Admixture for concrete, mortar, and grout - Part 4 Admixtures for grout for prestressing tendons - requirements
KS 2177: 2017

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In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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Foreword

This Kenya Standard was revised by the Concrete Technical Committee, under the guidance of the standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

This standard is part of the series KS 2770 "Admixtures for concrete, mortar and grout", which is comprised of the following additional parts:

— Part 1 Admixtures for concrete, mortar and grout — Common requirements
— Part 2 Concrete admixtures — Definitions, requirements, conformity, marking and labelling
— Part 3 Admixtures for masonry mortar — Definitions, requirements, conformity, marking and labelling
— Part 4 Admixtures for grout for prestressing tendons - Definitions, requirements, conformity, marking and labelling
— Part 5 Admixtures for sprayed concrete - Definitions, requirements, conformity, marking and labelling
— Part 6 Sampling, conformity control and evaluation of conformity

This draft Standard is used with the standards of the KS 2769: 2017 series which comprises the test methods for admixtures.
KENYA STANDARD

Admixture for concrete, mortar, and grout - Part 4: Admixtures for grout for prestressing tendons – requirements

1. Scope
This Standard defines and specifies requirements and conformity criteria for admixtures for the use in grouts for prestressing tendons according to ISO 14824-1. It covers admixtures for use in site-prepared mixed grout only.

Provisions for the use of grout admixtures are not part of this standard but are covered by ISO 14824.

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.
KS EAS 148-2-2016: Cement — Test methods — Part 2: Chemical analysis
KS EAS 148-6-2016: Cement — Test methods — Part 6: Determination of fineness
KS EAS 18-1-2016: Cement — Part 1: Composition, specification and conformity criteria for common cement
KS 2770-1, Admixtures for concrete, mortar and grout — Part 1: Common requirements
KS 2770-6, Admixtures for concrete, mortar and grout — Part 6: Sampling, conformity control and evaluation of conformity
EN 1008, Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete

3. Terms and definitions
For the purposes of this document, the terms and definitions in KS 2770-1 and the following apply.

3.1. admixture for grout
material which improves the characteristics of grouts to be injected into ducts for prestressing tendons by influencing their properties such as fluidity, expansion, volume change and bleeding, individually or in combination

3.2. expanding grout admixture
admixture for use in grout which is intended to ensure that the initial volume of the liquid grout has not reduced after hardening

3.3. compliance dosage
dosage of an admixture, quoted by the manufacturer in % by mass of cement, which will meet the requirements of this standard and which is within the recommended range of dosage

3.4. recommended range of dosage
dosages between limits, which the manufacturer recommends for the product and are expressed in % by mass of cement, based on experience on site

NOTE The use of the recommended dosage does not imply that compliance with this standard will be met over the whole range. Trial tests should be carried out with the materials to be used on site to find the dosage necessary to achieve the required result (see ISO 14824-2).

3.5.

For this standard site includes precast concrete factories.

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test mix
prescribed mix of cement, water and admixture

4. Composition and preparation of test mix

4.1. Constituent materials
   a) Cement type CEM I strength classes 42.5 and 52.5 complying with EAS 18-1, C_3A content 7% to 11% by mass calculated from chemical analysis in accordance with EAS 148-2 and a specific surface of 320 m²/kg to 400 m²/kg determined in accordance with EAS 148-6.
   b) Water in accordance with EN 1008.
   c) Admixture for grout under test used at its compliance dosage.

4.2. Water/cement ratio
   This shall be adjusted to provide the fluidity in 4.3 and shall not exceed 0.42.

4.3. Fluidity
   The fluidity, measured by cone method in accordance with ISO 14824-3, at (20 ± 2) °C, immediately after mixing shall be (15 ± 3) s

4.4. Mixing
   This shall be carried out mechanically, with a high shear mixer, to obtain a homogeneous grout. Any recommendations from the manufacturer of the admixture, regarding the mixing sequence, shall be followed.

5. Requirements

5.1. General
   Admixtures for grout shall comply with Table 1 and KS 2770-1, Table 1.

5.2. Specific
   Test mixes shall comply with Table 1.

   Table 1 — Requirements for grout admixtures

<table>
<thead>
<tr>
<th>No</th>
<th>Property</th>
<th>Test method</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fluidity 30 min after mixing&lt;sup&gt;a&lt;/sup&gt;</td>
<td>ISO 14824-3</td>
<td>Cone method, ≤ 25 s</td>
</tr>
<tr>
<td>2</td>
<td>Compressive strength&lt;sup&gt;a&lt;/sup&gt;</td>
<td>ISO 14824-3</td>
<td>≥30 MPa at 28 days</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding</td>
<td>Annex A</td>
<td>≤2% of initial volume at 3 h</td>
</tr>
<tr>
<td>4</td>
<td>Range of volume change at 24 h</td>
<td>Annex A</td>
<td>-1% ≤ S ≤ 5% or 0 ≤ S ≤ 5%, when testing expanding admixtures, where S is the volume change</td>
</tr>
</tbody>
</table>

<sup>a</sup>These requirements correspond with ISO 14824-1.

5.3. Release of dangerous substances
   For content and release of substances from the hardened grout dangerous to health, hygiene and the environment the relevant environmental regulations shall apply.

6. Sampling
   Requirements for sampling are given in KS 2770-6.

7. Conformity control
   Requirements for conformity control are given in KS 2770-6. The frequency of testing in connection with factory production control is given in Table 2.
### Table 2 — Minimum frequency of test for factory production control of admixtures for grout for prestressing tendons

<table>
<thead>
<tr>
<th>Tests</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogenity, colour</td>
<td>B</td>
</tr>
<tr>
<td>Relative density (for liquids only)</td>
<td>B</td>
</tr>
<tr>
<td>Conventional dry material content</td>
<td>B</td>
</tr>
<tr>
<td>pH value (for liquids only)</td>
<td>B</td>
</tr>
<tr>
<td>Chloride content (Cl)(^a)</td>
<td>4</td>
</tr>
<tr>
<td>Compressive strength</td>
<td>1</td>
</tr>
<tr>
<td>Fluidity</td>
<td>A</td>
</tr>
<tr>
<td>Bleeding</td>
<td>A</td>
</tr>
<tr>
<td>Volume change</td>
<td>A</td>
</tr>
</tbody>
</table>

Numbers in this table denote minimum frequency of test per year, spread according to production; if the production is less frequent every batch has to be tested.

- **A**: means test for every 500 t with a minimum of 2 times a year
- **B**: means test for each batch

\(^a\) Total chlorine content also has to be tested at this frequency if it is significantly different from the water soluble chloride content.

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### 8. Evaluation of conformity

Requirements for evaluation of conformity are given in KS 2770-6.

### 9. Marking and labelling

#### 9.1. General

When admixtures for grout are supplied in containers they shall be clearly marked with the relevant information. When the material is supplied into a bulk container at the point of delivery, the same information shall be provided in writing at the time of delivery.

#### 9.2. Designation of admixtures

Admixtures for concrete shall be designated by:

- **a)** Name of type of admixture in English language.
- **b)** Number of standard: KS 2770-4,

**Type of admixture** (i.e. admixture for grout or expanding admixture for grout; KS 2770-4)

**EXAMPLE** Admixture for grout or expanding admixture for grout; KS 2770-4.

#### 9.3. Additional Information

- **a)** batch number and production plant;

- **b)** summary of storage requirements including any special requirements on storage life which shall be clearly marked, e.g.: This admixture shall not be taken to comply with KS 2770-4 after "date";

- **c)** instructions for homogenisation, before use, when necessary;

- **d)** instructions for use and any necessary safety precautions, e.g. if caustic, toxic or corrosive;

- **e)** manufacturer’s recommended range of dosage.
Annex A
(normative)
Bleed and Volume Change test

A.1 Principle
The test measures the bleeding and volume change, as a percentage, of the initial volume of the grout between the start and end of the test. The bleeding is assessed at 3 h and the volume change at 24 h resulting from segregation or expansion of the grout.

A.2 Apparatus
A transparent cylinder of (50 ± 1) mm internal diameter and approximately 200 mm in height.

A.3 Procedure
Support the cylinder vertically on a surface that is free from shocks or vibration. Fill it carefully to a height of (180 ± 5) mm keeping clean the internal surface of the transparent cylinder above the grout meniscus. Measure the height \( h \) of the grout column accurately. Place a loose cover on the top of the tube to prevent evaporation.

After 3 h, measure the height of any bleed water on the top of the grout as \( h_1 \).

After 24 h re-measure the total height of the grout column as \( h_2 \).

A.4 Reporting results

A.4.1 Bleeding
The bleeding after the 3 h period is given by

\[
\frac{h_1 - h}{h} \times 100\%
\]

where
- \( h \) the initial height of the grout column in mm
- \( h_1 \) the height of the water on top of the grout after 3 h in mm

A.4.2 Volume change
The volume change after the 24 h period is given by

\[
\frac{(h_2 - h)}{h} \times 100\%
\]

where
- \( h \) the initial height of the grout column in mm
- \( h_2 \) the height of the grout column after 24 h in mm