

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

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English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Blast furnace cement CEM III/A 52,5 N-SR "ENCI
Rotterdam"

Product family
to which the construction product belongs

Blast Furnace Cement CEM III/A with assessment of
sulfate resistance (SR) and optional with low effective
alkali content (LA) and/or low heat of hydration (LH)

Manufacturer

ENCI B.V.
Directie
Humberweg 9
3197 KE BOTLEK-ROTTERDAM
NIEDERLANDE

Manufacturing plant

ENCI BV
Rotterdam
Humberweg 9
NL-3197 KE Botlek-Rotterdam
Netherland

This European Technical Assessment
contains

9 pages including 5 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 150009-00-0301

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Specific part

1 Technical description of the product

The blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" is a cement which fulfils all requirements given in EN 197-1¹ for a common cement of strength class 52,5 N.

Furthermore the blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" has a high resistance against sulfate attack on concrete.

The assessment for the verification of the essential characteristic "sulfate resistance" (SR) was done on a blast furnace cement CEM III/A with a blast furnace content of 52 % by mass. The blast furnace slag has a glass content of at least 90 % and a (CaO + MgO)/SiO₂-ratio of at least 1,2.

The blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" is manufactured from a Portland cement clinker, a blast furnace slag and an addition of gypsum or anhydrite or any mixture of them to control setting. The specific surface (Blaine) of the cement shall be at least 550 m²/kg by combined grinding of the raw materials. It is also possible to manufacture the blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" by separately grinding and subsequent mixing of the raw materials with a specific surface (Blaine) of at least 550 m²/kg.

The cement does not contain minor additional constituents.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" is intended to be used for preparation of concrete, mortar, grouts and other mixes for construction and for the manufacturing of construction products.

Especially the blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" is characterized by an evidently high resistance against sulfate attack on concrete.

The verifications and assessment methods on which the European Technical Assessment is based lead to the assumption of a working life of the of concrete incorporating the blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam" of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
(CaO + MgO)/SiO ₂ -ratio of the blast furnace slag	B = 1,4
Glass content of the blast furnace slag	GC = 99 %
Specific surface of the cement (Blaine)	ρ = 550 m ² /kg
Sulfate resistance	see Annex A (A1 to A4)
Characteristics for a common cement (CEM III/A)	
Early strength (2 days)	Class N (≥ 20,0 N/mm ²)

¹ EN 197-1

Cement - Part 1: Composition, specification and conformity criteria for common cement

Essential characteristic	Performance
Standard strength (28 days)	Class 52,5 ($\geq 52,5 \text{ N/mm}^2$)
Initial setting time	Passed (140 min)
Soundness	Passed (1 mm)
Loss on ignition	Passed (0,97 % by mass)
Insoluble residue	Passed (0,25 % by mass)
Sulfate content (as SO_3)	Passed (3,1 % by mass)
Chloride content	Passed (0,05 % by mass)
Composition of the cement: Clinker (K): Blast furnace slag (S):	K = 48 % by mass (35 – 48 % by mass) S = 52 % by mass (52 – 65 % by mass)

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to Decision 97/555/EC² of the European Commission amended by the Commission Decision 2010/683/EU³, the assessment and verification of constancy of performance system (AVCP system) (see Annex V to Regulation (EU) 305/2011 as amended by the Commission Delegated Regulation (EU) No 568/2014) given in table1 applies.

Table 1: AVCP system

Product	Intended use(s)	Level(s) or Classe(s) of performance	AVCP system
Blast furnace cement CEM III/A with assessment of sulfate resistance (SR) and optional with low effective alkali content (LA) and/or low heat of hydration (LH)	Preparation of concrete, mortar, grouts and other mixes for construction and for the manufacture of construction products	-----	1+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 11 October 2017 by Deutsches Institut für Bautechnik

Dr.-Ing. Lars Eckfeldt
p. p. Head of Department

beglaubigt:
Schröder

² Official Journal of the European Communities L 229 of 20 August 1997
³ Official Journal of the European Communities L 293 of 11 November 2010

Testing of Sulfate Resistance of Blast-furnace cement CEM III/A – Flat prism method S_{FPM}

The testing procedure was done according to EAD 150009-00-0301, Annex B.

Table 1: Expansion of length of mortar flat prisms

	Expansion of the length [mm/m] after				
	14 days	28 days	56 days	90 days	180 days
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 20 °C					
Na ₂ SO ₄ -solution	0,11	0,11	0,18	0,20	0,33
Ca(OH) ₂ -solution	0,06	0,06	0,06	0,06	0,12
ΔL	0,05	0,05	0,12	0,14	0,21
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 5 °C					
Na ₂ SO ₄ -solution	0,05	0,08	0,12	0,10	-
Ca(OH) ₂ -solution	-0,01	-0,02	-0,03	-0,12	-
ΔL	0,06	0,10	0,15	0,22	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C					
Na ₂ SO ₄ -solution	0,12	0,14	0,18	0,23	0,27
Ca(OH) ₂ -solution	0,07	0,08	0,08	0,12	0,11
ΔL	0,05	0,06	0,10	0,11	0,16
CEM III/B 42,5 N-LH/SR – storage at 5 °C					
Na ₂ SO ₄ -solution	0,00	0,00	0,02	0,13	-
Ca(OH) ₂ -solution	-0,04	-0,04	-0,04	0,05	-
ΔL	0,04	0,04	0,06	0,08	-
CEM I 42,5 R-SR3 – storage at 20 °C					
Na ₂ SO ₄ -solution	0,15	0,18	0,26	0,46	0,90
Ca(OH) ₂ -solution	0,09	0,09	0,12	0,11	0,09
ΔL	0,06	0,09	0,14	0,35	0,81
CEM I 42,5 R-SR3 – storage at 5 °C					
Na ₂ SO ₄ -solution	-0,09	0,02	0,06	0,36	-
Ca(OH) ₂ -solution	-0,13	-0,11	-0,06	-0,02	-
ΔL	0,04	0,09	0,12	0,38	-

Blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Expansion of the length

Annex A1

Testing of Sulfate Resistance of Blast-furnace cement CEM III/A – Flat prism method S_{FPM}

The testing procedure was done according to EAD 150009-00-0301, Annex B.

Table 2: Dynamic modulus of elasticity of mortar flat prisms

	Dynamic modulus of elasticity in kN/mm ² after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 20 °C						
Ca(OH) ₂ -solution	31,1	34,2	35,7	37,4	38,3	39,5
Na ₂ SO ₄ -solution	31,7	36,5	38,0	37,5	35,6	34,2
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 5 °C						
Ca(OH) ₂ -solution	32,1	32,9	34,0	35,1	36,2	-
Na ₂ SO ₄ -solution	31,7	34,2	36,1	36,1	35,7	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	28,6	30,9	32,6	34,8	36,5	38,1
Na ₂ SO ₄ -solution	28,5	33,1	33,5	34,8	35,0	32,8
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	29,0	29,7	30,0	30,7	31,6	-
Na ₂ SO ₄ -solution	28,5	30,89	31,6	32,6	32,6	-
CEM I 42,5 R-SR3 – storage at 20 °C						
Ca(OH) ₂ -solution	35,8	36,4	36,9	37,9	38,6	38,9
Na ₂ SO ₄ -solution	35,3	37,4	38,3	39,1	39,6	39,9
CEM I 42,5 R-SR3 – storage at 5 °C						
Ca(OH) ₂ -solution	35,3	36,2	36,4	36,9	37,5	-
Na ₂ SO ₄ -solution	36,2	37,8	38,3	38,7	38,6	-

Blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Dynamic modulus of elasticity

Annex A2

Testing of Sulfate Resistance of Blast-furnace cement CEM III/A – Flat prism method S_{FPM}

The testing procedure was done according to EAD 150009-00-0301, Annex B.

Table 3: Mass of mortar flat prisms

	Mass in g after					
	0 days	14 days	28 days	56 days	90 days	180 days
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 20 °C						
Ca(OH) ₂ -solution	146,0	146,3	146,5	146,7	146,8	147,1
Na ₂ SO ₄ -solution	146,5	146,4	146,5	147,3	148,0	149,1
CEM III/A 52,5 N-SR "ENCI Rotterdam" – storage at 5 °C						
Ca(OH) ₂ -solution	147,9	148,4	149,2	149,0	149,0	-
Na ₂ SO ₄ -solution	147,4	147,6	147,9	148,3	149,0	-
CEM III/B 42,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	144,9	145,4	145,4	145,6	145,8	146,0
Na ₂ SO ₄ -solution	145,00	145,5	145,8	145,8	146,3	147,3
CEM III/B 42,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	145,8	146,3	146,3	146,9	146,4	-
Na ₂ SO ₄ -solution	146,0	146,4	146,4	146,5	146,7	-
CEM I 42,5 R-SR3 – storage at 5 °C						
Ca(OH) ₂ -solution	147,7	148,2	148,3	148,6	148,7	148,6
Na ₂ SO ₄ -solution	147,1	147,4	147,7	147,9	148,5	149,0
CEM I 42,5 R-SR3 – storage at 5 °C						
Ca(OH) ₂ -solution	147,6	148,2	148,3	148,6	149,1	-
Na ₂ SO ₄ -solution	146,8	147,5	147,5	147,8	148,0	-

Blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Results of the assessment "sulfate resistance (Flat prism method) – S_{FPM} "
Mass of the mortar flat prisms

Annex A3

English translation prepared by DIBt

Testing of Sulfate Resistance of Blast-furnace cement CEM III/A – Flat prism method S_{FPM}

The testing procedure was done according to EAD 150009-00-0301, Annex B.

After a testing period of 180 days the specimens show no expansion damages, cracks or flaking based on formation of thaumasite, see figures A1 to A4.

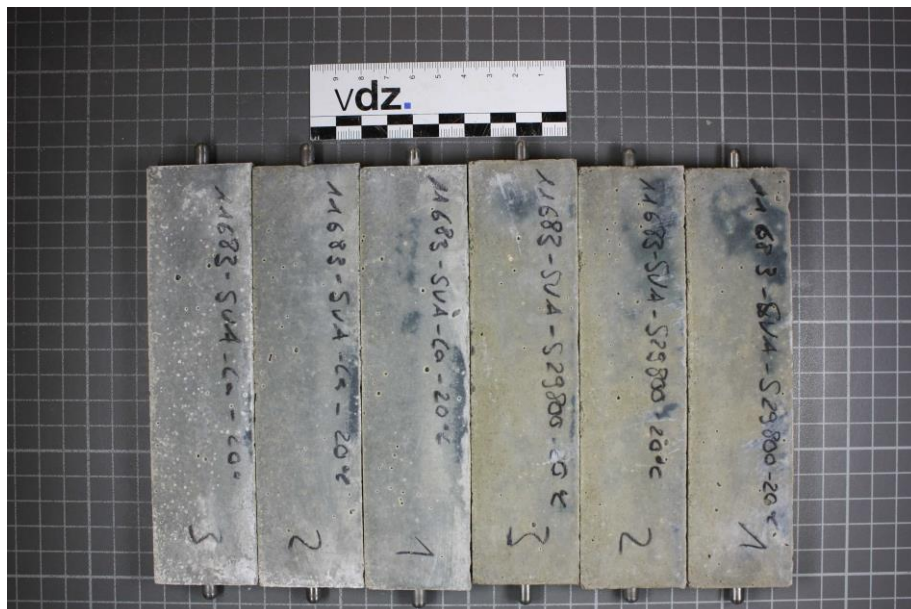


Figure A1: Specimens with CEM III/A 52,5 N-SR "ENCI Rotterdam" after 180 days; Storage: 20 °C in $\text{Ca}(\text{OH})_2$ -Solution (3 left-hand side specimens) and in Na_2O_4 -Solution (3 right-hand side specimens)

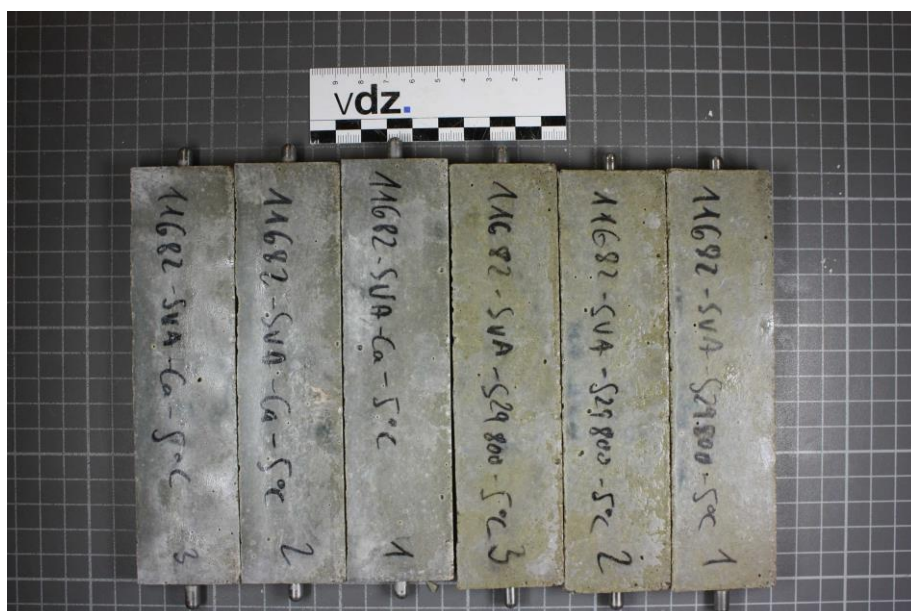


Figure A2: Specimens with CEM III/A 52,5 N-SR "ENCI Rotterdam" after 180 days; Storage: 5 °C in $\text{Ca}(\text{OH})_2$ -Solution (3 left-hand side specimens) and in Na_2O_4 -Solution (3 right-hand side specimens)

Blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Results of the assessment "sulfate resistance (flat prism method) – S_{FPM} "
Visual examination of the flat prisms with blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Annex A4
Page 1 of 2



Figure A3: Specimens with CEM III/B 42,5 N-LH/SR after 180 days;
Storage: in Na_2O_4 -Solution at 5 °C (3 left-hand side specimens) and at 20 °C (3 right-hand side specimens)



Figure A4: Specimens with CEM I 42,5 R-SR3 after 180 days;
Storage: in Na_2O_4 -Solution at 5 °C (3 left-hand side specimens) and at 20 °C (3 right-hand side specimens)

Blast furnace cement CEM III/A 52,5 N-SR "ENCI Rotterdam"

Results of the assessment "sulfate resistance (flat prism method) – S_{FPM} "
Visual examination of the flat prisms with CEM III/B 42,5 N-LH/SR and with CEM I 42,5 -SR3

Annex A4
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