

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-17/0489
of 7 December 2017

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

Centrilit NC II - Powder

Product family
to which the construction product belongs

Calcined Layer Silicate Based Type II Addition

Manufacturer

MC Bauchemie
Müller GmbH & Co. KG
Am Kruppwald
46238 Bottrop
DEUTSCHLAND

Manufacturing plant

102

This European Technical Assessment
contains

9 pages including 1 annex 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 260014-00-0301

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific part

1 Technical description of the product

The calcined layer silicate based type II addition "Centrilit NC II - Powder" is a finely divided powder. The calcined layer silicate is produced of layer silicate by a specific thermal and mechanical process. It consists essentially of SiO_2 and Al_2O_3 . The content of reactive SiO_2 , as defined and described in EN 197-1¹, amounts to at least 25 % by mass acc. to EN 450-1².

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

The calcined layer silicate "Centrilit NC II - Powder" is a type II addition (pozzolanic) for production of concrete, including in particular cast-in-situ or prefabricated structural concrete conforming to European standard EN 206³.

It is also intended to use calcined layer silicate "Centrilit NC II - Powder" in mortars and grouts.

From EN 206 all strength classes and consistency classes apply. All exposure classes are included. Calcined layer silicate "Centrilit NC II - Powder" is intended to be used in combination with Portland cement (CEM I) or Portland-composite cement (CEM II/A-S, CEM II/B-S, CEM II/A-LL) or blast-furnace cement (CEM III/A).

The recommended maximum dosage of calcined layer silicate "Centrilit NC II - Powder" is 11 % by cement mass.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of concrete incorporating the calcined layer silicate "Centrilit NC II - Powder" 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 cements
2	EN 450-1	Fly ash for concrete — Part 1: Definition, specifications and conformity criteria
3	EN 206	Concrete — Specification, performance, production and conformity

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

Table 1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Sulfate content (SO ₃)	0,03 - 0,07 % by mass
Silicon dioxide content (SiO ₂)	52 - 62 % by mass
Aluminium oxide content (Al ₂ O ₃)	32 – 41 % by mass
Chloride content (Cl ⁻)	≤ 0,02 % by mass
Loss on ignition	0,9 – 1,4 % by mass
Total content of alkalis	0,40 – 1,20 % by mass
Content of soluble alkalis	≤ 0,003 % by mass
Sieve residue on 200 µm sieve	≤ 0,01 % by mass
Specific surface	16,5 – 19,5 m ² /g
Fineness	9 – 18 % by mass
Initial setting time	Control Mix: 155 min Test Mix: ≤ 190 min
Soundness	≤ 0,6 mm
Relative compressive strength (of mortar) at 28 days	See Annex A, Table 2
Analysis of the pore-solution	See Annex A, Table 3
Content of Ca(OH) ₂	See Annex A, Table 4
Compressive strength of concrete	See Annex A, Table 5
Carbonation of concrete	See Annex A, Table 6
Freeze-thaw resistance	See Annex A, Table 7
Resistance against chloride penetration	See Annex A, Table 8
Shrinkage	See Annex A, Table 9

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

In accordance with EAD No. 260014-00-0301, the applicable European legal act is: 1999/469/EC(EU).

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 7 December 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Bahlmann

Table 2: Relative compressive strength at 28 days

Cement	Calcined layer silicate-sample				
	M1	M2	M3	M4	M5
CEM I 42,5 R	103 %	110 %	92 %	103 %	101 %
CEM I 42,5 R	125 %	122 %	139 %	132 %	125 %
CEM I 42,5 N-NA	112 %	102 %	104 %	107 %	108 %
CEM II/B-S 32,5 R	98 %	95 %	94 %	93 %	89 %
CEM III/A 32,5 N	87 %	89 %	82 %	93 %	97 %

Table 3a: Analysis of the pore-solution (with calcined layer silicate sample M3)

Testing age	days	Cement paste											
		I		II		I		II		I		II	
		7		28		90		180		365			
Na ⁺	mmol/l	73,9	40,7	71,3	38,9	82,5	41,5	83,3	46,4	75,5	41,2		
K ⁺		191	112	190	114	177	103	187	104	184	107		
Ca ⁺		3,46	1,81	2,55	1,14	2,56	1,38	2,86	1,65	2,15	1,44		
pH value	-	13,5	13,2	13,4	13,1	13,1	12,9	13,7	13,1	13,2	13,1		
Ks _{8,2}	mmol/l	255	123	244	135	251	125	277	135	243	137		
Ks _{4,3}		272	161	262	146	266	145	277	149	265	149		

Cement paste I = without addition
Cement paste II = with calcined layer silicate sample M3

Table 3b: Analysis of the pore-solution (with calcined layer silicate sample M5)

Testing age	days	Cement paste											
		I		II		I		II		I		II	
		7		28		90		180		365			
Na ⁺	mmol/l	73,9	38,6	71,3	38,8	82,5	42,6	83,3	41,0	75,5	42,4		
K ⁺		191	114	190	101	177	106	187	104	184	108		
Ca ⁺		3,46	1,25	2,55	1,26	2,56	1,41	2,86	1,32	2,15	1,60		
pH value	-	13,5	13,3	13,4	13,4	13,1	13,0	13,7	13,1	13,2	13,1		
Ks _{8,2}	mmol/l	255	143	244	140	251	143	277	137	243	141		
Ks _{4,3}		272	165	262	151	266	150	277	148	265	154		

Cement paste I = without addition
Cement paste II = with calcined layer silicate sample M5

Centrlit NC II - Powder

Results of performance assessment

Annex A
Page 1 of 5

Table 4a: Ca(OH)₂-content of cement paste without addition and with calcined layer silicate sample M3 after 7, 28 and 90 days

Sample	Testing age	Mean value
	days	% by mass
Cement paste I (without addition)	7	8,4
Cement paste II (with addition M3)		4,9
Cement paste I (without addition)	28	8,4
Cement paste II (with addition M3)		4,9
Cement paste I (without addition)	90	9,1
Cement paste II (with addition M3)		4,9

Table 4b: Ca(OH)₂-content of cement paste without addition and with calcined layer silicate sample M5 after 7, 28 and 90 days

Sample	Testing age	Mean value
	days	% by mass
Cement paste I (without addition)	7	8,4
Cement paste II (with addition M5)		5,6
Cement paste I (without addition)	28	8,4
Cement paste II (with addition M5)		4,7
Cement paste I (without addition)	90	9,1
Cement paste II (with addition M5)		4,5

Centrlit NC II - Powder

Results of performance assessment

Annex A
Page 2 of 5

Table 5: Fresh concrete properties and compressive strength

Property	Unit	Concrete Ia (without addition)	Concrete Ib (with calcined layer silicate sample M3)	Concrete Ib (with calcined layer silicate sample M5)
Slump	mm	385	390	395
Air content	%	1,1	1,2	1,1
7 d compressive strength	N/mm ²	50,1	54,0	52,9
28 d compressive strength		59,9	66,9	67,0
90 d compressive strength		65,0	70,4	69,4

Table 6a: Carbonation depth, compressive strength and carbonation speed of concrete IIa without addition and concrete IIb with calcined layer silicate sample M3

	Carbonation depth			
	Concrete IIa	Concrete IIb	Concrete IIa	Concrete IIb
Storage	water storage 7 days		water storage 28 days	
14 days	0,5	0,9	0,5	0,5
28 days	1,3	1,5	0,6	0,8
56 days	1,8	1,8	1,3	1,5
98 days	2,7	3,1	1,9	2,3
140 days	3,0	3,5	2,3	3,0
1 a	5,0	5,9	3,7	5,1
2 a	8,2	7,8	5,6	6,9
Compressive strength [N/mm ²]				
after storage in water	28,4	32,0	42,8	45,8
v_c [mm·d ^{-0,5}]	0,3064	0,3284	0,2375	0,3140

Table 6b: Carbonation depth, compressive strength and carbonation speed of concrete IIa without addition and concrete IIb with calcined layer silicate sample M5

	Carbonation depth			
	Concrete IIa	Concrete IIb	Concrete IIa	Concrete IIb
Storage	water storage 7 days		water storage 28 days	
14 days	0,5	0,8	0,5	0,5
28 days	1,3	1,4	0,6	0,9
56 days	1,8	1,7	1,3	1,5
98 days	2,7	2,9	1,9	2,3
140 days	3,0	3,6	2,3	2,8
1 a	5,0	5,1	3,7	5,0
2 a	8,2	8,1	5,6	6,8
Compressive strength [N/mm ²]				
after storage in water	28,4	31,1	42,8	46,3
v_c [mm·d ^{-0,5}]	0,3064	0,3425	0,2375	0,2893

Centrlit NC II - Powder

Results of performance assessment

Annex A
Page 3 of 5

English translation prepared by DIBt

Table 7a: Scaling

Scaling after freeze thaw cycles	Concrete without addition	Concrete with calcined layer silicate sample M3	Concrete with calcined layer silicate sample M5
	[g/m ²]		
4	20,9	14,5	-
6	-	-	40,7
8	35,6	28,5	-
12	-	-	72,3
14	51,3	45,9	-
16	-	-	89,4
18	66,2	58,6	-
20	-	-	103,2
22	94,0	75,2	-
28	164,4	97,9	130,9

Table 7b: Relative dynamic modulus of elasticity (RDM)

Freeze thaw cycles	Concrete without addition	Concrete with calcined layer silicate sample M3	Concrete with calcined layer silicate sample M5
0	100	100	100
4	92,9	94,6	-
6	-	-	96,6
8	92,3	95,8	-
12	-	-	95,2
14	72,1	95,1	-
16	-	-	95,8
18	65,1	94,2	-
20	-	-	96,0
22	54,9	96,1	-
28	44,3	95,3	96,4

Centrilit NC II - Powder

Results of performance assessment

Annex A
Page 4 of 5

Table 8: Chloride migration coefficients after 35 and 97 days

	Chloride migration coefficient after							
	35 days				97 days			
	single value		mean value	single value		mean value		
	10 ⁻¹² m ² /s							
Concrete without addition	23,8	23,2	23,4	23,5	51,6	54,9	51,9	52,8
Concrete with addition M3	8,3	7,8	7,1	7,7	6,9	6,3	6,3	6,5
Concrete with addition M5	7,3	6,8	7,5	7,2	6,5	6,3	6,5	6,4

Table 9: Shrinkage

Storage duration	Concrete without addition	Concrete with calcined layer silicate sample M3	Concrete with calcined layer silicate sample M5
days	mm/m		
1	-0,001	-0,010	-0,001
2	-0,009	-0,019	-0,007
3	-0,007	-0,018	-0,002
7	-0,028	-0,033	-0,027
14	-0,057	-0,065	-0,073
28	-0,097	-0,099	-0,103
56	-0,189	-0,170	-0,170
90	-0,280	-0,234	-0,225
180	-0,357	-0,286	-0,284
270	-0,412	-0,340	-0,328
360	-0,470	-0,396	-0,365

Centrlit NC II - Powder

Results for performance assessment

Annex A
Page 5 of 5