.2 (C) | 5.1 (C) | 5.2 (I) | 6.1 (C) | 8.1 (H) | 8.2 (C) | |
| 4 | prEN 12 617-1 | Linear shrinkage | | | | <input type="checkbox"/> | | | | | | | | |
| 9 | EN 12 190 | Compressive strength | | | | | | | | | | | | |
| 15 | EN 1770 | Coefficient of thermal expansion | | | | | | | | | | | | |
| 24 | ISO 7784-2 | Abrasion resistance | | | | | | | | | | | | |
| 25 | EN ISO 2409 | Adhesion by cross-cut test | | | | | | | | | | | | |
| 26 | prEN 1062-6 | Permeability to CO ₂ | | | | | | | | | | | | |
| 27 | prEN 1062-2 | Permeability to water vapour | | | | | | | | | | | | |
| 29 | prEN ISO Bern Müller | Capillary absorption and permeability to water | | | | | | | | | | | | |
| 31 | EN 1062-3 | Diffusion of chloride ions | | | | | | | | | | | | |
| 31 | TM till yet not determined | | | | | | | | | | | | | |
| 33 | | Adhesion after thermal compatibility | | | | | | | | | | | | |
| | prEN 13 687-1 | Freeze-thaw cycling with de-icing salt immersion | | | | | | | | | | | | |
| | prEN 13 687-2 | Thunder-shower cycling (thermal shock) | | | | | | | | | | | | |
| | prEN 13 687-3 | Thermal cycling without de-icing salt impact | | | | | | | | | | | | |
| 35 | prEN 13 687-5 | Resistance to thermal shock | | | | | | | | | | | | |
| 36 | ISO 2812-1 | Chemical resistance | | | | | | | | | | | | |
| | prEN 13 529 | Resistance to high chemical attack | | | | | | | | | | | | |
| 37 | prEN 1062-7 | Crack bridging ability | | | | | | | | | | | | |
| 38 | ISO 6272 | Impact resistance | | | | | | | | | | | | |
| 40 | EN 1542 | Adhesion by Pull-off test | | | | | | | | | | | | |
| 69 | acc. to TC 127 | Fire resistance after application | | | | | | | | | | | | |
| 71 | prEN 13 581 | Resistance against freeze-thaw salt stress of impregnated hydrophobic concrete (Determination of loss of mass) | | | | | | | | | | | | |
| 79 | acc. to TC 227 | Skid resistance | | | | | | | | | | | | |
| 82 | see table 3.1 | Depth of penetration | | | | | | | | | | | | |
| 91 | prEN 1062-11 | Behaviour after artificial weathering | | | | | | | | | | | | |
| 92 | EN 1081 | Anistatic behaviour | | | | | | | | | | | | |
| 93 | acc. to national regulations | Physiological performance - Release of dangerous substances | | | | | | | | | | | | |
| 95 | prEN 13 578 | Adhesion on wet concrete | | | | | | | | | | | | |
| 97 | prEN 13 580 | Water absorption and resistance to alkali tests for hydrophobic porelining impregnation | | | | | | | | | | | | |
| 99 | prEN 13 579 | Drying behaviour for hydrophobic porelining impregnation | | | | | | | | | | | | |

H Hydrophobic impregnation

I Impregnation

C Coating

■ characteristic for all intended uses

□ characteristic for certain intended uses within the scope of ENV 1504-9 (see also tables 3.1, 3.2, 3.3)

5 Requirements

5.1 Identification requirements

The identification characteristics are summarized in table 2.

Table 2: Identification test methods

| Property | Test method | Requirement |
|---|--------------------------|--|
| Identification on the components | | |
| Colour / General appearance | Visual | Uniform and similar to the description provided by the manufacturer |
| Determination of the Specific weight - Pyknometer method - Immersed body method | ISO 2811-1 ISO 2811-2 | ± 3 % ± 3% |
| Infrared spectrum | EN 1767 | Confirmed by comparison |
| Determination of epoxy equivalent | prEN 1877-1 | ± 5 % |
| Determination of amine functions | prEN 1877-2 | ± 6 % |
| Determination of hydroxyl value | EN 1240 | ± 10 % |
| Determination of isocyanate content | EN 1242 | ± 10 % |
| Determination of volatile and non volatile matter | EN ISO 3251 | ± 5 % |
| Determination of ash by direct calcination | EN ISO 3451-1 | ± 5 % |
| Thermogravimetric analysis | ISO 11358 | Confirmed by comparison and: ± 5 % with respect to loss of mass at 600 °C |
| Determination of flow time by use of flow cups | EN ISO 2431 | ± 15 % |
| Determination of viscosity | EN ISO 3219 | ± 20 % |
| Granulometry of dry components | prEN 12192-1 | > 2 mm: ± 6 % 0,063mm - 2 mm: ± 4 % < 0,063 mm: ± 2 % |
| Identification on the fresh mixture | | |
| Surface- drying test - Ballotini method | EN ISO 1517 | ± 10 % |
| Determination of pot-life in function of temperature | EN ISO 9514 | ± 15 % |
| Determination of progressing in hardening (shore A or B) | ISO 868 | ± 5 % |
| Determination of the Consistency and apparent density | | Air content: ± 2 % (abs.) or 50 % (rel.) Consistency: ± 15 % or 20 mm Apparent density: ± 0,1 kg/dm ³ |

00/103366DC

5.2 Performance requirements

The performance characteristics are summarized in table 3.1, 3.2 and 3.3.

All symbols used in these tables under the headline „Requirements“ are described in the test methods.

Flooring systems in buildings which are not intended to protect or reinstate the integrity of a concrete structure are standardised in prEN 00303018 (CEN/TC 303). If products and systems according to prEN 1504-2 are also used for flooring applications with substantial mechanical loading, the requirements according to prEN 00303018 (CEN/TC 303) shall also be fulfilled.

6 Sampling

This issue is defined in prEN 1504-8.

7 Quality control

This issue is defined in prEN 1504-8.

8 Marking and labelling

This issue is defined in prEN 1504-8.

Table 3.1 Performance Requirements for Hydrophobic Impregnation

| No. acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|-------------------------------------|---|---|
| 82 | | Depth of penetration | The depth of penetration is defined with an exactness of 0,1 mm by breaking of the treated specimen and spraying the fracture surface with water. |
| 97 | prEN 13580 | Water absorption and resistance to alkali | Absorption ratio < 7,5 % Absorption ratio (after immersion in alkali solution) < 10 %. |
| 98 | prEN 13579 | Drying test for hydrophobic porelining impregnation | Drying rate > 30 %. |
| 31 | test method till yet not determined | Diffusion of chloride ions | No value can be defined yet |
| 71 | prEN 13581 | Determination of loss of mass after freeze-thaw-salt stress | The erosion of the surface of the impregnated specimen must occur at least 20 cycles later than that of the not impregnated specimen. This test is only necessary for structures which may come in contact with deicing salts (e. g. bridges or tunnels) and is then compulsory. |

00/103366DX

Table 3.2 Performance Requirements for Impregnation

| No. Acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|-------------------------------------|--|---|
| 26 | pr EN 1062-6 | Permeability to CO ₂ | s ₀ > 50 m |
| 29 | EN 1062-3 | Capillary absorption and permeability to water | w < 0.1 kg/m ² x h ^{0.5} |
| 40 | EN 1542 | Adhesion by Pull-off test on reference substrate: CC (0.70) acc. to EN 1766 after curing 7 days at normal climate and after ageing 7 days at 70 °C in comparison with the non impregnated specimen | Application/Load vertical horizontal without traffic horizontal with traffic Average [N/mm ²] ≥ 0,8 (0,5)* ≥ 1,0 (0,7)* ≥ 1,5 (1,0)* * in brackets: lowest accepted single value |
| 82 | | Depth of penetration | The depth of penetration is defined with an exactness of 0,1 mm by breaking of the treated specimen and spraying the fracture surface with water. |
| 31 | test method till yet not determined | Diffusion of chloride ions | No value can be defined yet |
| 33 | | <u>Adhesion after thermal compatibility</u> Reference substrate: CC (0.70) acc. to EN 1766 <u>For outside application with deicing salt influence:</u> Freeze-thaw cycling with de-icing salt immersion (20 x) and thunder shower cycling (thermal shock) (10 x) <u>For outside application without deicing salt influence:</u> Thermal cycling without de-icing salt impact (20 x) | Thermal cycling acc. to prEN 13687-1 and prEN 13687-2 is carried out on the same sample. After thermal cycling a) no bubbles, cracks and delamination b) Pull-off-test Application/Load vertical horizontal without traffic horizontal with traffic Average [N/mm ²] ≥ 0,8 (0,5)* ≥ 1,0 (0,7)* ≥ 1,5 (1,0)* * in brackets: lowest accepted single value |
| 36 | ISO 2812-1 | Chemical resistance | Resistance against the influence of the environments defined in EN 206 after 30 days exposition. |
| 79 | prEN 00227-114 | Skid resistance | Class I: > 35 SKT (pedestrian traffic, wet area), Class II: > 50 SKT (car traffic, inside), Class III: > 65 SKT (car traffic, outside) |

Table 3.2 Performance Requirements for Impregnation (continuation)

| No. Acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|----------------------|-----------------------------------|---|
| 92 | EN 1081 | Antistatic behaviour | Class I: $>10^4$ and $<10^6 \Omega$ (Explosives) Class II: $>10^4$ and $<10^6 \Omega$ (Explosion hazardous substances) |
| 93 | National regulations | Physiological performance | Acc. to the national requirements |
| 69 | Acc. to CEN/TC 127 | Fire resistance after application | Acc. CEN/TC 127 |

00/103366X

Table 3.3 Performance Requirements for Coatings

| No. acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|------------------|---|---|
| 29 | EN 1062-3 | Capillary absorption and permeability to water | $w < 0.1 \text{ kg/m}^2 \times \text{h}^{0.5}$ |
| 40 | EN 1542 | Adhesion by Pull-off test on Reference substrate: MC (0.40) acc. to EN 1766 after curing - 28 days for one component systems, cement containing and PCC-systems - 7 days for reactive resin systems. Additionally for inside application pull-off test after ageing: 7 days at 70 °C | Average [N/mm ²] Crack-bridging systems Rigid systems** without mechanical load: $\geq 0.8 (0.5)^*$ $\geq 1.0 (0.7)^*$ with mechanical load: $\geq 1.5 (1.0)^*$ $\geq 2.0 (1.5)^*$ * in brackets: lowest accepted single value **Rigid coatings are coatings with shore D ≥ 60 acc. ISO 868 |
| 4 | prEN 12617-1 | Linear shrinkage for polymers and SPS only for rigid systems** Application thickness $\geq 1 \text{ mm}$ **Rigid coatings are coatings with shore D ≥ 60 acc. ISO 868 | Measure of shrinkage: $s \leq 0.3 \%$ |
| 9 | EN 12 190 | Compressive strength (only for solvent free reactive resin systems) | Class I: No value (tires) Class II: $> 40 \text{ N/mm}^2$ (Polyamide wheels) Class III: $> 80 \text{ N/mm}^2$ compressive strength and $> 50 \text{ N/mm}^2$ flexural strength (steel wheels) |
| 15 | EN 1770 | Coefficient of thermal expansion Application thickness $\geq 1 \text{ mm}$ | Rigid systems** for outside application: $\alpha_1 \leq 30 \cdot 10^{-6} \text{ K}^{-1}$ **Rigid coatings are coatings with shore D ≥ 60 acc. ISO 868 |
| 24 | ISO 7784-2 | Abrasion resistance (Taber test) | Coatings without aggregate: Abrasion resistance by taber test should be less than 100 mg; abrading wheel CS 10/rotation 1000 cycles/load 1000 g Coatings with aggregate: Less than 2000 mg abrading wheel H22 / rotation 1000 cycles/load 1000 g |

Table 3.3 Performance Requirements for Coatings (continuation)

| No. Acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|--|--|---|
| 25 | EN ISO 2409 | Adhesion by cross cut test | This test is only for thin film (up to 0.5 mm layer thickness). The test is carried out in the basic test additionally to the pull-off test. Therefore, onsite the cross cut performance test may replace the pull-off test. It has to be not less than cross cut value GT 2 |
| 26 | prEN 1062-6 | Permeability to CO ₂ | Permeability to CO ₂ s ₀ > 50 m |
| 27 | prEN 1062-2 | Permeability to water vapour | class I s ₀ < 5 m (permeable to water vapour) class II s ₀ > 50 m (dense against water vapour) |
| 31 | test method till yet not determined | Diffusion of chloride ions | No value can be defined yet. |
| 33 | prEN 13687-1 prEN 13687-2 prEN 13687-3 | Adhesion after thermal compatibility Reference substrate: CC (0.40) acc. to EN 1766 For outside application with de-icing salt influence: Freeze salt cycling with de-icing salt immersion (50 x) and Thunder shower cycling (thermal shock) (10 x) For outside application without de-icing salt influence: Thermal cycling without de-icing salt impact (20 x) Resistance to thermal shock (1 x) | Thermal cycling acc. to prEN 13687-1 and prEN 13687-2 is carried out on the same sample. After thermal cycling a) no bubbles, cracks and delamination b) Pull-off-test Average [N/mm ²] Crack-bridging systems Rigid systems** without mechanical load: ≥ 0,8 (0,5)* ≥ 1,0 (0,7)* with mechanical load: ≥ 1,5 (1,0)* ≥ 2,0 (1,5)* * in brackets: lowest accepted single value **Rigid coatings are coatings with shore D ≥ 60 acc. ISO 868 |
| 35 | prEN 13687-5 | Resistance to high chemical attack Class I: 3 d without pressure Class II: 28 d without pressure Class III: 28 d with pressure It is recommended to use testing liquids from the 20 classes given in 841 covering all types of common chemicals. Other testing liquids can be agreed between the interested parties. | Decrease of hardness ≤ 50 % (Buchholz, Shore) after 24 h after immersion with respect to the initial value. |

Table 3.3 Performance Requirements for Coatings (continuation)

| No. Acc. table A.1, part 9 | Test method prEN | Performance Characteristics | Requirements |
|----------------------------|----------------------|--|---|
| 37 | prEN 1062-7 | Crack bridging ability After conditioning in acc. to 1062-11: Clause 4.1 – 7 days at 70 °C for reactive resin systems Clause 4.2 – UV radiation and humidity for dispersion systems | The required crack bridging ability shall be given by the designer with respect to local conditions (climate, crack widths and crack movement). After testing the required class no failures may occur. Testing parameters see table 3.4 and 3.5. |
| 38 | ISO 6272 | Impact resistance | After loading no cracks and delamination Class I: 4 Nm Class II: 10 Nm Class III: 20 Nm |
| 79 | prEN 00227-114 | Skid resistance | Class I: > 35 SKT (pedestrian traffic, wet area), Class II: > 50 SKT (car traffic, inside), Class III: > 65 SKT (car traffic, outside) |
| 91 | 1062-11 | Artificial weathering acc. to prEN 1062-11 clause 4.2 (UV-radiation and humidity) | After 2000 h of artificial weathering: no blistering, no cracking, no flaking acc. to ISO 4628. Chalking is allowed but must be described exactly. |
| 92 | EN 1081 | Antistatic behaviour | Class I: >10 ⁶ and < 10 ⁸ Ω (Explosives) Class II: >10 ⁴ and < 10 ⁶ Ω (Explosion hazardous substances) |
| 95 | prEN 13578 | Adhesion on wet concrete (Substrate: MC (0.40)) | After loading: a) acc. to ISO 4628 no blistering, no cracking, no flaking b) Pull-off-test ≥ 1.5 N/mm ² , the failure shall occur < 50 % as adhesive rupture This test is mandatory for coatings on fresh concrete or concretes with a high moisture content > 4 %. |
| 69 | Acc. to CEN/TC 127 | Fire resistance after application | Acc. CEN/TC 127 |
| 93 | National regulations | Physiological performance | Acc. to the national requirements |

Table 3.4 Test conditions (method A) for crack bridging test acc. to prEN 1062-7

| Class | Width of the crack bridged µm | Speed mm/min |
|-------|----------------------------------|-----------------|
| A 1 | > 100 | - |
| A 2 | > 250 | 0,05 |
| A 3 | > 500 | 0,05 |
| A 4 | > 1250 | 0,5 |
| A 5 | > 2500 | 0,5 |

NOTE: *The test temperatures can be agreed between the interested parties.
As test temperature for the classes A2 - A5 -10 °C is recommended (A1: 21 °C).
Other test temperatures can be 10 °C, 0 °C, -10 °C, -20 °C, -30 °C, -40 °C.
The test temperature shall be included in brackets after the class (e. g. A4 (-20°C)).*

02103366DC

Table 3.5: Test conditions (method B) for crack-bridging test acc. to prEN 1062-7

| Class | Test conditions (see figures B.1 and B.2) |
|-------|---|
| B 0 | $w_o = 0,15$ mm $w_u = 0,10$ mm trapezoid $RW = 100$ $f = 0,03$ Hz $w = 0,05$ mm |
| B 1 | $w_o = 0,15$ mm $w_u = 0,10$ mm trapezoid $RW = 1000$ $f = 0,03$ Hz $w = 0,05$ mm |
| B 2.1 | $w_o = 0,30$ mm $w_u = 0,10$ mm trapezoid $RW = 1000$ $f = 0,03$ Hz $w = 0,20$ mm |
| B 2.2 | as in B 2.1, and $w_L = \pm 0,05$ sinus $RW = 20\ 000$ $f = 1$ Hz |
| B 3.1 | $w_o = 0,50$ mm $w_u = 0,20$ mm trapezoid $RW = 1000$ $f = 0,03$ Hz $w = 0,30$ mm |
| B 3.2 | as in B 3.1, and $w_L = \pm 0,05$ sinus $RW = 20\ 000$ $f = 1$ Hz |

Explanation of symbols:

| | |
|-------------------------------|---------------------------------------|
| f = frequency | w_L = load-dependent crack movement |
| RW = number of crack cycles | w_o = maximum crack width |
| w = Change in crack width | w_u = minimum crack width |

NOTE:

The test temperatures can be agreed between the interested parties.

As test temperature -10°C is recommended. Other test temperatures can be 10 °C, 0 °C, -20 °C, -30 °C, -40 °C.

The test temperature shall be included in brackets after the class (e. g. B3 (-20 °C)).

Annex ZA (informative) Harmonized clauses, attestation of conformity and CE marking

ZA.1 Clauses of this European Standard addressing the provisions of EU Construction Products Directive

This European Standard has been prepared under a Mandate given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in the table below, meet the requirements of the Mandate given under the EU Construction Products Directive (89/106).

Compliance with these clauses confers a presumption of fitness of the construction product covered by this European Standard for its intended use(s).

WARNING : Other requirements and other EU Directives, not affecting the fitness of intended use(s), can be applicable to the construction product falling within the scope of this European Standard.

Construction product : Surface protection products

Intended uses : used in protection against ingress, moisture control, physical resistance and resistance to chemicals

| Requirement/ Characteristic from the Mandate : | Requirement Clause(s) in this or other European Standard(s) : | Mandated levels and/or classes | Notes : |
|---|---|-----------------------------------|---------|
| - Bond / adhesion strength | Paragraph 5.2 Table 3 | None | wr |
| - Compressive strength | | | wr |
| - Shrinkage / expansion | | | wr |
| - Sensivity to water (incl. seawater) | | | wr |
| - Crack bridging (static and dynamic) | | | wr |
| - Diffusion resistance | | | wr |
| - Water repellence | | | wr |
| - Coefficient of thermal expansion | | | wr |
| - Reaction to fire | | | wr |
| - Water vapour permeability | | | wr |
| - Water permeability | | | wr |
| - Release of dangerous substances | | | wr |
| - Skid resistance | | | wr |

00/10.3366 DC

ZA.2 Procedure for the attestation of conformity of products

| Product | Intended use | Level(s) or Class(es) | Attestation of conformity |
|--|--|-----------------------|---------------------------|
| Surface protection products | For uses with low performance requirements in buildings and in civil engineering works | none | 4 |
| | ----- For other uses in buildings and civil engineering works | | 2 + |
| System 2+ : See CPD Annex III.2 (ii), First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as continuous surveillance assesment and approval of factory production control System 4 : See CPD Annex III 2 (ii), Third possibility | | | |

The evaluation of conformity of the surface protection products covered by this European Standard shall be assessed following clause 7.

ZA.3 CE marking and labelling

CE marking shall be fixed following clause 8 which gives guidance on the characteristics that have to be stated within the labelling that will accompany the CE marking in compliance with the intended use of the product and on the way of expressing the values on these characteristics where required.

Accompanying the CE marking, the manufacturer shall mention the following information on the commercial documents accompanying the product :

- Name, or identify mark, and the address of the manufacturer
- Last two digits of the year in which the marking was fixed
- EN 1504-2 – Surface protection products
- For the system 2+ : number of the CE certificate of conformity delivered by the certification body and ist identification number
- For the system 2+ : identification number of the body involved in FPC
- Bond/strength : where relevant
- Compressive strength : where relevant
- Shrinkage/expansion : where relevant
- sensivity to water : where relevant
- Crack bridging : where relevant
- Diffusion resistance : where relevant
- Water repellence : where relevant
- Coefficient of thermal expansion : where relevant
- Reaction to fire : where relevant
- Water vapour permeability : where relevant
- Water permeability
- Release of dangerous substance : where relevant
- Skid resistance : where relevant

NOTE For those characteristics that are not declared by the manufacturer for given intended uses and for which there are no requirements in a Member State of destination, the corresponding boxes do not need to be completed

Annex A (informative)

Examples of how to use the classification system of three individual cases

| No. Acc. to Table 3 of ENV 1504-9 | Test methods defined in | Performance characteristics | Example 1 | Example 2 | Example 3 |
|-----------------------------------|--|---|-----------|-----------|-----------|
| 4 | prEN 12617-1 | Linear shrinkage for polymers and SPS | | ■ | |
| 9 | EN 12190 | Compressive strength | | ■ | |
| 15 | EN 1770 | Coefficient of thermal expansion | | ■ | |
| 24 | ISO 7784-2 | Abrasion resistance | | ■ | ■ |
| 26 | prEN 1062-6 | Permeability to CO ₂ | ■ | ■ | ■ |
| 27 | prEN 1062-2 | Permeability to water vapour | ■ | ■ | ■ |
| 29 | EN 1062-3 | Capillary absorption and permeability to water | ■ | ■ | ■ |
| 33 | prEN 13687-1 | Adhesion after thermal compatibility | | | |
| | | Freeze-thaw cycling with deicing salt immersion | | | ■ |
| | prEN 13687-2 | Thunder shower cycling (thermal shock) | ■ | | ■ |
| | prEN 13687-3 | Thermal cycling without de-icing salt impact | ■ | ■ | |
| 36 | ISO 2812-1 | Chemical resistance | | | ■ |
| | prEN 13529 | Resistance to high chemical attack | | ■ | |
| 37 | prEN 1062-7 | Crack bridging ability | | | ■ |
| 38 | ISO 6272 | Impact resistance | | ■ | ■ |
| 40 | EN 1542 | Adhesion by Pull-off test | ■ | ■ | ■ |
| 69 | Acc. to TC 127 | Fire resistance after application | | ■ | |
| 79 | Acc. to TC 127 | Skid resistance | | ■ | ■ |
| 91 | prEN 1062-11 | Behaviour after artificial weathering | ■ | | ■ |
| Example 1 | Coating system for exposed surfaces, not mechanically or chemically loaded, without de-icing salt influence acc. to the principles 1 (IP) and 2 (MC) | | | | |
| Example 2 | Coating system for interior surfaces, mechanically and chemically loaded, in acc. to the principles 1 (IP), 5 (PR) and 6 (RC) | | | | |
| Example 3 | Crack bridging coating system for exposed surfaces mechanically and low chemically loaded with de-icing salt influence in acc. to the principles 1 (IP) and 5 (PR) | | | | |

001103266DC