



SLOVENSKI STANDARD
SIST EN 14487-2:2007

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Brizgan beton - 2. del: Izvedba

Sprayed concrete - Part 2: Execution

Spritzbeton - Teil 2: Ausführung

Béton projeté - Partie 2 : Exécution

Ta slovenski standard je istoveten z: EN 14487-2:2006

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ICS:

91.100.30 Beton in betonski izdelki Concrete and concrete products

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ICS 91.100.30

English Version

Sprayed concrete - Part 2: Execution

Béton projeté - Partie 2 : Exécution

Spritzbeton - Teil 2: Ausführung

This European Standard was approved by CEN on 3 August 2006.

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

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

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

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14487-2:2006) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

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

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1 Scope

This European Standard is applicable to sprayed concrete to be used for ground strengthening, repair and upgrading of existing structures and for free-standing structures.

The standard specifies requirements for the execution of concrete spraying both by wet and dry process.

The standard is applicable to temporary as well as permanent structures.

This standard does not cover safety and health aspects of execution.

This standard does not state requirements for quality assurance and for qualification of personnel for the various activities.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 206-1:2000, *Concrete — Part 1. Specification, performance, production and conformity*

EN 1504-3, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 3: Structural and non-structural repair*

EN 1504-10, *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 13670-1, *Execution of concrete structures — Part 1: Common*

EN 14487-1:2005, *Sprayed concrete — Part 1: Definitions, specifications and conformity*

EN 14488-6, *Testing sprayed concrete — Part 6: Thickness of concrete on a substrate*

EN 14889-1, *Fibres for concrete — Part 1: Steel fibres — Definitions, specifications and conformity*

EN 14889-2, *Fibres for concrete — Part 2: Polymer fibres — Definitions, specifications and conformity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14487-1:2005 apply.

4 Documentation

4.1 Project specification

The project specification shall include all necessary information and technical requirements for execution of the works.

As a minimum the following shall be stated:

- type of project (bridge, house, road, railway, hydro power, etc.),
- purpose of concrete spraying (permanent or temporary support etc. for ground strengthening), (structural or non structural for repair),

- inspection category according to EN 14487-1,
- requirements related to health and safety,
- qualification of personnel,
- requirements on quality assurance plan for execution if required,

NOTE 1 Quality plan for execution is normally required for inspection classes 2 and 3.

- relevant European Technical Approvals and provisions valid on the construction site,

NOTE 2 Provisions valid at the construction site are national standards and documents approved by competent authority defined in the project specification.

- procedures for making alterations to previously agreed requirements,
- list of relevant design documents.

for ground strengthening also:

- general type of ground conditions (rock type and quality etc.),
- main principles applied for the sprayed concrete ground strengthening design,
- any particular execution conditions (e.g. frozen substrate, spraying under compressed air, special waste deposits).

for repair, upgrading and free-standing structures also:

- requirements on surface finish,
- requirements on thickness.
- main structural design principles and objectives

NOTE 3 Informative Annex A contains a checklist of requirements and information that may have to be included in the project specification as appropriate.

Before commencement of execution of any part of the works, the project specification relevant to that part of the works shall be complete and available. The project specification should also include statements on requirements for the distribution, the filing and recording of technical documents used for the works.

4.2 Execution documentation

If required, a quality plan for the execution of the work shall be prepared including a complete listing of relevant references. References shall, where appropriate, be given to requirements and conformity criteria in EN 14487-1.

The sprayed concrete execution shall be documented according to requirements put forward in this standard and the established QA plan.

5 Preparatory works

5.1 For strengthening of ground

5.1.1 Preparation of substrate

All poor or loose rock shall be removed.

Ground water leakages are to be collected in hoses, pipes or other drainage systems, to prevent detriment to the quality of the sprayed concrete.

Any specified rock mechanics instrumentation shall be installed.

5.1.2 Removal of dust and debris

Dust debris and other deposits shall be removed by pressurised water jetting prior to spraying.

5.1.3 Pre-wetting

The need for additional pre-wetting prior to spraying shall be considered taking into account the suction of the substrate and the consequent risk of an adverse influence on the sprayed concrete.

5.1.4 Protection against extreme ambient temperatures

When working in high or low temperatures, precautions shall be taken to ensure the quality of the sprayed concrete.

If the ambient temperature is expected to be below 0 °C at the time of spraying or in the curing period, precautions shall be planned to protect the concrete against damage due to freezing.

If the ambient temperature is forecast to be high at the time of spraying or in the curing period, precautions shall be planned to protect concrete against damaging effects.

5.2 For repair, upgrading and free-standing structures

5.2.1 Scaffolding, falsework and formwork

Scaffolding, falsework and formwork shall, generally, apply to EN 13670-1.

For scaffolding and falsework for sprayed concrete operations, the following additional clauses shall be considered:

- it shall be strong enough to take all the loads including the produced rebound, without undue deformations,
- it shall accommodate the safe working of the nozzleman,
- it shall be placed such that a sufficient distance between nozzle and surface of application can be achieved (see 9.1),
- it shall allow easy access to all parts of the members to be treated.

Formwork for sprayed concrete operations shall be designed so as to avoid pockets of rebound.

5.2.2 Preparation of substrate

It is essential that sprayed concrete is applied to a thoroughly clean, rough and defect-free surface. High pressure water jetting or grit blasting, capable of etching the substrate surface, are the recommended methods.

For repair and upgrading, the preparation of concrete substrate and reinforcement shall conform to EN 1504-10.

5.2.3 Pre-wetting

For repair and upgrading, pre-wetting of the substrate of the existing concrete (or other porous material) shall be considered according to EN 1504-10.

5.2.4 Protection against extreme ambient temperature

Formwork or structural parts in contact with the section to be sprayed shall have a temperature which does not result in freezing of the sprayed concrete before it has sufficient strength to resist the effects of freezing.

If the ambient temperature is expected to be below 0 °C at the time of spraying or during the curing period, precautions shall be taken to protect the concrete against damage due to freezing.

If the ambient temperature is expected to be high at the time of spraying or during the curing period, precautions shall be taken to protect concrete against damaging effects.

6 Reinforcement

Reinforcement steel may be mesh, reinforcement bars or fibres.

For ground strengthening, lattice girders and steel ribs may be incorporated in the sprayed concrete, under separate materials specification.

Reinforcement in terms of mesh or bars for sprayed concrete structures shall comply with ENV 13670-1.

Steel or polymer fibres used for reinforcement shall comply with EN 14889-1 or EN 14889-2 respectively.

Additionally:

- reinforcement is to be fixed in such a way, that it will stay in place and not vibrate during the spraying process,
- design and the arrangement of the rebars shall be adapted for the spraying process in order to minimize the shadow effect and improve compaction.
- where two or more layers of mesh reinforcement are incorporated, the rear layer should be encased in sprayed concrete prior to fixing the next front layer (not applicable to necessary overlaps within a layer) which shall be fixed at a distance of at least 2 times the maximum aggregate size from the preceding sprayed concrete layer.

Pressurised air used shall be freed from oil by using adequate equipment (e.g. oil traps).

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7 Equipment

7.1 Storage of materials

Constituent materials shall be stored and handled so that their properties do not change significantly, e.g. by action of climates, intermingling or contamination, and that their conformity with the respective standard is maintained.

Storage compartments shall be clearly marked in order to avoid errors in the use of the constituent materials.

Special instructions from the suppliers of the constituent materials shall be taken into account.

Facilities shall be provided to enable samples to be taken from the stockpiles, silos and bins.

7.2 Batching equipment

When factory blended dry mixes are used, they shall comply with EN 1504-3. For site mixes, the performance of the batching equipment shall be such that under practical operating conditions the maximum tolerances stated in Table 1 shall be achieved.