

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-17/0812  
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 - Suspension

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

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This European Technical Assessment  
contains

10 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

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## Specific part

### 1 Technical description of the product

The calcined layer silicate based type II addition "Centrilit NC II - Suspension" is produced by using the layer silicate "Centrilit NC II - Powder" according to ETA-17/0489. The slurry is a pH-regulated liquid suspension of the powder in water, typically with a dry solids content of 51 % by mass.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD 260014-00-0301)

The calcined layer silicate slurry "Centrilit NC II - Suspension" 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 206<sup>1</sup>.

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

From EN 206 all strength classes and consistency classes apply. All exposure classes are included. Calcined layer silicate slurry "Centrilit NC II - Suspension" 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 slurry "Centrilit NC II - Suspension" is 22 % 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 slurry "Centrilit NC II - Suspension" 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.

<sup>1</sup> 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 <sub>3</sub> )*	0,03 - 0,07 % by mass
Silicon dioxide content (SiO <sub>2</sub> )*	52 - 62 % by mass
Aluminium oxide content (Al <sub>2</sub> O <sub>3</sub> )*	32 – 41 % by mass
Chloride content (Cl)*	≤ 0,02 % by mass
Loss on ignition*	0,91 – 1,36 % 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 <sup>2</sup> /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
pH value of the slurry	6,0
Density of the slurry	1,47 g/cm <sup>3</sup>
Dry mass content of the slurry	51 % by mass
Stability of the slurry	No sedimentation
Analysis of the pore-solution	See Annex A, Table 3
Content of Ca(OH) <sub>2</sub>	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

\*The parameters apply to the substance dried at 105°C.

### 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+

English translation prepared by DIBt

**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	
		7		28		90		180		365	
Na <sup>+</sup>	mmol/l	73,9	40,7	71,3	38,9	82,5	41,5	83,3	46,4	75,5	41,2
K <sup>+</sup>		191	112	190	114	177	103	187	104	184	107
Ca <sup>+</sup>		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 <sub>8,2</sub>	mmol/l	255	123	244	135	251	125	277	135	243	137
Ks <sub>4,3</sub>		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	
		7		28		90		180		365	
Na <sup>+</sup>	mmol/l	73,9	38,6	71,3	38,8	82,5	42,6	83,3	41,0	75,5	42,4
K <sup>+</sup>		191	114	190	101	177	106	187	104	184	108
Ca <sup>+</sup>		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 <sub>8,2</sub>	mmol/l	255	143	244	140	251	143	277	137	243	141
Ks <sub>4,3</sub>		272	165	262	151	266	150	277	148	265	154
Cement paste I = without addition											
Cement paste II = with calcined layer silicate sample M5											

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**Table 4a:**  $\text{Ca(OH)}_2$ -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:**  $\text{Ca(OH)}_2$ -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

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**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 <sup>2</sup>	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 Ia without addition and concrete Ib with calcined layer silicate sample M3

	Carbonation depth			
	Concrete Ia	Concrete Ib	Concrete Ia	Concrete Ib
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 <sup>2</sup> ]				
after storage in water	28,4	32,0	42,8	45,8
$v_c$ [mm·d <sup>-0,5</sup> ]	0,3064	0,3284	0,2375	0,3140

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

	Carbonation depth			
	Concrete Ia	Concrete Ib	Concrete Ia	Concrete Ib
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 <sup>2</sup> ]				
after storage in water	28,4	31,1	42,8	46,3
$v_c$ [mm·d <sup>-0,5</sup> ]	0,3064	0,3425	0,2375	0,2893

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**Table 7a:** Scaling of concrete without addition and concrete with calcined layer silicate

Scaling after .... freeze thaw cycles	Concrete without addition	Concrete with calcined layer silicate sample M3	Concrete with calcined layer silicate sample M5
	[g/m <sup>2</sup> ]		
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

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**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		
	$10^{-12} \text{ m}^2/\text{s}$							
Concrete IVa without addition	23,8	23,2	23,4	23,5	51,6	54,9	51,9	52,8
Concrete IVb with addition M3	8,3	7,8	7,1	7,7	6,9	6,3	6,3	6,5
Concrete IVb 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 Va without addition	Concrete Vb with calcined layer silicate sample M3	Concrete Vb 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

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