

Draft for Public Comment

99/102235DC
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Latest date for receipt of comments: end of May 1999

Project no.: 917814

Responsible committee: B/517/8

Interested committees: CB/1, B/2, B/11, B/517, B/517/3, B/524

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<p>Products and systems for the protection and repair of concrete structures — Test method — Resistance to high chemical attack (prEN 13529)</p>
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This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication as a British Standard. **See overleaf for instructions on commenting.**

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How to submit comments

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.

Format

The guidance given below is intended to ensure that all comments receive efficient and appropriate attention by the responsible BSI committee. Annotated text is 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 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.

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

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Project no.: 917814	DPC number: 99/102235DC
Commentator:	Date:

Clause/ subclause	Paragraph/ Figure/ Table	Type of comment (General/ technical/ editorial)	Comment (with rationale)	Proposed change
<u>Examples:</u> 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.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 13529

March 1999

ICS

English version

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

Produits et systèmes pour la protection et la réparation des structures en béton - Méthodes d'essai - Résistance aux fortes attaques chimiques

Produkte und Systeme für den Schutz und die Instandhaltung von Betontragwerken - Prüfverfahren - Widerstand gegen starken chemischen Angriff

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

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Ref. No. prEN 13529:1999 E

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104 "Concrete (performance, production, placing and compliance criteria)", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

1 SCOPE

This European Standard is one of a series dealing with products and systems for the protection and repair of concrete structure. It specifies a method for determining the resistance to high chemical attack of surface protection systems.

2 REFERENCES

- EN 1504-2¹⁾ Products and systems for the protection and repair of concrete structures -Part 2: Surface protection systems
- EN 1542¹⁾ Products and systems for the protection and repair of concrete structures - test method - pull off test
- EN 1766¹⁾ Reference concretes for testing
- EN 21512¹⁾ Paints and varnishes - sampling.
- EN 21513 Paints and varnishes - Examination and preparation of samples for testing.
- ISO 868 Testing of rubbers, elastomers and plastics; Shore hardness testing A and D
- ISO 2808 Paints and varnishes - Determination of film thickness
- ISO 2815 Paints and varnishes - Buchholz indentation test
- ISO 4628/1 Paints and varnishes - Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - General principles and rating schemes
- ISO 4628/2 Paints and varnishes - Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect - Designation of degree of blistering
- ISO 4628/4 Paints, varnishes and similar coating materials - Designation of degree of cracking of coatings.
- ISO 4628/5 Paints varnishes and similar coating materials - Designation of degree of flaking of coatings.

3 PRINCIPLE

The testing of the resistance to high chemical attack is a one-side exposure of the coating material to the testing chemical.

¹⁾ At present at draft stage

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4 APPARATUS

- 4.1 Laboratory maintained at the temperature of (21 ± 2) °C.
- 4.2 Usual accessories to apply the coating material to the basic test pieces.
- 4.3 Concrete slabs as basic test pieces, according to prEN 1766.
- 4.4 Testing apparatus

The testing apparatus consists of a metal frame to take up the test piece and to clamp one or two bell-type caisson chambers (see fig. 1). The bell-type caisson chamber consists of a bell-type steel cup with an inner diameter of > 100 mm. (The tested area is a circle with a diameter of 10 cm). It is connected to an compressed air vessel equipped with a pressure reducing valve via a compressed air hose. The pressure device is fixed on the coating by a metal clamp. To ensure the tightness of the caisson chamber, a rubber cuff is placed between the coating and the caisson chamber.

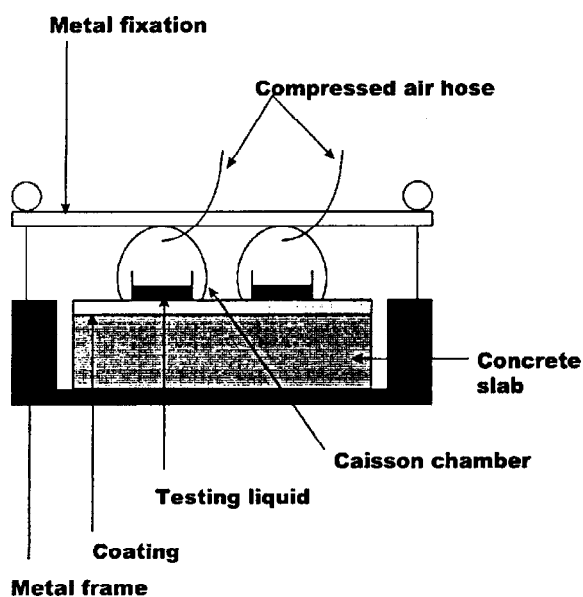


Fig. 1: Sketch of the testing apparatus

5 SAMPLING

A representative and homogenous sample of the material under test shall be taken as described in pr EN 21512. The sample shall be examined and prepared as described in EN 21513.

6 TEST METHOD

6.1 Test pieces

Test pieces are concrete slabs measuring 300 mm x 200 mm x 40 mm are fabricated in accordance with prEN 1766 using a test concrete MC (0.45) with an aggregate size of 8 mm.

Note 1:

It is possible to use slabs without any reinforcement. It is also possible to use slabs with a reinforcement cage according to prEN 1062-7, Informative Annex C, C2.2.3. Then, after a crack-bridging test, the test of resistance against high chemical attack can follow immediately with the same test pieces. When the resistance of the coating above the crack in the concrete is to be tested, only one bell-type caisson chamber is used. It is positioned exactly above the notch in the slab.

Concrete slabs are prepared and stored according to prEN 1766. If needed, surface preparation is carried out according to prEN 1766 by grit-blasting. After storage according prEN 1766, the concrete slabs have to be stored for at least 7 days in a climate $(21 \pm 2) ^\circ\text{C}$ / $(60 \pm 10) \% \text{ R. H.}$ before they are coated.

The test pieces are coated, cured and stored in accordance with the manufacturer's instructions.

6.2 Procedure

One or two rings (alloy or plastic, height 20 mm; inner diameter: 100 mm) are glued on the coating with a chemical resistant sealant or glue, so that a surface of $\pi (50 \text{ mm})^2$ of the coating is exposed to the testing liquid. Before the testing liquid is filled in, the initial hardness of the coating is measured. When using two rings, two different testing liquids can be used. The level of the testing liquid must reach a height of 1 cm. The test can be carried out without or with a pressure of 1 bar. When testing with applied pressure the bell-type caisson chamber is fixed and an air pressure of 1 bar is applied. When testing without pressure, it is necessary to cover the glued ring with a lid to avoid evaporation of the testing liquid.

The test duration depends on the field of application, specified in EN 1504-2. The duration shall be typically 1 or 3 or 7 or 28 or 90 d.

The standard testing temperature shall be $(21 \pm 2) ^\circ\text{C}$, other testing temperatures can be agreed between the interested parties.

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6.3 Testing liquids

Testing liquids are used according to Informative Annex A or as agreed between the interested parties.

6.4 Evaluation

After being subjected to chemical attack, the testing liquid is removed and test pieces are examined in comparison to the original sample for

- blistering
- flaking
- cracking
- optical changes (e. g. colour, gloss)
- If it is possible, adhesion or hardness (Buchholz indentation test or Shore hardness appropriate to the type of coating) are measured

The examination is carried out one hour and 24 hours after removal of the testing liquid.

7 TEST REPORT

The test report shall contain at least the following information:

- a) A reference to this European Standard;
- b) Any details necessary to identify the coating tested;
- c) Nature of the substrate;
- d) Thickness, in micrometers, of the dry coating and method of measurement in accordance with ISO 2808 , and whether it is a single coating or a multi-coat system;
- e) Full details of the testing liquid to be used for the test;
- f) A description of all evaluation results.

A INFORMATIVE ANNEX

This Informative Annex gives proposals for testing liquids. Each group of testing liquids represents a whole class of similar acting substances. For example, group 9 is a mixture of 50 vol.-% of acetic acid and 50 vol.-% of propionic acid. When a coating is resistant to this testing liquid, the coating is resistant to all organic acids (except formic acid) and their salts (in an aqueous solution).

Other testing liquids can be agreed between the interested parties (e. g. oxidizing acids, higher concentrations etc.).

List of testing liquids

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	Group	Testing liquid
1.	Petrol acc. to DIN 51 600 and DIN EN 228	47,5 Vol.-% toluene 30,4 Vol.-% isooctane 17,1 Vol.-% n-heptane 3,0 Vol.-% methanol 2,0 Vol.-% tert.-butanol
2.	Aviation fuel	1. 50,0 Vol.-% isooctane 50,0 Vol.-% toluene 2. Aviation Gasoline 100 LL Nato-code F-18 3. Turbo Fuel A-1 Nato-code F-34/F-35
3.	Heating oil EL (DIN 51 603-1) and diesel fuel (acc. to DIN EN 590) and unused motor and gear oils	Testing liquid A 20/NP II J. Haltermann, Ferdinandstraße 55/57, D-20095 Hamburg
4.	All hydrocarbons incl. group 2 and 3 except 4a and 4b and used motor and gear oils	60,0 Vol.-% toluene 30,0 Vol.-% xylene 10,0 Vol.-% methylnaphthalene
4a.	Benzene and benzene containing mixtures (incl. 2 - 4b)	30,0 Vol.-% benzene 30,0 Vol.-% toluene 30,0 Vol.-% xylene 10,0 Vol.-% methylnaphthalene
4b.	Crude oil	acc. to TRbF (Technical Rules for inflammable liquids) 401/2. section 3.1.8. tab. 1
5.	Mono- and polyalcohols (up to 48 Vol.-% methanol), glycol ethers	48,0 Vol.-% methanol 48,0 Vol.-% isopropanol 4,0 Vol.-% water
5a.	All alcohols and glycol ethers (incl. 5)	methanol
6.	Halogenated hydrocarbons (incl. 6b)	trichloroethylene
6a.	All aliphatic halogenated hydrocarbons (incl. 6 and 6b)	dichloromethane
6b.	Aromatic halogenated hydrocarbons	monochlorobenzene
7.	All organic esters and ketones (incl. 7a)	50,0 Vol.-% ethylacetate 50,0 Vol.-% methylisobutylketone
7a.	Aromatic esters and ketones	50,0 Vol.-% salicylic acid methylester 50,0 Vol.-% acetophenone
8.	Aliphatic aldehydes	35 - 40 % solution of formaldehyde
9.	Aqueous solutions of organic acids (carbon acids) up to 10 %	10 % aqueous acetic acid
9a.	Organic acids (except formiac acid) and their salts (in aqueous solution)	50,0 Vol.-% acetic acid 50,0 Vol.-% propionic acid

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	Group	Testing liquid
10.	Anorganic acids up to 20 % and acidic hydrolysing salts in aqueous solution (pH<6) except hydrofluoric acid and oxidizing acids and their salts	sulfuric acid (20 %)
11.	Anorganic bases and their alkaline hydrolysing salts in aqueous solution (pH>8) except solutions of ammonium and oxidizing solutions of salts (e. g. hypochlorite)	sodium hydroxide (20 %)
12.	Solutions of anorganic non-oxidizing salts showing a pH = 6-8	aqueous solution of sodium chloride (20 %)
13.	Amines and their salts (in aqueous solution)	35,0 Vol.-% triethanolamine 30,0 Vol.-% n-butylamine 35,0 Vol.-% N, N-dimethylaniline
14.	Aqueous solutions of organic tensides	1. 3,0 % Protectol KLC 50 2,0 % Marlophen NP 9,5 95,0 % water 2. 3,0 % Texapon N 28 2,0 % Marlipal O 13/80 95,0 % water
15	Cyclic and acyclic ethers	tetrahydrofuran (THF)
15a.	Acyclic ethers	diethyl ether

RemarksGroup 2:

The test shall be carried out with all testing liquids. Using only one testing liquid, the applicability applies only to this testing liquid.

Groups 9 -12:

1. If all tests are passed when testing groups 9 and 9a, the applicability applies to all concentrations of organic acids in aqueous solution except formiac acid > 10 %.
2. Anorganic acids of group 10 shall be tested with the respective testing liquid of the group (Sulfuric acid) and with the highest concentration required (e. g. 40 %). By that, this anorganic acid applies to the tested highest concentration, all other anorganic acids belonging to this group only up to the limit concentration of the testing liquid of this group (20 %).
3. If the tests are passed with the testing liquids of group 10 and 11, the applicability applies to group 12, too.

Group 14:

The test shall be carried out with both testing liquids. For the preparation of the mixture, the following substances shall be used:

„Protectol KLC 50“ is a product of BASF AG (Ludwigshafen). It is a solution of 50 wt% of Dimethyl-n-(C_{12/14}-alcyl-benzyl-ammoniumchloride [(H₃C)₂N((CH₂)_n-CH₃)(CH₂-C₆H₅)]Cl (n=11/13) in water.

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„MarlophenNP 9,5“ is a product of Hüls AG (Marl). It is a liquid, containing 99 wt% of Isononylphenol-Polyglycoether $C_9H_{19}-C_6H_4-O(CH_2CH_2O)_nH$ and about 1 wt% of water.

„Texapon N 28“ is a product of Henkel KGaA (Düsseldorf). It is a solution of Sodiumlauryl ethersulfate $[C_{12}H_{25}-O-(CH_2)_n-O]_m-SO_3Na$ and Sodium chloride in water. The viscosity of „Texapon N 28“ is about 2800 mPas.

„Marlipal O 13/80“ is a product of Hüls AG (Marl). It is a liquid, containing about 99 wt% of fatty alcohol-Polyglycoethers $R-O(CH_2CH_2O)_nH$ (Mean degree of polymerisation $n \approx 8$) and a little amount of polymerised ethylenoxide (≤ 1 wt%) and traces of water (about 0.2 wt%).