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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/LA "Neuwied"

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

Dyckerhoff GmbH
Rheinstraße 159
56564 Neuwied
DEUTSCHLAND

Manufacturing plant

Dyckerhoff GmbH
Werk Neuwied
Rheinstraße 159
56564 Neuwied
DEUTSCHLAND

This European Technical Assessment
contains

8 pages including 1 annex with 4 pages, which forms 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/LA "Neuwied" 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/LA "Neuwied" has a high resistance against sulfate attack on concrete (SR) and a low effective alkali content (LA).

The assessment for the verification of the essential characteristic "sulfate resistance" (SR) and "low effective alkali content" (LA) was done on a blast furnace cement CEM III/A with a blast furnace slag content of 49 % by mass and a specific surface of the cement of 530 m²/kg.

The low effective alkali content (LA) can be verified by the Na₂O-equivalent (Na₂O_{eq}) and the blast furnace slag content of the blast furnace cement CEM III/A:

- Blast furnace slag content between 45 to 49 % by mass and Na₂O_{eq} ≤ 0,95 % by mass or
- Blast furnace slag content of ≥ 50 % by mass and Na₂O_{eq} ≤ 1,10 % by mass

The blast furnace cement CEM III/A 52,5 N-SR/LA "Neuwied" is manufactured from Portland cement CEM I 52,5 R^{2, 3} and blast furnace slag³ under addition of gypsum or anhydrite or any mixture of them to control setting by separately grinding of the raw materials and subsequent mixing in the plant Neuwied.

During the production of the blast furnace cement CEM III/A 52,5 N-SR/NA "Neuwied" no minor additional constituents shall be added.

The cement composition shall be in the following range:

Portland cement clinker:	35 to 51 % by mass
Blast furnace slag:	49 to 65 % by mass

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/LA "Neuwied" 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/LA "Neuwied" is characterized by an evidently high resistance against sulfate attack on concrete and can be used to avoid a damaging alkali-silica reaction in concrete.

The verification and assessment methods on which the European Technical Assessment is based lead to the assumption of a working life of concrete incorporating the blast furnace cement CEM III/A 52,5 N-SR/LA "Neuwied" 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.

¹ EN 197-1 Cement - Part 1: Composition, specification and conformity criteria for common cement
² The Portland cement CEM I 52,5 R contains minor constituents.
³ The manufacturing plant of the Portland cement CEM I 52,5 R and of the granulated blast furnace slag is deposited.

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 = 1,2
Glass content of the blast furnace slag	GC > 98 %
Specific surface of the cement (Blaine)	$\rho = 530 \text{ m}^2/\text{kg}$
Sulfate resistance	see Annex A (A1 to A4)
Characteristics for a common cement (CEM III/A)	
Early strength (2 days)	Class N ($\geq 20,0 \text{ N/mm}^2$)
Standard strength (28 days)	Class 52,5 ($\geq 52,5 \text{ N/mm}^2$)
Initial setting time	Passed (220 min)
Soundness	Passed (0 mm)
Loss on ignition	Passed (1,46 % by mass)
Insoluble residue	Passed (1,05 % by mass)
Sulfate content (as SO ₃)	Passed (1,30 % by mass)
Chloride content	Passed (0,03 % by mass)
<u>Composition of the cement :</u>	
Clinker (K):	K = 51 % by mass
Blast furnace slag (S):	S = 49 % by mass
Alkali-Content of the cement (Na ₂ O _{eq})	0,57 % by mass

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

In accordance with EAD No. 150009-00-0301, the applicable European legal act is: 97/555/EC⁴ amended by the Commission Decision 2010/683/EU⁵.

The system to be applied is: 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 15 April 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Schröder

⁴ Official Journal of the European Communities L 229 of 20 August 1997

⁵ Official Journal of the European Communities L 293 of 11 November 2010

ANNEX A: Assessment

Sulfate resistance – Flat prism method

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

The elongation of the flat prisms was calculated as mean value from 3 specimens. The difference in elongation between the sulfate storage and the reference storage are given as expansion of the length. The expansion of the length for the different mortars and storages are given in Table A1.

Table A1: Expansion of length of the 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/LA "Neuwied" – storage at 20 °C					
Ca(OH) ₂ -solution	-0,04	0,04	0,08	0,13	0,15
Na ₂ SO ₄ -solution	-0,04	0,07	0,14	0,23	0,31
ΔL	0,00	0,03	0,06	0,10	0,16
CEM III/A 52,5 N-SR/LA "Neuwied" – storage at 5 °C					
Ca(OH) ₂ -solution	-0,29	-0,22	-0,17	-0,12	-
Na ₂ SO ₄ -solution	-0,26	-0,20	-0,13	-0,06	-
ΔL	0,03	0,02	0,04	0,06	-
CEM III/B 32,5 N-LH/SR – storage at 20 °C					
Ca(OH) ₂ -solution	-0,03	0,05	0,09	0,12	0,12
Na ₂ SO ₄ -solution	-0,02	0,08	0,15	0,23	0,32
ΔL	0,01	0,03	0,06	0,11	0,20
CEM III/B 32,5 N-LH/SR – storage at 5 °C					
Ca(OH) ₂ -solution	-0,16	-0,13	-0,10	-0,08	-
Na ₂ SO ₄ -solution	-0,22	-0,15	-0,04	0,02	-
ΔL	-0,06	-0,02	0,06	0,10	-
CEM I 42,5 R-SR3 – storage at 20 °C					
Ca(OH) ₂ -solution	-0,03	0,02	0,05	0,10	0,10
Na ₂ SO ₄ -solution	-0,02	0,12	0,35	0,86	3,86
ΔL	0,01	0,10	0,30	0,76	3,76
CEM I 42,5 R-SR3 – storage at 5 °C					
Ca(OH) ₂ -solution	-0,25	-0,18	-0,15	-0,13	-
Na ₂ SO ₄ -solution	-0,19	-0,10	0,03	0,19	-
ΔL	0,06	0,08	0,18	0,32	-

Table A2: Dynamic modulus of elasticity of the 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/LA "Neuwied" – storage at 20 °C						
Ca(OH) ₂ -solution	36,97	38,64	39,19	39,59	39,99	39,86
Na ₂ SO ₄ -solution	36,69	37,15	38,50	39,00	39,17	38,15
CEM III/A 52,5 N-SR/LA "Neuwied" – storage at 5 °C						
Ca(OH) ₂ -solution	37,51	38,08	39,04	39,45	39,87	-
Na ₂ SO ₄ -solution	37,52	38,31	39,27	39,36	39,46	-
CEM III/B 32,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	28,41	33,49	35,53	37,00	38,55	39,16
Na ₂ SO ₄ -solution	28,88	33,87	37,30	38,00	38,63	36,43
CEM III/B 32,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	28,56	28,95	29,89	31,00	32,52	-
Na ₂ SO ₄ -solution	28,97	31,61	33,63	35,00	37,49	-
CEM I 42,5 R-SR3 – storage at 20 °C						
Ca(OH) ₂ -solution	35,97	36,86	37,41	37,55	37,72	35,68
Na ₂ SO ₄ -solution	36,54	35,53	37,50	37,10	36,63	31,82
CEM I 42,5 R-SR3 – storage at 5 °C						
Ca(OH) ₂ -solution	35,65	35,62	36,43	36,60	36,87	-
Na ₂ SO ₄ -solution	36,19	36,21	37,04	37,70	36,29	-

Table A3: 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/LA "Neuwied" – storage at 20 °C						
Ca(OH) ₂ -solution	145,70	146,15	146,06	146,25	146,43	146,59
Na ₂ SO ₄ -solution	145,10	145,59	145,67	146,10	146,43	148,13
CEM III/A 52,5 N-SR/LA "Neuwied" – storage at 5 °C						
Ca(OH) ₂ -solution	145,80	145,90	146,21	146,28	146,37	-
Na ₂ SO ₄ -solution	146,30	146,58	146,80	147,22	147,60	-
CEM III/B 32,5 N-LH/SR – storage at 20 °C						
Ca(OH) ₂ -solution	146,20	146,23	146,24	146,35	146,54	146,81
Na ₂ SO ₄ -solution	147,10	147,45	147,54	147,85	148,41	148,62
CEM III/B 32,5 N-LH/SR – storage at 5 °C						
Ca(OH) ₂ -solution	147,20	147,55	147,70	147,69	147,77	-
Na ₂ SO ₄ -solution	147,00	147,44	147,68	147,54	147,46	-
CEM I 42,5 R-SR3 – storage at 20 °C						
Ca(OH) ₂ -solution	145,50	145,94	145,99	146,10	146,17	146,98
Na ₂ SO ₄ -solution	145,50	145,72	145,73	146,18	146,84	148,21
CEM I 42,5 R-SR3 – storage at 5 °C						
Ca(OH) ₂ -solution	145,80	146,28	146,59	146,50	146,70	-
Na ₂ SO ₄ -solution	145,60	145,88	146,05	146,91	147,78	-

Visual description of the specimens after sulphate storage

After a testing period of 180 days respectively 90 days the specimens show no expansion damages, cracks or flaking based on formation of thaumasite, see figures A1 and A2.



Figure A1: Specimens after 180 days storage in Na_2O_4 -solution at 20 °C
Top: CEM I; Middle: CEM III/A 52,5 N-SR/LA "Neuwied"; Bottom: CEM III/B



Figure A2: Specimens after 90 days storage in Na_2O_4 -solution at 5 °C
Top: CEM I; Middle: CEM III/A 52,5 N-SR/LA "Neuwied"; Bottom: CEM III/B