INTERNATIONAL STANDARD

ISO 14824-1

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Grout for prestressing tendons —

Part 1: Basic requirements

Coulis pour câbles de précontrainte —

Partie 1: Exigences essentielles

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14824-1 was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 3, *Concrete production and execution of concrete structures*.

ISO 14824 consists of the following parts, under the general title *Grout for prestressing tendons:*

— *Part 1: Basic requirements*

— *Part 2: Grouting procedures*

— *Part 3: Test methods*

Introduction

In post-tensioned prestressed concrete construction, the grouting of tendons is an important operation. The intention of this part of ISO 14824 is to provide basic requirements for the approval of cement grouts, compliance with which will satisfy the requirements in ISO 22966.

The main function of grouting is to:

— protect the prestressing steel against corrosion;

— provide a bond between the prestressing steel and the ducts where required for the design of the structure;

— allow transfer of compressive stresses in the structure in a direction transverse to internal tendons;

— fill all voids where water may accumulate and cause frost damage.

The testing regimes anticipated by this part of ISO 14824 include three levels:

(1) initial type and audit testing in accordance with this part of ISO 14824;

(2) suitability testing for confirmation of the selected grout for a specific project in accordance with ISO 14824-2;

(3) inspection during grouting works on a specific project in accordance with ISO 14824-2.

The test methods for each of the regimes are given in ISO 14824-3.

In some countries requirements exist for independent third-party certification of grout and grouting procedures which should be set out in national requirements to supplement ISO 22966.

Certain special structures or tendon configurations can require grouts with enhanced performance. Any resulting necessary amendment of the requirements of this part of ISO 14824 needs to be included in the execution specification.

Grout for prestressing tendons —

Part 1:
Basic requirements

1 Scope

This part of ISO 14824 covers the materials that may be used in the manufacture of cement grouts and the required properties and composition of the grout. It is applicable to grouting of tendons in all types of structures, including bridges and buildings.

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.

ISO 9597, *Methods of testing cement — Determination of setting times and soundness*

ISO 22965-2, *Concrete — Part 2: Specification of constituent materials, production of concrete and compliance of concrete*

ISO 14824-3, *Grout for prestressing tendons — Part 3: Test methods*

ISO 12439, *Mixing water for concrete*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
grout
homogeneous mixture of cement and water, which may contain admixtures and additions

3.2
tendon
assembly of prestressing steel and sheath with anchorages and all necessary auxiliary components to permit grouting, either placed internally or externally to the concrete structure

4 Materials

4.1 General

Materials shall have a general suitability in accordance with ISO 22965-2.

4.2 Cement

Cement shall be Portland cement or any other type of cement permitted for grouting of tendons which complies with national standards in the place of use of the grout. The cement type shall be declared.

4.3 Water

Water shall comply with ISO 12439.

4.4 Admixtures

Admixtures shall have an established suitability for use in grouts. It shall be permissible to use admixtures singly or in combination. Admixtures shall only be used according to the admixture manufacturer's instructions unless any variation is proven satisfactory by testing and approved by the manufacturer.

4.5 Additions

Grout complying with this part of ISO 14824 may contain silica fume.

If permitted in the place of use, grout may contain other additions intended for use in concrete in accordance with ISO 22965-2. The type and amount of additions shall be declared.

5 Batching and mixing of grout

Materials may be batched and mixed on site to fabricate grout. Alternatively, the dry materials may be batched in a factory for ready-mixed grout and mixed with the liquid materials on site to fabricate grout.

All materials shall be batched by mass except the mixing water and liquid admixtures which may be batched by mass or volume. The accuracy of batching shall be

— ±2 % for cement, dry admixtures and additions,

— ±1 % for water and liquid admixtures,

of the quantities specified.

Water contained in liquid admixtures shall be declared and it shall be stated whether it is included in the calculation of water/cement (w/c) ratio.

All pozzolanic materials used as separate ingredients shall be included in the calculation of w/c ratio in accordance with the procedures in ISO 22965-2.

Mixing shall be carried out mechanically with suitable equipment to obtain a homogeneous and stable grout with the plastic properties given in Clause 6.

For any grout fabricated in accordance with this part of ISO 14824 the following information shall be declared by the grout manufacturer:

— mix proportions of materials;

— w/c ratio and its acceptable variation;

— sequence of introducing the materials, type of mixer and mixing time;

— range of temperature for which the grout complies with this part of ISO 14824.

NOTE 1 Grouts complying with this part of ISO 14824 normally have a w/c ratio below 0,45.

NOTE 2 ISO 14824-2 requires suitability testing to be carried out using the same type of mixing equipment as is used for the actual project operations. Hence, it is preferable to also use the same type of equipment for all testing as far as possible.

6 Properties of grout

6.1 General

The grout shall not contain more than:

— chloride (Cl^-) ≤ 0,10 % by mass of cement;

— sulfate (as SO_3) ≤ 4,5 % by mass of cement;

— sulfide (S^{2-}) ≤ 0,04 % by mass of cement where ordinary Portland cement is used. Where other cements are permitted the sulfide limit shall be according to national requirements and described in the Execution Specification.

These values are the summation of the chloride, sulfates, sulfites and sulfides occurring in the constituent materials.

Grout shall comply with the requirements given in 6.2 to 6.8 for:

— sieve test;

— fluidity;

— bleeding;

— volume change;

— strength;

— setting time;

— fluid density.

Testing shall be in accordance with ISO 14824-3.

Other test methods may be used if the correlation or safe relationship between the results of these test methods and the reference methods of ISO 14824-3 have been established.

The performance requirements of 6.2 to 6.8 shall be satisfied for the range of conditions of temperature as declared by the grout manufacturer.

Grout shall be tested as specified in this part of ISO 14824 or in the project specification at the following ambient temperatures:

— reference temperature (20 ± 2) °C or (27 ± 2) °C for hot/tropical climates;

— lowest temperature declared by the manufacturer (–1/+3) °C;

— highest temperature declared by the manufacturer (–3/+3) °C.

For pre-bagged grout, the range of suitable temperature shall be stated on the package or accompanying records.

In the absence of specified maximum and minimum ambient temperatures, it is recommended to use 15 °C above and below the reference temperature

6.2 Sieve test

Grout shall be tested according to ISO 14824-3 and no lumps shall remain in the sieve.