Deutsches Institut für Bautechnik DIBt

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-05/0213 of 11 May 2018

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	"Hydrolith F200"
Product family to which the construction product belongs	Natural calcined pozzolana as type II addition
Manufacturer	Hans G. Hauri KG Mineralstoffwerke Bergstraße 114 79268 Bötzingen DEUTSCHLAND
Manufacturing plant	Hans G. Hauri KG Mineralstoffwerk Bergstraße 114 79268 Bötzingen DEUTSCHLAND
This European Technical Assessment contains	13 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 260035-00-0301
This version replaces	ETA-05/0213 issued on 13 May 2013

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Specific part

1 Technical description of the product

The concrete addition "Hydrolith F200" is a natural calcined pozzolana of volcanic origin. The initial material - a tertiary volcanic rock - is Phonolith from Fohberg nearby Bötzingen/Kaiserstuhl, Germany. In the production plant of Hans G. Hauri KG Mineralstoffwerke in Bötzingen, it is pre-processed and after thermal treatment (450 °C) finely divided by grinding.

It consists essentially of SiO_2 and Al_2O_3. The content of reactive SiO_2, as defined and described in EN 197-1[1], amounts to at least 25 % by mass acc. to EN 450-1[2]. The pozzolana mainly consists of the minerals zeolite, alkali-feldspar, aegirine augite and wollastonite.

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

The natural calcined pozzolana "Hydrolith F200" 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[3].

The natural calcined pozzolana "Hydrolith F200" is also intended to be used in mortars and grouts.

The recommended maximum replacement of cement by "Hydrolith F200" is 25 % by mass.

"Hydrolith F200" can be used in concrete with all types of common cement acc. to EN 197-1[1]. It is also intended to be used with verified k-value concept in concrete made of Portland cement CEM I, Portland limestone cement CEM II/A-LL and Portland composite cement CEM II/B-M (T-LL) acc. to EN 197-1[1]. Therefore the types of cements for which the suitability of the k-value concept is verified are CEM I, CEM II/A-LL and CEM II/B-M (T-LL) acc. to EN 197-1[1]. The k-value concept can be used for all exposure classes acc. to EN 206[3] except XF2 and XF4. The maximum content of addition to be taken into account is 33 % by mass of the cement content. The determined k-value is $\geq$ 0,6 for a concrete age $\geq$ 28 days.

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 natural calcined pozzolana "Hydrolith F200" 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
Loss on ignition *	≤ 6,0 % by mass
Chloride content (Cl^-)	≤ 0,10 % by mass
Sulfate content (SO_3)	≤ 1,0 % by mass
Total content of alkalis	≤ 12,0 % by mass
Content of soluble alkalis	≤ 0,2 % by mass
Fineness (45 µm sieve residue)	18 ± 10 % by mass
Specific surface	530 ± 50 m²/kg
Activity index	7 days: ≥ 80 % 28 days: ≥ 90 %
Initial setting time	Control Mix: 280 min Test Mix: 270 min
Soundness	≤ 10 mm
Pozzolanic reactivity (Content of reactive silicon dioxide)	≥ 25 % by mass
Carbonation of concrete	See Annex A.1
Freeze thaw resistance of concrete	See Annex A.2
Suitability of the k-value concept	See Annex A.3
Resistance against chloride penetration	NPA
* if loss on ignition > 6,0 % by mass: difference between loss on ignition and CO_2 ≤ 4,0 % by mass	

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

In accordance with EAD No. 260035-00-0301, 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 11 May 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Bahlmann

Deutsches Institut für Bautechnik DIBt

Annex A - Results of performance assessment

Annex A.1 – Carbonation of concrete (Concrete composition 2a and 2b)

Table A.1.1 - Carbonation of concrete with CEM II/A-LL

constituent	concrete composition	
	2 a	2 b
type of cement	CEM II/A-LL 32,5 R	
cement	320 kg/m³	240 kg/m³
addition	-	80 kg/m³
water	192 kg/m³	
w/c- resp. w/(c+add)-value	0,60	
age	carbonation depth in mm	
14 d	0,6	0,8
28 d	0,7	1,0
56 d	1,4	1,9
90 d	2,3	3,2
140 d	2,7	3,7
	rate of carbonation in mmxd$^{-0,5}$	
	0,286	0,394
	7 d-compressive strength in N/mm^2	
	28	23

Table A.1.2 - Carbonation of concrete with CEM II/B-M (T-LL)

constituent	concrete composition	
	2 a	2 b
type of cement	CEM II/B-M (T-LL) 42,5 N	
cement	320 kg/m³	240 kg/m³
addition	-	80 kg/m³
water	192 kg/m³	
w/c- resp. w/(c+add)-value	0,60	
age	carbonation depth in mm	
14 d	0,3	0,8
28 d	0,5	0,9
56 d	1,5	1,6
90 d	1,6	2,6
140 d	2,2	3,5
	rate of carbonation in mm x d$^{-0,5}$	
	0,241	0,352
	7 d-compressive strength in N/mm^2	
	37	28

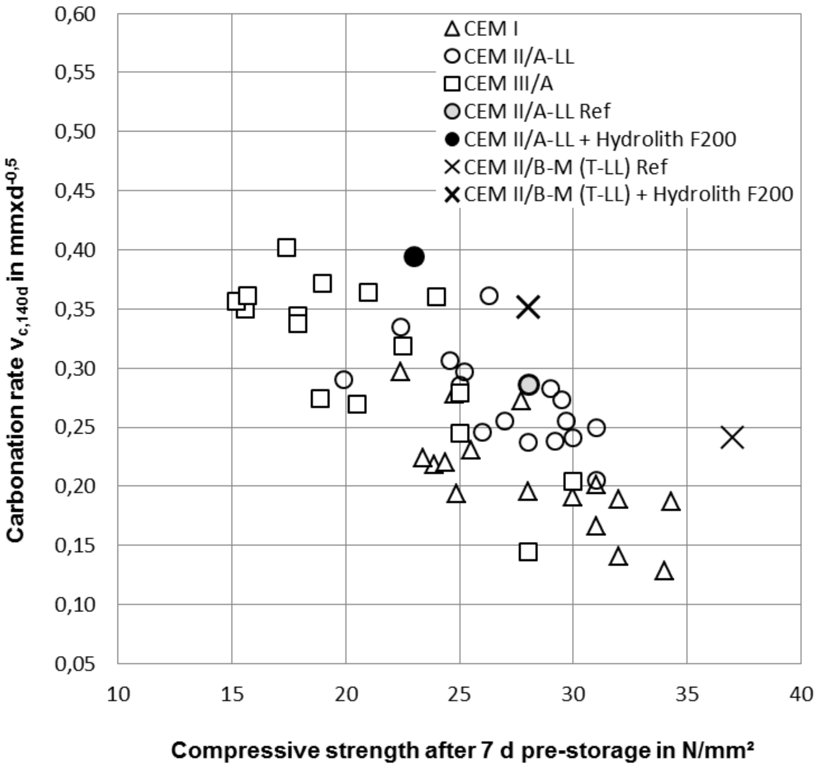

Fig. A.1.1 Rate of carbonation and compressive strength for concretes with different cements

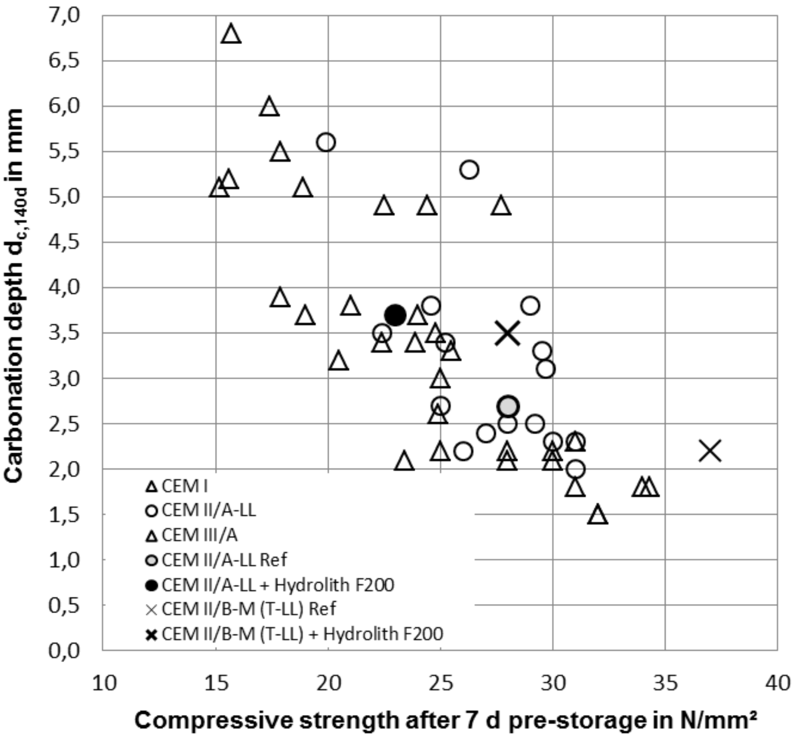

Fig. A.1.2 Carbonation depth and compressive strength for concretes with different cements

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Results of performance assessment - Carbonation of concrete	

Annex A.2 – Freeze thaw resistance of concrete

Table A.2.1 – Freeze thaw resistance of concrete with CEM II/A-LL *(Method 1)*

constituent	concrete composition	
	2 a	2 b
type of cement	CEM II/A-LL 32,5 R	
cement	320 kg/m³	240 kg/m³
addition	-	80 kg/m³
water	192 kg/m³	
w/c- resp. w/(c+add)-value	0,60	
No. of freeze-thaw-cycles	scaling in % by mass	
10	0,1	0,1
25	0,1	0,5
50	0,6	1,3
75	1,9	2,6
100	2,8	4,1

Table A.2.2 – Freeze thaw resistance of concrete with CEM II/B-M (T-LL) *(Method 2)*

constituent	concrete composition	
	IIa	IIb
type of cement	CEM II/B-M (T-LL) 42,5 N	
cement	320 kg/m³	240 kg/m³
addition	-	80 kg/m³
water	160 kg/m³	
admixture	0,8 % by mass	
w/c- resp. w/(c+add)-value	0,50	
No. of freeze-thaw-cycles	scaling in g/m² **/** RDM in %	
4	7 **/** 92	13 **/** 92
10	10 **/** 98	20 **/** 98
14	13 **/** 98	25 **/** 99
18	15 **/** 98	28 **/** 99
24	20 **/** 100	37 **/** 100
28	24 **/** 98	41 **/** 99
	28 d-compressive strength in MPa	
	70	59

Annex A.3 – Suitability of the k-value concept

Table A.3 - Suitability of the k-value concept: concrete composition and compressive strength

constituent		concrete composition					
		1 a	1 b	2 a	2 b	3 a	3 b
cement		340 kg/m³	255 kg/m³	320 kg/m³	240 kg/m³	290 kg/m³	217,5 kg/m³
addition		-	85 kg/m³	-	80 kg/m³	-	72,5 kg/m³
water		170 kg/m³		192 kg/m³		217,5 kg/m³	
w/c- resp. w/(c+add)-value		0,50		0,60		0,75	
type of cement	age in d	compressive strength in MPa					
CEM I with low Na2O-equivalent (0,47 % by mass)	2	22	19	14	12	7	6
	7	36	33	24	22	14	12
	28	47	47	36	34	23	21
	90	54	52	42	38	27	25
	360	59	59	44	43	27	28
CEM I with medium Na2O-equivalent (0,86 % by mass)	2	27	20	18	14	10	7
	7	37	32	28	24	19	15
	28	48	44	40	34	26	24
	90	57	54	46	44	29	25
	360	60	56	48	47	31	29
CEM I with high Na2O-equivalent (1,10 % by mass)	2	29	20	16	12	10	7
	7	40	32	27	22	17	13
	28	50	48	39	38	27	22
	90	57	53	49	45	32	27
	360	58	54	51	49	34	31
CEM II/A-LL	2	30	23	21	16	12	7
	7	38	33	28	23	17	12
	28	47	45	36	34	24	21
	90	52	51	42	41	26	24
	360	54	54	44	42	29	25
CEM II/B-M (T-LL)	2	30	20	24	16	12	7,1
	7	48	35	37	28	21	14
	28	66	57	51	44	32	26
	90	69	61	56	49	35	28

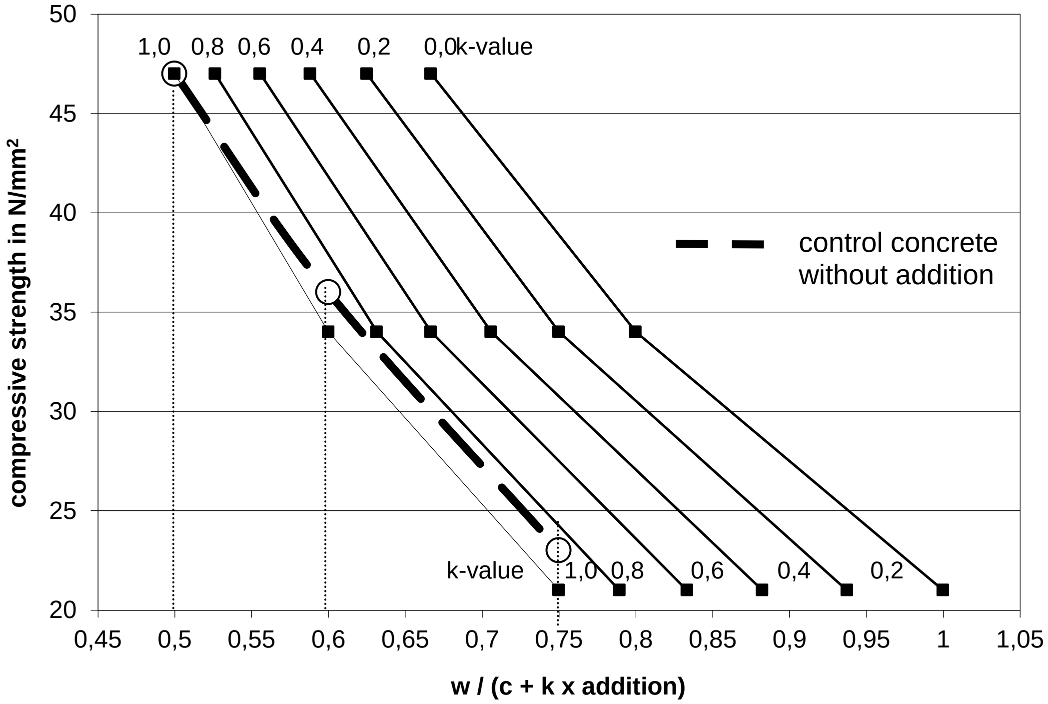

Fig. A.3.1: Compressive strength versus w/(c + k x addition) at an age of 28 days for combination with CEM I with low Na_2O-equivalent

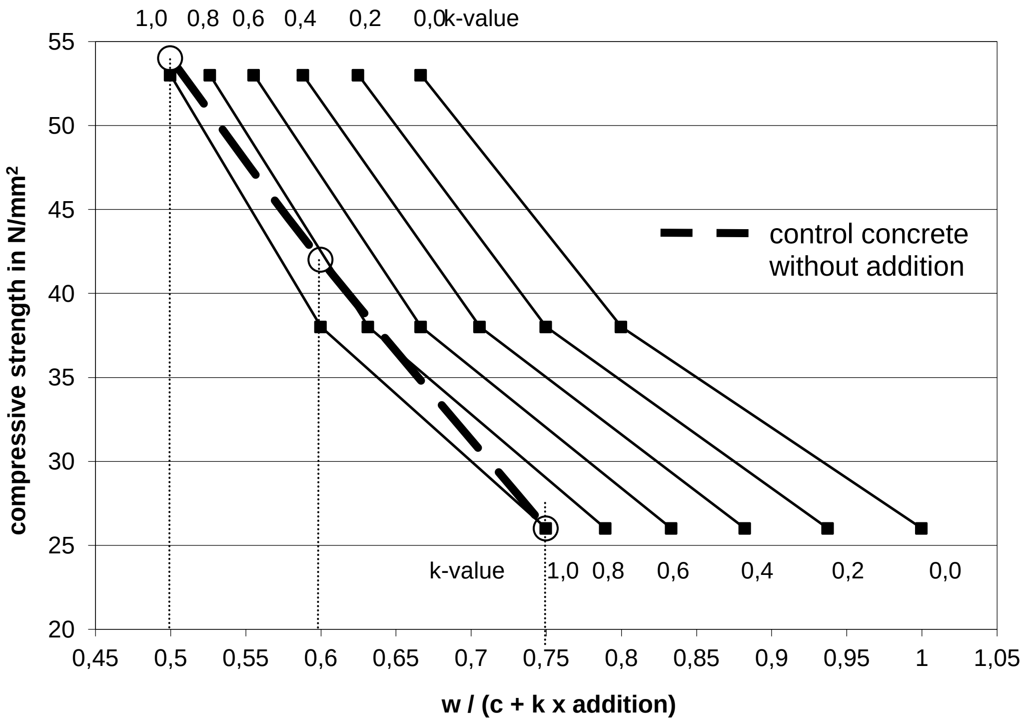

Fig. A.3.2: Compressive strength versus w/(c + k x addition) at an age of 90 days for combination with CEM I with low Na_2O-equivalent

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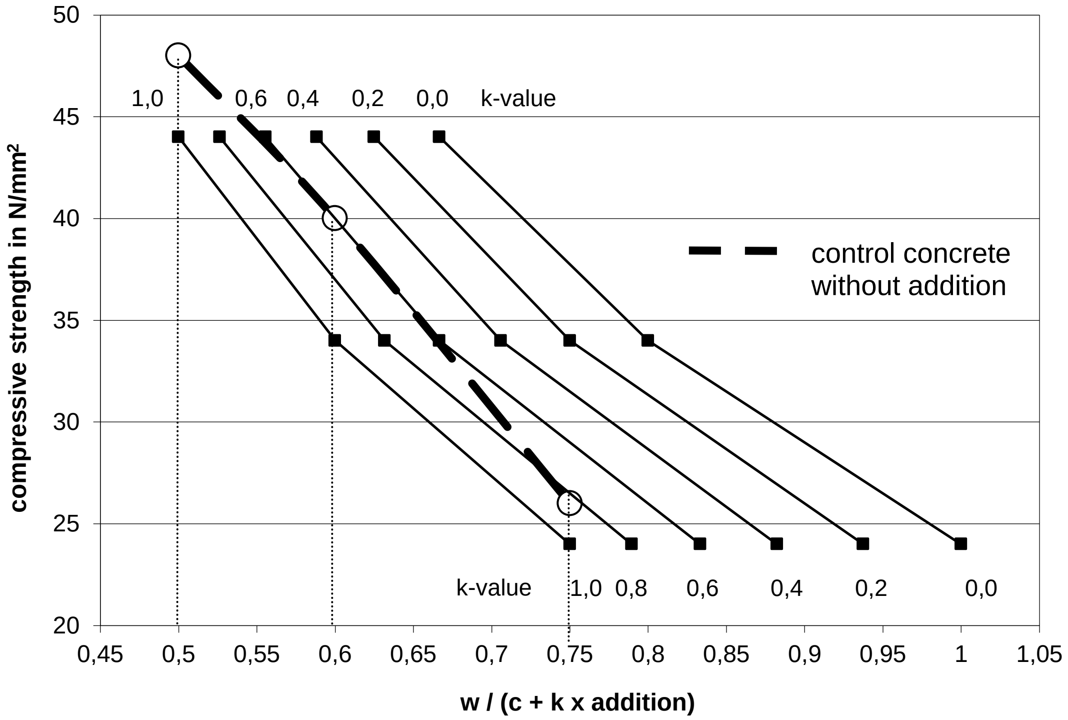

Fig. A.3.3: Compressive strength versus w/(c + k x addition) at an age of 28 days for combination with CEM I with medium Na_2O-equivalent

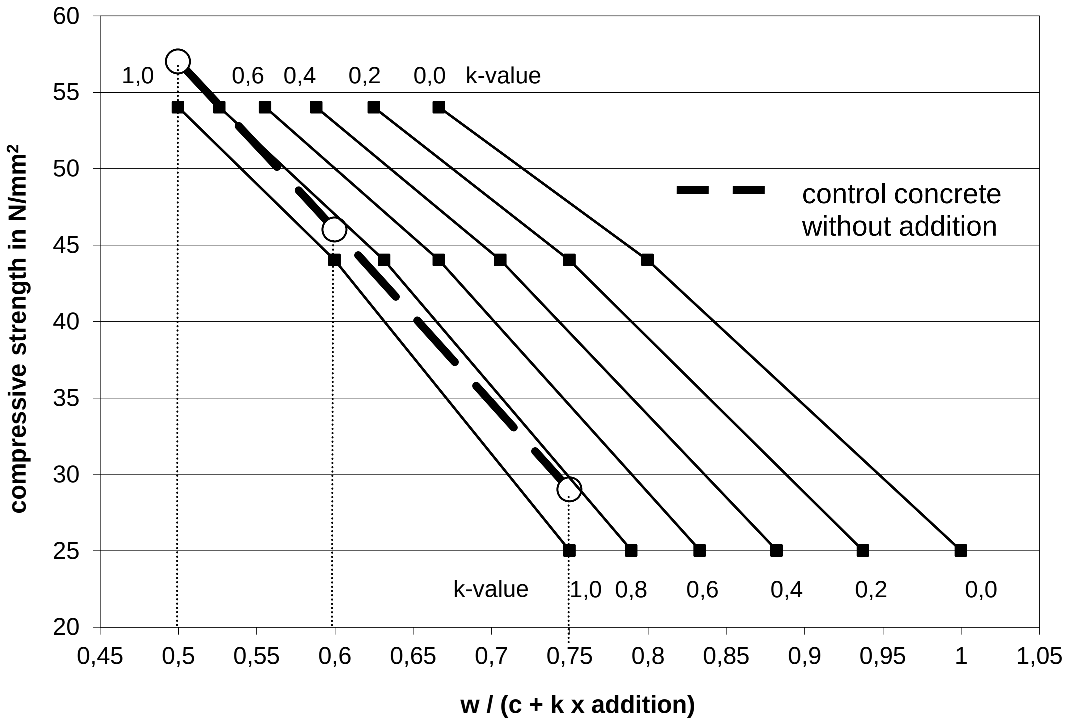

Fig. A.3.4: Compressive strength versus w/(c + k x addition) at an age of 90 days for combination with CEM I with medium Na_2O-equivalent

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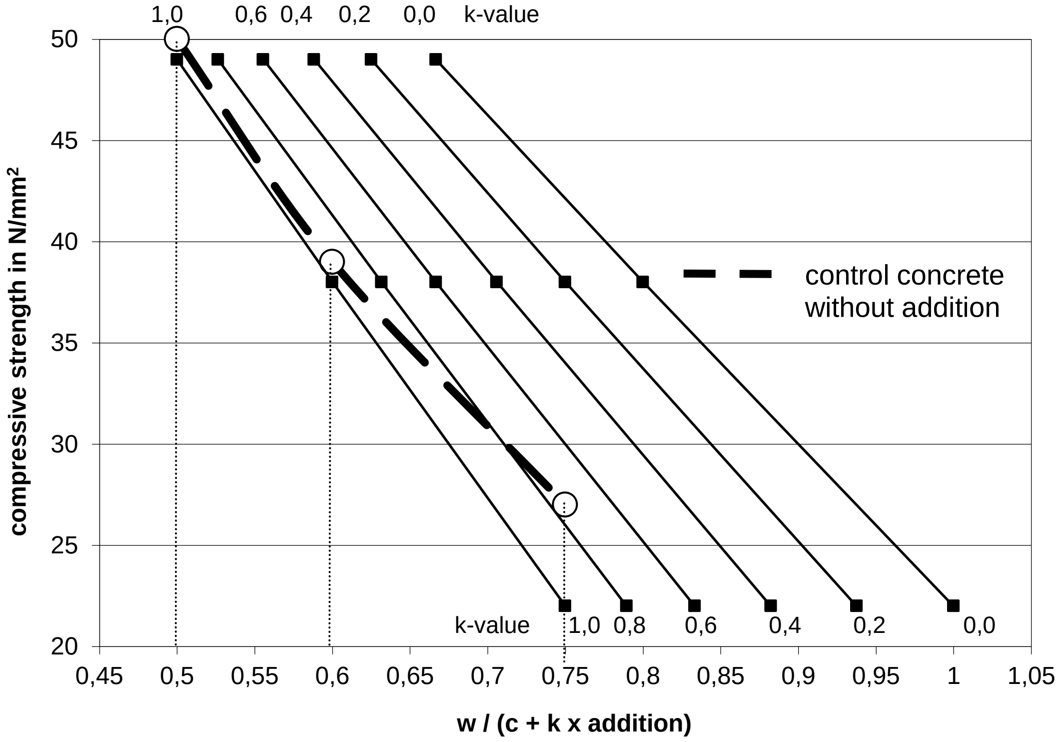

Fig. A.3.5: Compressive strength versus w/(c + k x addition) at an age of 28 days for combination with CEM I with high Na_2O-equivalent

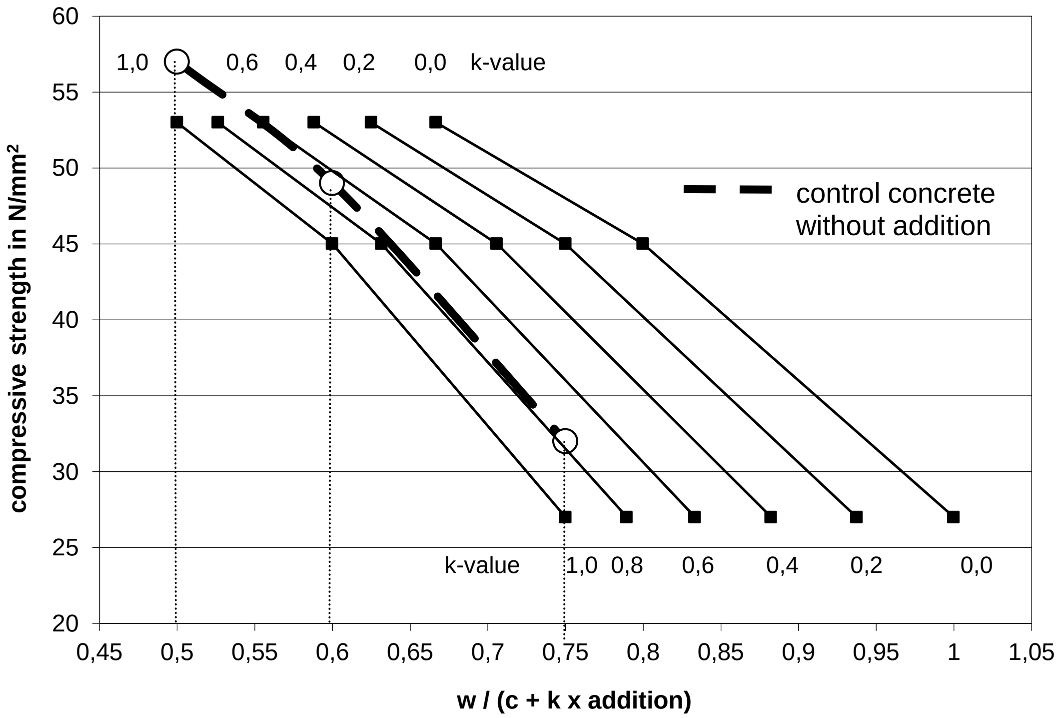

Fig. A.3.6: Compressive strength versus w/(c + k x addition) at an age of 90 days for combination with CEM I with high Na_2O-equivalent

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Results of performance assessment - Suitability of the k-value concept	

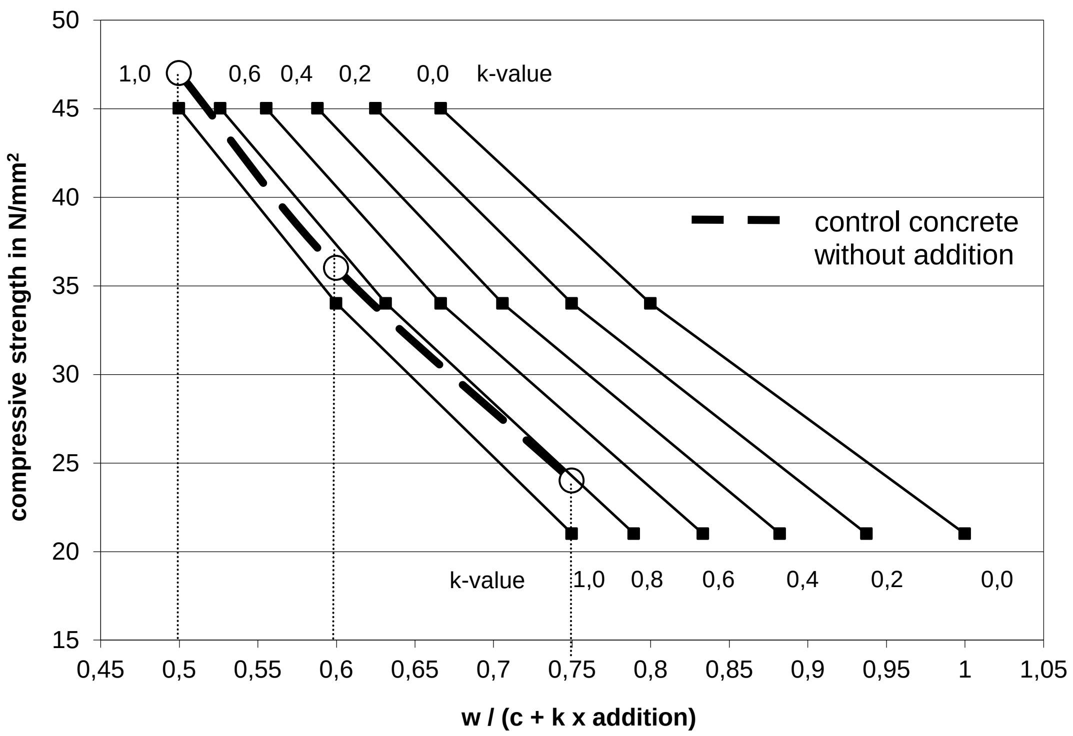

Fig. A.3.7: Compressive strength versus w/(c + k x addition) at an age of 28 days for combination with CEM II/A-LL

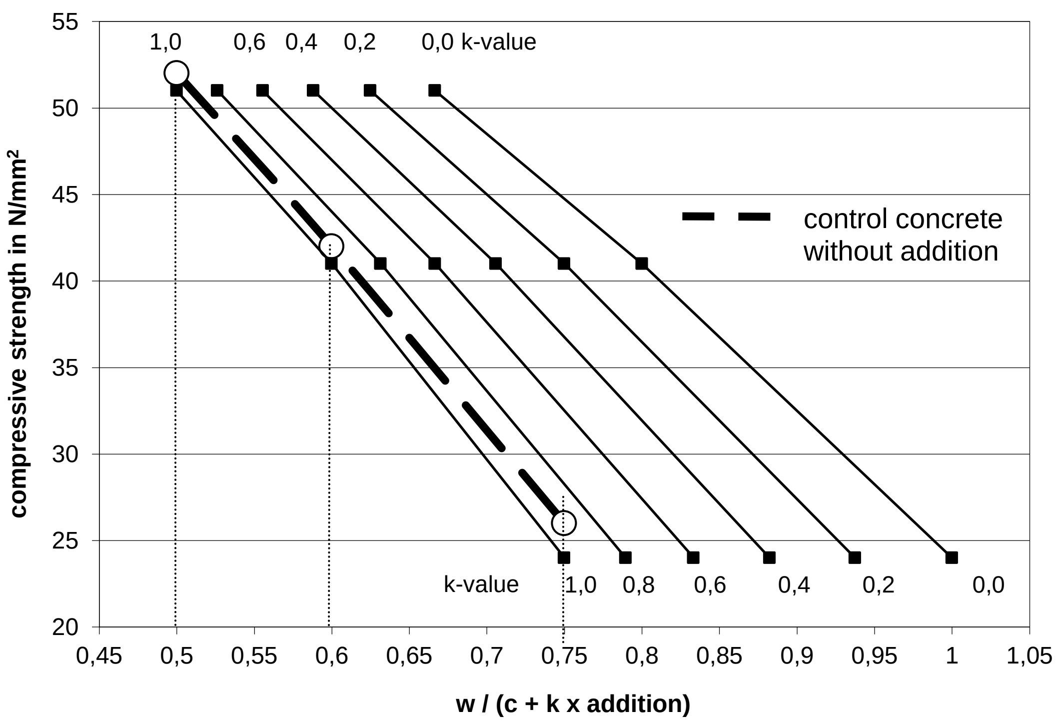

Fig. A.3.8: Compressive strength versus w/(c + k x addition) at an age of 90 days for combination with CEM II/A-LL

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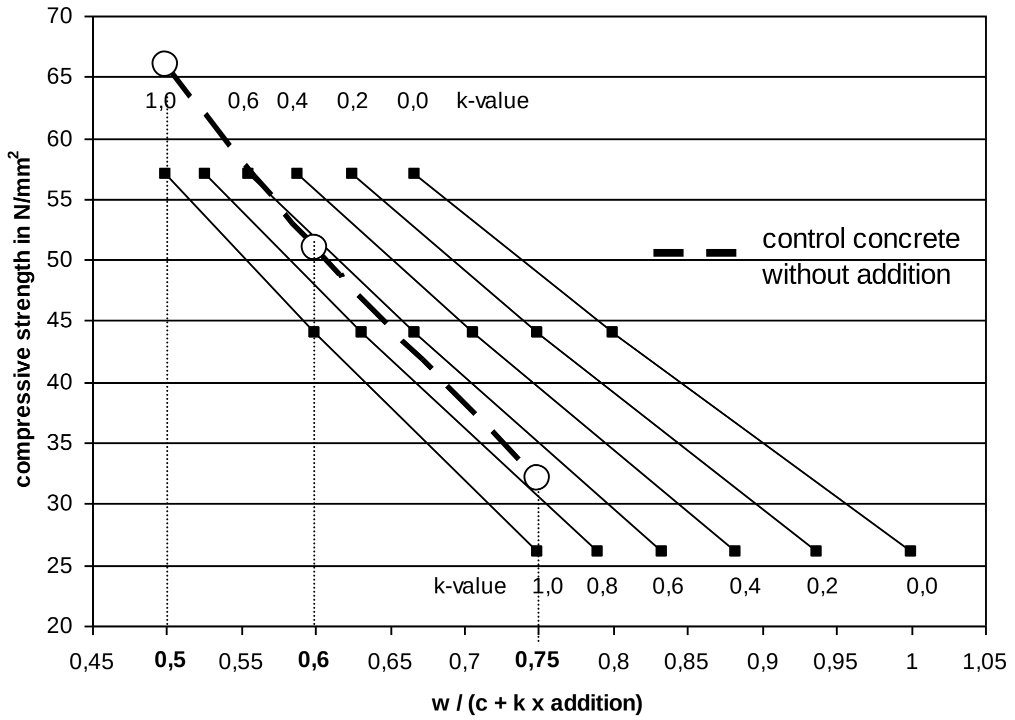

Fig. A.3.9: Compressive strength versus w/(c + k x addition) at an age of 28 days for combination with CEM II/B-M (T-LL)

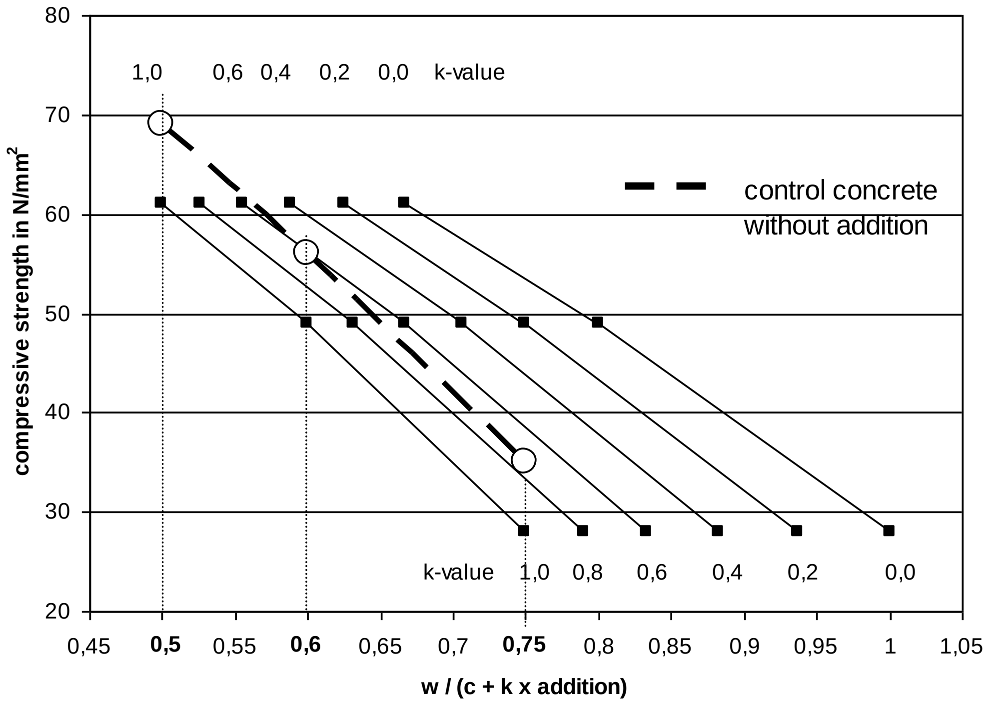

Fig. A.3.10: Compressive strength versus w/(c + k x addition) at an age of 90 days for combination with CEM II/B-M (T-LL)

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