



## European Technical Approval ETA-13/0419

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung  
*Trade name*

"Next SL05"

Zulassungsinhaber  
*Holder of approval*

Buzzi Unicem Spa  
Via L. Buzzi 6  
15033 CASALE MONFERRATO  
ITALIEN

Zulassungsgegenstand  
und Verwendungszweck  
*Generic type and use  
of construction product*

Schnellerhärtender Zement auf Basis von Calciumaluminatsulfat  
*Rapid hardening calcium sulphoaluminate based cement*

Geltungsdauer:  
*Validity:* vom  
*from*  
bis  
*to*

21 June 2013  
21 June 2018

Herstellwerk  
*Manufacturing plant*

Buzzi Unicem SpA  
Trino (VC)  
Italy

Diese Zulassung umfasst  
*This Approval contains*

9 Seiten  
*9 pages*

## I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
  - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998<sup>4</sup>, as amended by law of 31 October 2006<sup>5</sup>;*
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
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- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12  
<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1  
<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25  
<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812  
<sup>5</sup> *Bundesgesetzblatt Teil I 2006*, p. 2407, 2416  
<sup>6</sup> Official Journal of the European Communities L 17, 20 January 1994, p. 34

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of the product and intended use

#### 1.1 Definition of the construction product

The rapid hardening calcium sulphoaluminate based cement "Next SL05" referred to in this European technical approval is a special cement that is not covered by the European standard EN 197-1<sup>7</sup>. It is a hydraulic binder with rapid hardening properties.

This cement complies with the specifications of the standard EN 197-1<sup>7</sup> except the following points:

- this cement contains as main constituent a calcium sulphoaluminate clinker and
- the sulfate content of the cement, expressed as SO<sub>3</sub>, is greater than 4 % by mass.

The calcium sulphoaluminate clinker (CSAK) is made by sintering a precisely specified mixture of raw materials (raw meal, paste or slurry) containing elements, usually expressed as oxides, CaO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, SO<sub>3</sub> and small quantities of other materials.

The calcium sulphoaluminate clinker is a hydraulic material which is composed mainly by C<sub>4</sub>A<sub>3</sub>S (Yeelimite).

The rapid hardening calcium sulphoaluminate based cement "Next SL05" is characterized by a high early strength  $\geq 10$  MPa (6 h). The strength after 28 days is greater than 32,5 MPa.

#### 1.2 Intended use

The rapid hardening calcium sulphoaluminate based cement "Next SL05" is a cement for production of concrete, mortar, grouts and other mixes including in particular cast-in-situ and prefabricated structural concrete conforming to EN 206-1<sup>8</sup> and other European standards for concrete elements<sup>9</sup>

The provisions made in this European technical approval are based on an assumed working life of concrete incorporating the rapid hardening calcium sulphoaluminate based cement "Next SL05" of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When the rapid hardening calcium sulphoaluminate based cement "Next SL05" is used in mortars and grouts, the assumed working life and assessment methods have been written based upon an assumed working life of mortars and grouts incorporating the rapid hardening calcium sulphoaluminate based cement "Next SL05" for the intended use of a duration similar to the one of mortar and grout with a cement covered by EN 197-1.

<sup>7</sup> EN 197-1 Cement - Part 1: Composition, specifications and conformity criteria for common cements  
<sup>8</sup> EN 206-1 Concrete – Part 1: Specification, production, performance and conformity  
<sup>9</sup> e. g. EN 490, EN 516, EN 1168, EN 1317, EN 1338, EN 1340, EN 1520, EN 1858, EN 1857, EN 1916, EN 1917, EN 13084, EN 12446, EN 12737, EN 13224, EN 15037, EN 14844, EN 12839, EN 14843, EN 13978, EN 12843, EN 12951, EN 13224, EN 13813, EN 13877, EN 14843, EN 14992, EN 15037, EN 15258, EN 15435, EN 15498

## 2 Characteristics of the product and methods of verification

### 2.1 Calcium sulphoaluminate content of the product

The calcium sulphoaluminate content in the rapid hardening calcium sulphoaluminate based cement "Next SL05", expressed as  $C_4A_3S$ , shall be determined from calcium sulphoaluminate content in the calcium sulphoaluminate clinker with XRD-analysis with Rietveld refinement and shall be  $(16 \pm 5)$  % by mass.

### 2.2 Cement composition

The composition of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined by an appropriate verification method and shall be

Calcium sulphoaluminate clinker (CSA-clinker)	$(30 \pm 7)$ % by mass
$CaSO_4$ (CS)	$(15 \pm 7)$ % by mass
CEM II/A-LL	$(55 \pm 7)$ % by mass

### 2.3 Early strength ( $3 \text{ h} \leq t \leq 8 \text{ h}$ )

The early strength of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-1 at  $t$  hours ( $3 \leq t \leq 8$ ) and shall be declared.

### 2.4 Standard strength at 28 days

The standard strength of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-1<sup>10</sup> at 28 days and shall be declared. The declared value shall be at least 32,5 MPa.

### 2.5 Initial setting time

The initial setting time of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-3<sup>11</sup> and shall be declared.

### 2.6 Soundness

The soundness of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-3<sup>11</sup> and shall be not greater than 10 mm.

### 2.7 Sulfate content

The sulfate content, expressed as  $SO_3$ , of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-2<sup>12</sup> and shall be  $(12,7 \pm 5,0)$  % by mass.

### 2.8 Chloride content

The chloride content of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined in accordance with EN 196-2 and shall be not greater than 0,10 % by mass.

NOTE: If the  $Cl^-$  content is above 0,10 % by mass, the upper limit value shall be declared by the manufacturer.

<sup>10</sup> EN 196-1 Methods of testing cement - Part 1: Determination of strength

<sup>11</sup> EN 196-3 Methods of testing cement - Part 3: Determination of setting time and soundness

<sup>12</sup> EN 196-2 Methods of testing cement - Part 2: Chemical analysis of cement

## 2.9 Density

The density of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined according to EN 196-6<sup>13</sup> and shall be declared. The declared value shall be at least 2,93 g/cm<sup>3</sup>. The density shall not vary by more than  $\pm 0,20$  g/cm<sup>3</sup> from the declared value.

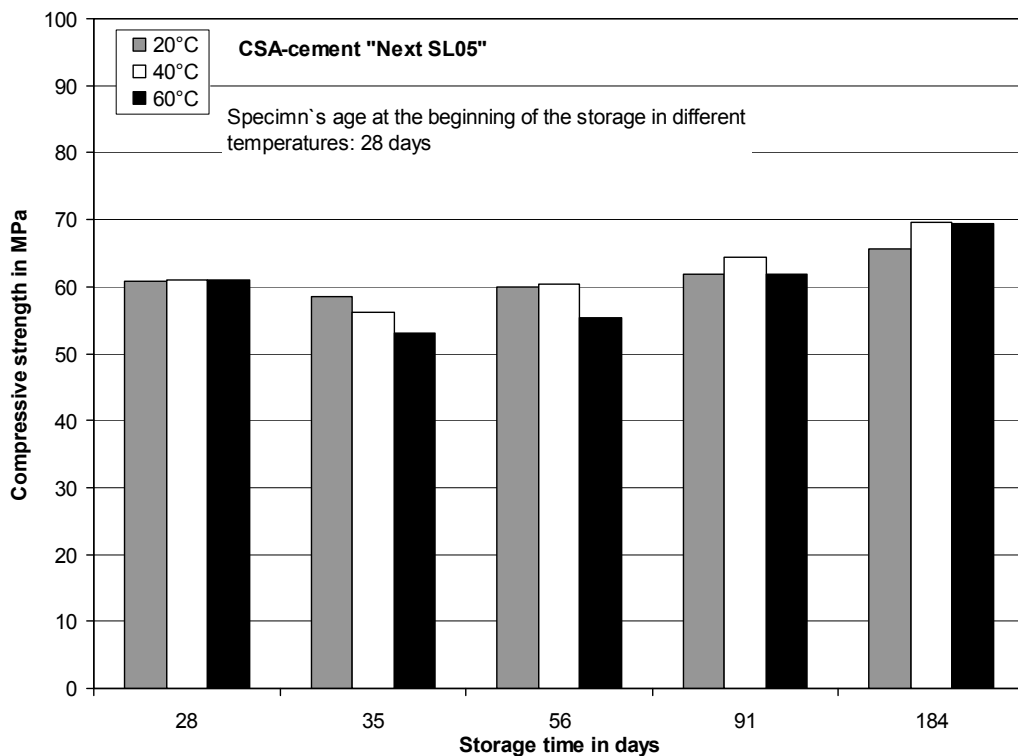
## 2.10 Fineness (Blaine)

The fineness of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined according to EN 196-6<sup>13</sup> and shall be declared. The declared value shall be at least 4370 cm<sup>2</sup>/g. The fineness shall not vary by more than  $\pm 500$  cm<sup>2</sup>/g from the declared value.

## 2.11 Effect of high temperature on mortar hardened under standard conditions

To evaluate the effect of high temperature on mortar with the rapid hardening calcium sulphoaluminate based cement "Next SL05" and with Portland cement CEM I according to EN 197-1<sup>7</sup> as reference is preliminary hardened in climate with  $(20 \pm 2)^\circ\text{C}$  and more then 95 % relative humidity (climate 20/95). At an age of 28 days the specimens are subjected to high temperatures (40 °C and 60 °C). The development of strength is compared to the strength of the samples stored at  $(20 \pm 2)^\circ\text{C}$  when tested at the same age.

The compressive strength of mortar with the rapid hardening calcium sulphoaluminate based cement "Next SL05" at 20 °C, 40 °C and 60 °C is shown in **figure 1**.



**Figure 1:** Compressive strength of mortar with rapid hardening calcium sulphoaluminate based cement "Next SL05" at 20°C, 40°C and 60°C

The compressive strength of mortar with CEM I 52,5 R acc. to EN 197-1<sup>7</sup> at 20 °C, 40 °C and 60 °C is shown in figure 2.

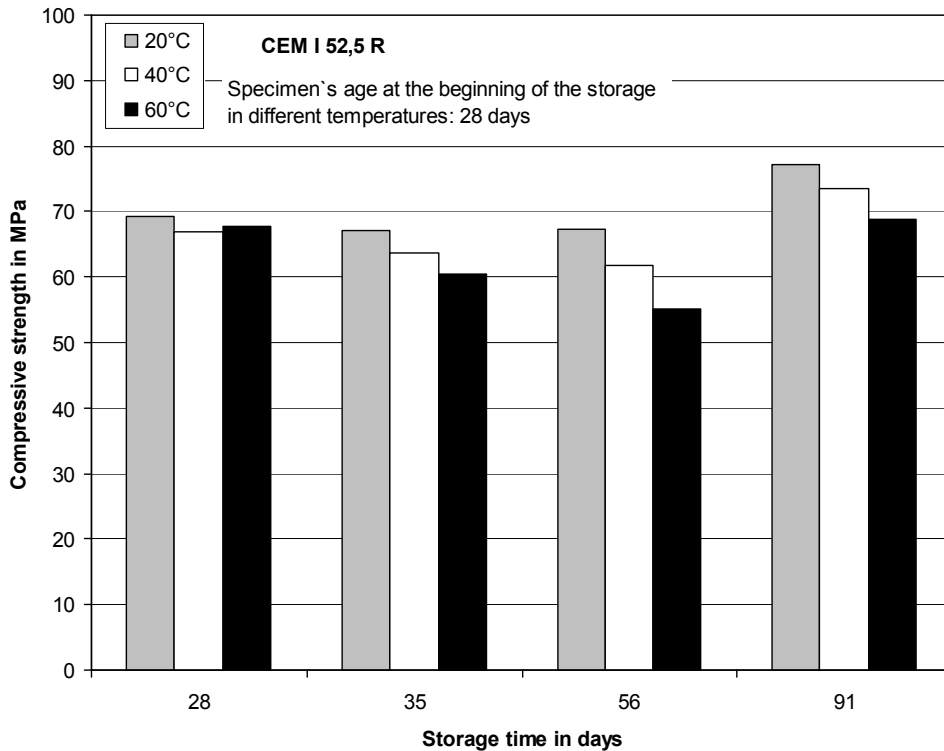


Figure 2: Compressive strength of mortar with CEM I 52,5 R at 20°C, 40°C and 60°C

## 2.12 Shrinkage

The shrinkage of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be determined according to ISO 1920-8 and shall be declared.

## 2.13 Resistance to chloride penetration

The resistance to chloride penetration of concrete with the rapid hardening calcium sulphoaluminate based cement "Next SL05" and with Portland cement CEM I according to EN 197-1 as reference was determined by the non-steady-state migration experiments – chloride migration coefficient  $D_{\text{mig}}$ . The tests were carried out on concrete with a cement content of 300 kg/m<sup>3</sup> and a w/c-ratio of 0,50.

The chloride migration coefficient  $D_{\text{mig}}$  of the rapid hardening calcium sulphoaluminate based cement "Next SL05" at an age of 97 days is less than  $25 \cdot 10^{-12}$  m<sup>2</sup>/s. Therefore the chloride migration coefficient ( $D_{\text{mig}}$ ) is assigned to category  $D_{\text{mig},25}$ .

## 2.14 Freeze-thaw resistance (without de-icing agent)

The freeze-thaw resistance (without de-icing agent) of concrete with the rapid hardening calcium sulphoaluminate based cement "Next SL05" was determined according to CEN/TS 12390-9<sup>14</sup> ("cube procedure"). The test was carried out on concrete with a cement content of 300 kg/m<sup>3</sup> and a w/c-ratio of 0,60. After 100 freeze-thaw cycles the scaling was less than 10 % by mass.

## 2.15 Freeze-thaw and de-icing salt resistance

The freeze-thaw and de-icing salt resistance of concrete with the rapid hardening calcium sulphoaluminate based cement "Next SL05" was determined according to CEN/TS 12390-9<sup>14</sup> ("CDF-Procedure"). The test was carried out on concrete with a cement content of 320 kg/m<sup>3</sup>, a w/c-ratio of 0,50 and with air entraining agent. After 28 freeze-thaw cycles the scaling was less than 1500 g/m<sup>2</sup>.

## 3 Evaluation and attestation of conformity and CE marking

### 3.1 System of attestation of conformity

According to the communication of the European Commission<sup>15</sup> system 1+ of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1+: Certification of the conformity of the product by an approved certification body on the basis of:

- (a) Tasks for the manufacturer:
  - (1) factory production control;
  - (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;
- (b) Tasks for the approved body:
  - (3) initial type-testing of the product;
  - (4) initial inspection of factory and of factory production control;
  - (5) continuous surveillance, assessment and approval of factory production control;
  - (6) audit-testing of samples taken at the factory.

Note: Approved bodies are also referred to as "notified bodies".

### 3.2 Responsibilities

#### 3.2.1 Tasks for the manufacturer

##### 3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.<sup>16</sup>

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

<sup>15</sup> Letter of the European Commission of 22/01/2009 to EOTA

<sup>16</sup> The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.





- Freeze-thaw and de-icing salt resistance  
CDF-procedure (FTS<sub>CDF</sub>) FTS<sub>CDF</sub>: pass

#### 4 Assumptions under which the fitness of the product for the intended use was favourably assessed

##### 4.1 Manufacturing

The rapid hardening calcium sulphoaluminate based cement "Next SL05" is manufactured from calcium sulphoaluminate clinker (CSA-clinker), calcium sulphate (CaSO<sub>4</sub>), Portland-limestone cement (CEM II/A-LL), minor additional constituents and citric acid to control setting in the plant of Buzzi Unicem SpA, Trino, Italy. Grinding is carried out separately with subsequent mixing. The sources of the constituents are deposited with Deutsches Institut für Bautechnik.

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

##### 4.2 Application

The rapid hardening calcium sulphoaluminate based cement "Next SL05" is intended to be used for preparation of concrete, mortar, grouts and other mixes for construction and for the manufacturing of construction products<sup>9</sup>.

Heat treatment must not be applied to concrete containing the rapid hardening calcium sulphoaluminate based cement "Next SL05".

#### 5 Indications to the manufacturer for packaging, transport and storage

In the production plant the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be stored in silos.

Packaging, transport, storage of the rapid hardening calcium sulphoaluminate based cement "Next SL05" shall be the same as for common cements according to EN 197-1<sup>7</sup>.

The manufacturer shall ensure that the requirements given in sections 1, 2 and 4 are made known to those involved. This can be implemented by, for example, handing over copies of the appropriate sections of the European technical approval.

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p.p. Head of Department

*beglaubigt:*  
Schröder