EUROPEAN ASSESSMENT DOCUMENT

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CALCIUM CARBONATE FINE AS ACTIVE ADDITION WITH CATALYTIC BINDING PERFORMANCE FOR CONCRETE

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The calcium carbonate fine (CCF or addition) is fine grained inorganic material with specific granulometry and with specified catalytic binding performance. The product is intended to be added into fresh concrete to improve by catalytic performance in action with used cement some of its features, substitution of part of used cement included.

The CCF has content of calcium carbonate ($CaCO_3$) in minimum 95 % (w/w) and granulometry of 100 % passing through a 2 mm sieve and minimum 70 % passing through a 63 µm sieve.

The CCF is originated from exploitation of naturally pure carbonate rock-forming minerals (limestone, chalk, marble and travertine). The production process maintains the carbonate very close to its original state, ending up in a finely ground product. The production of CCF starts with its extraction and processing includes grinding, size classification of particles and sometimes washing, sorting of undesirable by-minerals (clays, micas, dolomite, quartz) and drying.

The product is not fully covered by the harmonised technical standard EN 12620[1]. Catalytic binding performance is not covered by EN 12620. With reference to this performance, actively improving function of cement in concrete, the product is considered as addition corresponding to type II, as specified in EN 206, Cl. 5.2.5.1, Par. (2) and (3).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual good practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

CCF is active addition for production of concrete with additionally specified catalytic binding performance, including in particular cast in situ and prefabricated structural concrete conforming to EN 206, EN 1992 series, EN 1994 series and ENs for concrete products (EN 13369 etc.).

With regard to EN 206, Introduction, Cl. 5.1.1 and Cl 5.2.5.1, Par. (2) and (3), the product may be taken into account if the suitability has been established in the provisions valid in the place of use and its quantity to be used in concrete is determined by the initial tests of concrete (EN 206, Annex A).

Effect of product on compressive strength as the most important performance of concrete and on common exposures of concrete in European climatic conditions is covered by scope of this EAD (carbonation – environment XC1, XC2, XC3 and XC4, freeze-thaw cycles with presence of water – environment XF1, XF3). Effects of product in specific concrete applications (environment with chlorides XD…, XS…, XF2, XF4, aggressive environment XA…), depending on locally specific composition of concrete (e.g. specific admixtures, specific cement, aggregate with specific performance) should be verified and assessed during initial tests of specified concrete with detailed composition (EN 206, Introduction, Cl. 5.2.1 and Annex A).

[1] All undated references to standards or to EADs in this document are to be understood as references to the dated versions listed in Chapter 4.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the CCF as addition for concrete with catalytic binding properties for the intended use of 50 years when installed in the works provided that they are subject to appropriate installation. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[2].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

For the purposes of this document, the terms and definitions given in EN 206, EN 197-1, EN 450-1, EN 1744-1, EN 12620, ISO 6707-1 and CET/TS 12390-9 apply.

[2] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the calcium carbonate fine is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Activity index	2.2.1	Level
2	Particle size distribution	2.2.2	Level
3	Specific surface	2.2.3	Level
4	$CaCO_3$ content	2.2.4	Level
5	Total organic content	2.2.5	Level
6	Total content of alkalis	2.2.6	Level
7	SiO_2 content	2.2.7	Level
8	SO_3 content	2.2.8	Level
9	Total content of sulphur	2.2.9	Level
10	Chloride content	2.2.10	Level
11	Content of fines	2.2.11	Level
12	Moisture content	2.2.12	Level
13	Initial setting time	2.2.13	Level
14	Soundness	2.2.14	Level
15	*k*-value concept	2.2.15	Level / Description
16	Carbonation of concrete	2.2.16	Description
17	Freeze – thaw resistance of concrete	2.2.17	Description

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

The tests specified in 2.2.1 to 2.2.15 are to be performed on three samples at least with approach as specified in EN 196-7, with interval of sampling 14 days at least. The tests specified in 2.2.16 and 2.2.17 are to be performed on one sample at least, habitually on the first one from three mentioned.

Portland cement CEM I 42,5 R in accordance with EN 450-1, Cl. 3.3 and Cl. 5.3.2, and EN 197-1 is to be used for preparation of test specimens as reference binder. Convenient cement from manufacturing plant near to site of CCF manufacturing should be used. The reference cement used for tests shall be clearly identified in the ETA.

2.2.1 Activity index

With regard to EN 450-1, Cl. 3.3 and Cl. 5.3.2, the preparation and curing of the test specimens is to be performed according to EN 196-1 with substitution of the fly ash by the CCF. At least six test specimens from mixture with CCF and six test specimens from reference mixture with 100 % cement are to be prepared from one sample of CCF.

Compressive strength of prepared test specimens is to be determined in accordance with EN 196-1 at age of 28 and 90 days, three test specimens for each age and each mixture.

The activity index is to be determined according to EN 450-1, Cl. 3.5. The individual values of activity index of each test specimen are given in the ETA.

2.2.2 Particle size distribution

The determination of particle size distribution is to be performed according to EN 933-10. It is expressed and determined as the mass proportion in percent of the CCF passing through 0.063 mm, 0.125 mm and 2 mm mesh sieves on one specimen taken from each of three samples.

The individual values of fineness of each sample are given in the ETA. These values have to be in accordance with EN 12620, Cl. 4.3.6.

2.2.3 Specific surface

Specific surface is to be determined in accordance with EN 196-6, Cl. 4, on one test specimen taken from each of three samples.

The individual values of specific surface of each sample are given in the ETA.

2.2.4 $CaCO_3$ content

CaO content is determined by test procedure according to EN 196-2, Cl. 4.5.12.

Instead of unsmoked residue, the mass of (1,00 ± 0,05) g determined with accuracy ± 0,0005 g of tested CCF is to be used for preparation of 500 ml solution according to EN 196-2, Cl. 4.5.5.2.

Note: EN 196-2, Cl. 1: This document describes methods which apply principally to cements, but which can also be applied to their constituent materials. They can also be applied to other materials, the standards for which call up these methods.

$CaCO_3$ content is to be calculated from CaO content according to equation below, taking into account molecular weight of compounds:

$$\mathbf{C\ (CaCO_3) = 1{,}785 \times C\ (CaO)}$$

where:
C ($CaCO_3$) … $CaCO_3$ content [%]
C (CaO) … CaO content [%].

$CaCO_3$ content is to be determined on one specimen taken from the sample. During preparation of the ETA it is to be assessed, if determined $CaCO_3$ content corresponds with specification of product given in Cl. 1.1.

The individual values of $CaCO_3$ of each sample are given in the ETA.

2.2.5 Total organic content

Total organic content is to be determined in accordance with EN 13639, Cl. 6, on one specimen taken from each of three samples.

The values of the total organic content have to be in accordance with EN 197-1, Cl. 5.2.6 c2). The individual values of total organic content of each sample are given in the ETA.

2.2.6 Total content of alkalis

Before the test of total content of alkalis, the test of insoluble residue according to EN 196-2, Cl. 4.4.3 is to be performed on one specimen taken from each of three samples.

Than total content of alkalis is to be determined in accordance with EN 196-2, Cl. 4.5.19, on one specimen taken from the sample. Procedure of specimen decomposition according to EN 196-2, Cl. 4.5.19.4, is to be selected according to result of test of insoluble residue, performed on specimen taken from the sample.

The value of the total content of alkalis has to be in accordance with EN 450-1, Cl. 5.2.9. The individual values of total content of alkalis of each sample are given in the ETA.

2.2.7 SiO_2 content

SiO_2 content is to be determined in accordance with EN 196-2, Cl. 4.5.3, on one specimen taken from each of three samples. The value of the SiO_2 content has to be in accordance with EN 450-1, Cl. 5.2.7.

The individual values of SiO_2 of each sample are given in the ETA.

2.2.8 SO_3 content

SO_3 content is to be determined in accordance with EN 1744-1, Cl. 12, on one specimen taken from each of three samples.

The value of the SO_3 content has to be in accordance with EN 450-1, Cl. 5.2.4. The individual values of SO_3 of each sample are given in the ETA.

2.2.9 Total content of Sulphur

Total content of sulphur is to be determined in accordance with EN 1744-1, Cl. 11, on one specimen taken from each of three samples.

The values of the total content of sulphur have to be in accordance with EN 12620, Cl. 6.3.2. The individual values of total content of sulphur of each sample are given in the ETA.

2.2.10 Chloride content

Chloride content is to be determined in accordance with EN 196-2, Cl. 4.5.16, on one specimen taken from each of three samples.

The values of the chloride content have to be in accordance with EN 450-1, Cl. 5.2.3. The individual values of chloride content of each sample are given in the ETA.

2.2.11 Content of fines

Content of fines is to be determined by methylene blue test in accordance with EN 933-9, on one specimen taken from each of three samples.

The values of the content of fines, determined by methylene blue test, have to be in accordance with EN 197-1, Cl. 5.2.6 b) Clay content. The individual values of methylene blue test of each sample are given in the ETA.

2.2.12 Moisture content

Moisture content is to be determined in accordance with EN 1097-5, on one specimen taken from each of three samples.

The individual values of moisture content of each sample are given in the ETA.

2.2.13 Initial setting time

The initial setting time is to be determined on one specimen taken from each of three samples on cement paste with and without CCF in accordance with EN 196-3, Cl. 6. Test specimens with CCF are to be prepared with 25 % addition + 75 % test cement by mass.

The values of the initial setting time of the sample with CCF have to be in accordance with EN 450-1, Cl. 5.3.5. The individual values of initial setting time of each sample with and without CCF are given in the ETA.

2.2.14 Soundness

The soundness is to be determined on cement paste with CCF prepared with 30 % addition + 70 % test cement by mass. Test is to be performed in accordance with EN 450-1, Cl. 5.3.3 and EN 196-3, Cl. 7 on three test specimens taken from each of three samples.

The individual values of the soundness have to be in accordance with EN 450-1, Cl. 5.3.3. The individual values of soundness of each sample are given in the ETA.

2.2.15 *k*-value concept

Verification of suitability of *k*-value concept is to be performed according to following procedure. Manufacturer can specify to TAB intended level of k-value before start of tests. If he doesn't, *k*-value of level 0.25 is to be used.

Set of 3 bars of dimension 40×40×160 mm from each of three samples of CCF for each composition of mixture, specified in Tab. 2 with regard to have an equal workability, is to be prepared and cured for 28 days according to EN 196-1.

For mixtures without CCF only one set of reference bars together with bars from the first sample of CCF is prepared.

Table 2 Compositions of mixtures for verification of suitability k-value concept

Mixture No.		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Cement (C)	kg/m^3	500	450	450	412	409	375	377	346	346	321	321	296
Addition (A)	kg/m^3	-	153	-	137	-	128	-	116	-	107	-	99
Sand *) (S)	kg/m^3	1287	1184	1337	1238	1378	1284	1410	1325	1441	1358	1466	1392
Water (W)	kg/m^3	225	225	225	225	225	225	225	225	225	225	225	225
W/C	--	0.45	0.50	0.50	0.55	0.55	0.60	0.60	0.65	0.65	0.70	0.70	0.76
W/(C+*k*×A) **)	k=0.20	-	0.47	-	0.51	-	0.56	-	0.61	-	0.66	-	0.71
	k=0.25		0.46		0.50		0.55		0.60		0.65		0.70
	k=0.30		0.45		0.50		0.54		0.59		0.64		0.69
k = A/(A+C)	--	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25

* Normalised sand according to EN 196-1, Cl. 5.1.3.

** Values of W/(C+*k*×A) for *k*-0.05 and for *k*+0.05 are calculated from real content of C_n, A_n and W_n in relevant mixture and given in table for control of correctness of mixture composition.

If manufacturer specifies intended level of *k*-value different from 0.25, the dosage of cement (C), addition (A) and sand (S) for compositions A_2, A_4, A_6, A_8, A_{10} and A_{12} are to be recalculated for water content W = 225 kg/m^3, given ratio W/C from 0,45 up to 0,70 with step 0,05 and given *k*-value (*k*) according to equations:

$$C_n + A_n + S_n = 1787$$

$$C_n = \frac{W}{(W/C)_n}$$

$$A_n = \frac{k}{(1 - k)} \times C_n$$

where:

C_n	content of cement in mixture for n-th mixture in kg
A_n	content of addition in mixture for n-th mixture in kg
S_n	content of sand in mixture for n-th mixture in kg
W	content of water in mixture in kg
$(W/C)_n$	ratio of water content and cement content for n-th mixture
k	assessed level of *k*-value, specified by manufacturer.

After finish of curing the compressive strength on test specimens is to be determined according to EN 196-1 and single test results $R_{Mn,Ta,Si}$ for each mixture (index $_{Mn}$), each test specimen (index $_{Ta}$) and, if appropriate, each sample (index $_{Si}$) are recorded.

Than, separately for each mixture with CCF, average values $R_{av,Mn,Si}$ of test results obtained for each sample and, if appropriate, global average value $R_{Mn,glob}$ of all samples are calculated and recorded into table. If only one sample is tested, $R_{Mn,glob} = R_{av,Mn,S1}$.

For each mixture without CCF average value $R_{av,Mn}$ is calculated.

Portions of compressive strength ΔR_{WR} of mixture with CCF (index $_n$) and related mixture without CCF (index $_{n-1}$) for each water ratio W/(C+*k*×A) tested are calculated and expressed in % according to equation:

$$\Delta R_{WR,Mn} = \frac{R_{Mn,globe}}{R_{av,Mn-1}} \times 100$$

Calculated results ΔR_{WR} are rounded to 1 decimal point and recorded. Then global average value ΔR of calculated portions and variation coefficient V_x of set of calculated portions ΔR_{WR} are calculated and given in the ETA together with level of *k*-value verified by tests.

Following working diagrams with expressed linear correlation and reliability value are prepared:

- W/(C) / compressive strength of mixture without CCF
- W/(C+*k*×A) / compressive strength of mixture with CCF

Both working diagrams together with linear correlation and reliability value are given in the ETA.

If level of *k*-value different from 0.25, specified by manufacturer, is verified by tests, the compositions and their characteristics of all mixtures used for tests, as specified in Tab. 2, are given in the ETA too.

2.2.16 Carbonation of concrete

Carbonation depth of concretes made with and without CCF is to be measured according to EN 14630.

The concrete specimens are cubes of size 150 mm prepared from mixture with and without CCF according to Table 3. 15 cubes of each composition at least for test are to be prepared.

After demoulding, specimens are to be immersed in water until the age of 7 days and afterwards stored for all the time of testing in normal climate conditions 20/65.

Measurement of carbonation depth is to be performed according to EN 14630, Cl. 4.2, after 14, 28, 56, 90 and up to 180 days on three specimens (cubes) for each age.

Table 3 Concrete compositions for test of carbonation

Concrete No. ***)		B1	B2
Cement (C)	(kg/m^3)	320	292
Addition (A)	(kg/m^3)	-	96
Water (W)	(kg/m^3)	192	192
Coarse aggregate 8/16 *)	(kg/m^3)	745	730
Coarse aggregate 4/8 *)	(kg/m^3)	245	240
Fine aggregate 0/4 **)	(kg/m^3)	850	830
W/C ratio		0.60	0.66
W/(C+k.A) with k = 0.30		0.60	0.60
A/(A+C)		-	0.25
A+C		320	388

*) Coarse aggregate 4/8, 8/16: crushed stone according to EN 12620, made of and/or based on magmatic, metamorphic or fine grain sediment rock, not based on calcium carbonate, washed, frost resistance category F1 or F2

**) Fine aggregate 0/4: natural graded river sand according to EN 12620, without content of shells or other calcium carbonate particles

***) Indications used for marking of concrete components see 2.2.15.

A petrographic type, origin locality and size distribution of each type of aggregate, used for tests, and frost resistance category of coarse aggregate, used for tests, are given in the ETA.

Carbonation depth of the concrete with CCF (composition B2) and of the reference concrete (composition B1) of each specimen and each age of specimens are given separately in the ETA.

2.2.17 Freeze thaw resistance of concrete

The freeze thaw resistance of concrete is to be determined on concrete with and without CCF with composition according to Cl. 2.2.16, Table 3. Each test specimen (slab) is cut from one cube. The test is to be performed in accordance with CEN/TS 12390-9, Cl. 5, on four test specimens from each concrete composition.

Mass of scaling material S_n of each specimen and average value of scaling material $S_{n,av}$ of each composition (with and without CCF) after 7±1, 14±1, 28±1, 42±1 and 56 cycles are given in the ETA.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Decision 1999/469/EC as amended by Decision 2001/596/EC.

With reference to the catalytic performance of product, actively improving function of cement in concrete, with performance expressed by using of *k*-value concept as specified in EN 206, Cl. 3.2 and Cl. 5.2.5.2.1, the product is considered as addition corresponding to type II according to EN 206, Cl. 3.1.2.3.

The system is: 1+

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 4.

Table 4 Control plan for the manufacturer; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Activity index	2.2.1	declared level	3	1 per month, but 1 per week during the 3 months initial period
2	Particle size distribution - passing 63 µm - passing 125 µm - passing 2 mm	2.2.2	≥ 70 % ≥ 85 % = 100 %	3	1 per week, but 1 per day during the 3 months initial period
3	Specific surface	2.2.3	declared level	3	1 per week, but 1 per day during the 3 months initial period
4	$CaCO_3$ content	2.2.4	≥ 95 %	3	1 per 2 weeks, but 1 per week during the 3 months initial period
5	Total organic content	2.2.5	< 0,50 %	3	1 per 2 months
6	Total content of alkalis	2.2.6	< 5,0 %	3	1 per 2 months
7	SiO_2 content	2.2.7	declared level	3	1 per 2 months
8	SO_3 content	2.2.8	< 3,0 %	3	1 per 2 months
9	Total content of sulphur	2.2.9	< 1,0 %	3	1 per 2 months
10	Chloride content	2.2.10	< 0,10 %	3	1 per 2 months
11	Content of fines	2.2.11	< 1,2 g / 100 g	3	1 per week
12	Moisture content	2.2.12	declared level	3	1 per week
13	Initial setting time (IST)	2.2.13	IST with CCF ≤ 2 × IST without CCF	3	1 per 2 months
14	Soundness	2.2.14	< 10 mm	3	1 per 2 months
15	*k*-value concept	2.2.15	declared level	3	1 per 3 years
16	Carbonation of concrete	2.2.16	declared level	1	1 per 3 years
17	Freeze thaw resistance of concrete	2.2.17	declared level	1	1 per 3 years

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for product are laid down in Table 5.

Table 5 Control plan for the notified body; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
	Initial inspection of the manufacturing plant and of factory production control	Control of devices, personal, equipment, test results and documentation of FPC	See control plan		1
Continuous surveillance, assessment and evaluation of factory production control					
	Continuous surveillance of the manufacturing plant and of factory production control	Control of devices, personal, equipment, and documentation of FPC, with specific attention to test results of particle size distribution and $CaCO_3$ content	See control plan		1 per year
Audit-testing of samples taken by the notified product certification body at the manufacturing plant or at the manufacturer's storage facilities					
1	Activity index	EN 450-1, Cl. 3.5	declared level	1	1 per 2 months
2	Particle size distribution - passing 63 µm - passing 125 µm - passing 2 mm	EN 933-10	≥ 70% ≥ 85% = 100 %	1	1 per 2 months
3	Specific surface	EN 196-6, Cl. 4	declared level	1	1 per 2 months
4	$CaCO_3$ content	2.2.4	≥ 95 %	1	1 per 2 months
5	Total organic content	EN 13639, Cl. 6	< 0,50 %	1	1 per year
6	Total content of alkalis	EN 196-2, Cl. 4.5.19	< 5,0 %	1	1 per year
7	SiO_2 content	EN 196-2, Cl. 4.5.3	declared level	1	1 per year
8	SO_3 content	EN 1744-1, Cl. 12	< 3,0 %	1	1 per year
9	Total content of sulphur	EN 1744-1, Cl. 11	< 1,0 %	1	1 per year
10	Chloride content	EN 196-2, Cl. 4.5.16	< 0,10 %	1	1 per year
11	Content of fines	EN 933-9	< 1,2 g / 100 g	1	1 per 2 months
12	Moisture content	EN 1097-5	declared level	1	1 per 2 months
13	Initial setting time	2.2.13	Sample with CCF ≤ 2 times sample without CCF	1	1 per 2 months
14	Soundness	2.2.14	< 10 mm	1	1 per 2 months

4 REFERENCE DOCUMENTS

EN 196-1:2016	Methods of testing cement - Part 1: Determination of strength
EN 196-2:2013	Method of testing cement - Part 2: Chemical analysis of cement
EN 196-3:2016	Methods of testing cement - Part 3: Determination of setting times and soundness
EN 196-6:2018	Methods of testing cement - Part 6: Determination of fineness
EN 196-7:2007	Methods of testing cement – Part 7: Methods of taking and preparing samples of cement
EN 197-1:2011	Cement - Part 1: Composition, specifications and conformity criteria for common cements
EN 206:2013+A1:2016	Concrete - Specification, performance, production and conformity
EN 450-1:2012	Fly ash for concrete - Part 1: Definition, specifications and conformity criteria
EN 450-2:2005	Fly ash for concrete - Part 2: Conformity evaluation
EN 933-9:2009+A1:2013	Tests for geometrical properties of aggregates - Part 9: Assessment of fines - Methylene blue test
EN 933-10:2009	Tests for geometrical properties of aggregates - Part 10: Assessment of fines - Grading of filler aggregates (air jet sieving)
EN 1097-5:2008	Tests for mechanical and physical properties of aggregates - Part 5: Determination of the water content by drying in a ventilated oven
EN 1744-1:2009+A1:2012	Tests for chemical properties of aggregates - Part 1: Chemical analysis
EN 1992-1-1:2004/AC:2010	Design of concrete structures – Part 1-1: General rules and rules for buildings
EN 1994-1-1:2004/AC:2009	Design of composite steel and concrete structures – Part 1-1: General rules and rules for buildings
EN 12620:2002+A1:2008	Aggregates for concrete
EN 13369:2018	Common rules for precast concrete products
EN 13639:2017	Determination of total organic carbon in limestone
EN 14630:2006	Products and systems for the protection and repair of concrete structures - Test methods - Determination of carbonation depth in hardened concrete by the phenolphthalein method
ISO 6707-1:2017	Buildings and civil engineering works - Vocabulary - Part 1: General terms
CEN/TS 12390-9:2006	Testing hardened concrete - Part 9: Freeze-thaw resistance - Scaling