BS EN 12878:2014

BSI Standards Publication

Pigments for the colouring of building materials based on cement and/or lime — Specifications and methods of test

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National foreword

This British Standard is the UK implementation of EN 12878:2014. It supersedes BS EN 12878:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee STI/1, Pigments.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Pigments for the colouring of building materials based on cement and/or lime - Specifications and methods of test

Pigments de coloration des matériaux de construction à base de ciment et/ou de chaux - Spécifications et méthodes d'essai

Pigmente zum Einfärben von zement- und/oder kalkgebundenen Baustoffen - Anforderungen und Prüfverfahren

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Foreword

This document (EN 12878:2014) has been prepared by Technical Committee CEN/TC 298 “Pigments and extenders”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2014 and conflicting national standards shall be withdrawn at the latest by January 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12878:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the Construction Production Regulation (CPR).

For relationship with the Construction Production Regulation, see informative Annex ZA, which is an integral part of this document.

EN 12878:2005 has been technically revised as follows:

a) requirements for Category B regarding water soluble substances in 4.2.3 modified to accommodate non powder preparations;

b) test method for total chlorine content (5.2.5) changed;

c) permission to use alternative test methods with proven correlation to standard methods added;

d) light source amended;

e) Annex ZA has been changed to consider the new Construction Production Regulation (CPR).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the requirements and the methods of test for pigments for use in the colouring of building materials based on cement and cement/lime combinations.

Pigments covered by this European Standard may also be used in pure lime mortar. For this application, see EN 459-1 and EN 459-2.

Pigments for this purpose may be single pigments, blends of pigments, or blends of pigments and extenders, in powder or granular form, or aqueous preparations.

Pigments typically belong to one of the following classes of compounds:

— synthetic or natural oxides and hydroxides of iron;

— oxides of chromium, titanium and manganese;

— complex inorganic pigments, for example combinations of the above mentioned metal oxides and hydroxides with cobalt, aluminium, nickel and antimony oxides and hydroxides;

— ultramarine pigments;

— phthalocyanine blue and green;

— elemental carbon (shall be regarded as an inorganic pigment);

— blends of the above materials (which may also include extenders).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-1:2005, *Methods of testing cement - Part 1: Determination of strength*

EN 196-3, *Methods of testing cement - Part 3: Determination of setting times and soundness*

EN 197-1, *Cement - Part 1: Composition, specifications and conformity criteria for common cements*

EN 934-1:2008, *Admixtures for concrete, mortar and grout - Part 1: Common requirements*

EN ISO 787-3, *General methods of test for pigments and extenders - Part 3: Determination of matter soluble in water - Hot extraction method (ISO 787-3)*

EN ISO 787-7, *General methods of test for pigments and extenders - Part 7: Determination of residue on sieve - Water method - Manual procedure (ISO 787-7)*

EN ISO 787-9, *General methods of test for pigments and extenders - Part 9: Determination of pH value of aqueous suspension (ISO 787-9)*

EN ISO 787-13, *General methods of test for pigments and extenders - Part 13: Determination of water-soluble sulfates, chlorides and nitrates (ISO 787-13)*

EN ISO 15528, *Paints, varnishes and raw materials for paints and varnishes - Sampling (ISO 15528)*

ISO 9277, *Determination of the specific surface area of solids by gas adsorption - BET method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
pigment
substance, generally in the form of fine particles, which is practically insoluble in the application medium and whose sole purpose is to colour cement- and/or lime-based building materials

3.2
single pigment
pigment that is of singular (chemical) composition

Note 1 to entry: Single pigments contain no substances other than those originating from the pigment manufacturing process.

Note 2 to entry: Surface treatment of the primary pigment particles is considered as a part of the pigment manufacturing process.

3.3
pigment blend
blend of at least two single pigments, or at least one single pigment and an extender

3.4
aqueous pigment preparation
preparation in which a pigment (single pigment or pigment blend) is dispersed in water, with or without a dispersion or other agent

EXAMPLES of agents are:

– dispersants;

– binding agents (resins);

– solvents;

– wetting agents;

– or combinations thereof.

3.5
pigment in granular form
preparation in which a pigment (single pigment or pigment blend) is converted into granules, by the use of the binding agent which retains the integrity of the granule

3.6
reference sample; standard pigment
sample of a single pigment or a blend (powder, or preparation) retained by the interested parties for comparison for the evaluation of the product properties (e.g. colour)

3.7
extender
inorganic substance, generally in the form of fine particles, which is practically insoluble in the application medium and has no inherent colour properties

4 Requirements

4.1 Effects on concrete properties

4.1.1 General

Pigments for steel reinforced concrete shall additionally meet all Category B requirements given in 4.1.3, 4.2.3 to 4.2.5.

The inorganic pigment dosage shall be 5,0 % solids, carbon black and organic pigment dosage of 2,0 % solids, by mass, based on the cement amount for testing according 5.1.

If a higher dosage of pigment is recommended the tests shall be carried out with that dosage.

The dosage in percent by mass shall be specified by the manufacturer.

4.1.2 Setting time

4.1.2.1 Initial setting time

The initial setting time of cement with the single pigment or a blend (both as powder, granulate or preparation), determined in accordance with 5.1.1, shall be not less than 60 min.

The maximum difference between the initial setting time of mixes with and without the single pigment or a blend (both as powder, granulate or preparation) shall be not greater than 60 min.

4.1.2.2 Final setting time

The final setting time of cement with the single pigment or a blend (both as powder, granulate or preparation), determined in accordance with 5.1.1, shall not be longer than 720 min. The maximum difference between the final setting time of mixes with and without the single pigment or a blend (both as powder, granulate or preparation) shall be not greater than 120 min.

4.1.3 Compressive strength

The 28 day compressive strength of mixes with the single pigment or a blend (both as powder, granulate or preparation), determined in accordance with 5.1.2, shall not be reduced in comparison with the mix without pigment more than

— Category A: the manufacturer’s declared value;

— Category B: 8 %.

4.2 Composition

4.2.1 General

The stability of a pigment with respect to colour shall be linked to the intended end use conditions.

The solids content, as a percentage (%) of aqueous preparations, shall be declared by the manufacturer.

4.2.2 Constitution of pigments

The main constituents of the pigments are determined in accordance with 5.2.1 and 5.2.2.

4.2.3 Water soluble substances

The content of water soluble substances, determined in accordance with 5.2.3, shall not be greater than

— Category A: the manufacturer's declared value

— Category B: 0,5 % by mass for single pigments and pigment blends. Where additives such as dispersion agents, binding agents and/or grinding aids are used for powder and non-powder preparations, their total water soluble content shall be equal to or less than 5,0 % (8 % for carbon black) by mass, based on solids. The used additives shall conform to EN 934-1:2008, Annex A.1.

For pigment blends in powder form, evidence of compliance may be calculated from data recorded for constituent single pigments.

4.2.4 Soluble chloride

The soluble chloride content of a single pigment or a blend (powder, granulate or preparation), determined in accordance with 5.2.4, shall not be greater than

— Category A: the manufacturer's declared value;

— Category B: 0,10 % by mass.

For pigment blends in powder form, evidence of compliance may be calculated from data recorded for constituent single pigments.

Where pigment blends, pigment/extender mixtures, or granulates or aqueous preparations thereof, are used in excess of 5 % based on cement, the total content of halides which are admitted into the concrete should not exceed 0,005 % based on the cement.

4.2.5 Total chlorine

The total chlorine content of a single pigment or a blend (powder, granulate or preparation), determined in accordance with 5.2.5, shall not be greater than

— Category A: the manufacturer's declared value;

— Category B: 0,10 % by mass.

For pigment blends in powder form, evidence of compliance may be calculated from data recorded for constituent single pigments.

4.3 Loss on ignition

The loss on ignition of a single pigment or a blend (powder, granulate or preparation), determined in accordance with 5.3, shall be declared by the manufacturer.

4.4 Emission of radioactivity

Where subject to regulatory requirements, the emission of radioactivity by a single pigment or a blend (powder, granulate or preparation) shall be declared.

4.5 Release of dangerous substances

Where subject to regulatory requirements, the release of dangerous substances by a single pigment or a blend (powder, granulate or preparation) shall be declared.

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: *http://ec.europa.eu/enterprise/construction/cpd-ds/*

4.6 Relative colour strength

The relative colour strength in comparison with the standard pigment, determined in accordance with 5.6, shall be 100 % ± 5 %.

4.7 Residue on sieve

The residue on the sieve of pigment in powder form, determined in accordance with 5.7, shall be declared by the manufacturer.

4.8 pH value

The pH value, determined in accordance with 5.8, shall conform with the manufacturer's specified value ± 2.

4.9 Alkali stability

The manufacturer shall declare that the pigment, tested in accordance with 5.9, is alkali stable.

4.10 Resistance to weathering

The manufacturer shall declare that the pigment, tested in accordance with 5.10, is resistant to weathering.

4.11 Thermal stability

The manufacturer shall declare that the pigment, tested in accordance with 5.11, is thermally stable.

4.12 Colour comparison against standard pigment

The manufacturer shall declare the ΔE value, compared against the standard pigment, tested in accordance with 5.12.

NOTE Research into the repeatability and reproducibility of this test method has shown that samples prepared using the same pigments at five separate laboratories produced results within a ΔE range of 0,5.

5 Test methods

5.1 Effect on concrete properties

5.1.1 Setting time

The influence on the setting time of cement shall be tested using the test method described in EN 196-3, using a paste made with Portland cement CEM I 42,5 R conforming to EN 197-1, with and without the addition of pigment.

5.1.2 Compressive strength

The influence of a pigment on the 28 day compressive strength of the mortar shall be tested in accordance with EN 196-1. The mortar shall be made with Portland cement CEM I 42,5 R conforming to EN 197-1 (same cement as in 5.1.1) with and without the addition of pigment.

The water content of aqueous pigment preparations shall be taken into account.

5.2 Composition

5.2.1 General

Any physical effects are determined by way of comparative tests on pigmented and unpigmented cement paste, mortar or concrete mixes, as appropriate. When using pigment preparations (3.4 and 3.5), the pigment solids content shall be taken into consideration in the mix composition.

Generally, an amount of not more than 10,0 % pigment should be added to cement or lime.

Sampling shall be in accordance with 6.2.

5.2.2 Composition of the pigments

Determine the chemical composition of the pigments (4.2.2) in accordance with the relevant standard (see Bibliography). Where no standard exists, appropriate up-to-date analytical procedures shall be used.

5.2.3 Water soluble substances

The determination of the water soluble content shall be performed in accordance with EN ISO 787-3. In pigment preparations (3.4 and 3.5) the quantity to be used is chosen so that it contains the amount of solids indicated in EN ISO 787-3.

5.2.4 Soluble chloride

Conduct the test for water soluble chloride in accordance with EN ISO 787-13. For pigment preparations (3.4 and 3.5), the quantity to be used is chosen so that it contains the amount of solids indicated in EN ISO 787-3.

5.2.5 Total chlorine

5.2.5.1 Reagents

5.2.5.1.1 Sodium carbonate, anhydrous

5.2.5.1.2 Nitric acid 1:1 (1 volume 65 % nitric acid (density 1,4 g/cm^3) and 1 volume water)

5.2.5.1.3 0,1 N silver nitrate solution

5.2.5.2 Procedure

Measure (1,000 ± 0,001) g of the sample (mass M) and completely mix it with 6 g to 8 g sodium carbonate (5.2.5.1.1). Heat the mixture carefully in a porcelain or nickel crucible until a clear melt is obtained. After cooling, crush the melt in a pestle and take it up in water. Wash with diluted (hot) sodium carbonate solution until the filtrate is sulphate free (no turbidity of barium sulphate solution). Slightly acidify the filtrate with nitric acid (5.2.5.1.2). Measure the total chlorine content in the filtrate by potentiometric titration with 0,1 N silver nitrate solution (5.2.5.1.3) using a semi-micro burette (consumption a). A blank value shall be measured.

The total chlorine content in % is:

$$Total\ chlorine\ content = \frac{0{,}003\,546 \cdot a}{M} \cdot 100 \quad (1)$$

where

a is the consumption of 0,1 N silver nitrate solution in cm^3;

M is the weighed sample mass in g.

5.3 Loss on ignition

Weigh 2 g to 5 g (to an accuracy of 1 mg) of pigment (m_1) that has been dried to constant mass at 105 °C ± 5 °C and calcine it to constant mass at (1 000 ± 50) °C. Cool in a dessicator to room temperature and weigh again (m_2). Calculate the loss on ignition L as a percentage by mass using the following formula:

$$L = \frac{m_1 - m_2}{m_1} \cdot 100 \quad (2)$$

where

m_1 mass, in grams, of the pigment under test;

m_2 mass, in grams, of the residue after ignition and cooling.

5.4 Emission of radioactivity

Where required, a relevant test method should be used.

5.5 Release of dangerous substances

Where required, a relevant test method should be used.

5.6 Relative colour strength

5.6.1 General remarks

The relative colour strength attained in coloured cement or cement/lime bound construction materials is determined by means of the following special test methods.

Pigments in powder form shall be tested by dry mixing with a white material in fine powder form, in accordance with 5.6.2, or by wet mixing, in accordance with 5.6.3 or 5.6.4. The relative colour strength of aqueous pigment preparations and granulates shall be tested in accordance with 5.6.3 or in a wet mix with cement in accordance with 5.6.4. Testing may be carried out in accordance with alternative test methods with a proven correlation to the standard methods.

The test method 5.6.4 shall be the reference method.

The measurement of colour strength shall be carried out well below the point of colour saturation in a given formulation. This is the point at which an increase in pigment loading produces no noticeable change in colour intensity.

5.6.2 Relative colour strength in barytes or white Portland cement CEM I (dry mix)

5.6.2.1 Equipment and test materials

5.6.2.1.1 Analytical balance, capable of weighing to the nearest 0,1 mg.

5.6.2.1.2 200 ml jars, thick-walled, for shaking the mix.

5.6.2.1.3 Stainless steel balls, (5,0 ± 0,5) mm in diameter.

5.6.2.1.4 Stopwatch.

5.6.2.1.5 Sieve, for separating the stainless steel balls.

5.6.2.1.6 Spatula.

5.6.2.1.7 Paper with rough surface texture.

5.6.2.1.8 Barytes of 1 m^2/g to 2 m^2/g specific surface area measured by the BET method as described in ISO 9277, or white Portland cement CEM I.

5.6.2.1.9 Pigment in powder form, to be used as a reference sample.

5.6.2.1.10 Mechanical sieve machine or shaker.

5.6.2.2 Test procedure

The pigment sample (0,1 g to 0,5 g weighed to the nearest 0,1 mg) and 10,00 g of the white material are weighed into the shaker jar. After adding 200 stainless steel balls, mix for 3 min with the mechanical sieve machine or shaker. If a suitable machine is not available the jar may be hand-shaken until a thorough mix is obtained. Abraded glass shaking jars and corroded steel balls shall be discarded.

Sieve the contents of the jar to remove the stainless steel balls. The resultant dry powder mix shall appear without streaks when spread and smoothed out with the spatula on the rough paper. If streaks are apparent, the test shall be repeated using a longer shaking time.

Prepare a mix of the reference sample in a similar manner.

To determine the colour strength, place the mixes alongside each other on the paper and draw down with the spatula, so that the mixes touch but do not intermix.

Compare the drawdowns visually and, if different, adjust the amount of pigment in the test mix and repeat until parity with the reference sample mix is achieved.

5.6.2.3 Calculation of result

The relative colour strength F, in %, of the pigment tested is calculated using the formula:

$$F = \frac{m_R}{m_T} \cdot 100 \qquad (3)$$

where

m_R is the mass of the reference sample, in g, in the mix;

m_T is the mass, in g, of the test pigment, in the mix.

NOTE In this formula, a stronger pigment relative to the reference sample will give a value exceeding 100 %.

5.6.3 Determination of relative colour strength in barytes (wet mix)

5.6.3.1 Equipment and test material

As indicated in 5.6.2.1, together with:

5.6.3.1.1 Film applicator or drawdown bar, giving a wet film thickness of 500 µm

5.6.3.1.2 Glass plates

5.6.3.1.3 Forced-air drying oven

5.6.3.1.4 Aqueous preparation (or pigment in powder or granular form) and a reference sample

5.6.3.1.5 Tap water

5.6.3.2 Test procedure

The pigment sample (0,3 g to 1,5 g weighed to the nearest 0,1 mg) and 30,00 g of barytes are weighed into the shaker jar. Add 300 stainless steel balls and sufficient water to produce a free flowing suspension. The suspension shall separate easily from the stainless steel balls and be easily drawn down.

Shake the jar as described in 5.6.2.2.

Sieve the aqueous suspension directly after the shake cycle.

Draw out the aqueous suspension on a glass plate, using the film applicator, and dry in the oven at 105 °C ± 5 °C for 15 min. Scrape the dried mixture from the glass plate and follow the dry mix procedure in accordance with 5.6.2.2; mix for 1 min to pulverize the mix.

Prepare a mix using the reference sample in similar manner and compare.

Compare the drawdowns visually and, if different, adjust the amount of pigment in the test mix and repeat until parity with the reference sample mix is achieved.

Calculate the test results in accordance with 5.6.2.3.

NOTE For further details, see Annex A.

5.6.4 Determination of relative colour strength in white Portland cement mortar (wet mix)

5.6.4.1 Test procedure

Mortar test pieces are made using the pigment to be tested and the reference sample. After curing, the test pieces are split and their split faces are compared.

5.6.4.2 Preparation of test pieces

The making of the mortar mix and the preparation, compaction and storage of the test pieces are all performed in accordance with EN 196-1. Cement from the same batch shall be used for the pigment to be tested and for the reference sample.

The following deviations from EN 196-1 are permitted:

— The prescribed work area climate need not be adhered to.

— Smaller test mixes may be used provided that they have the same ratio of ingredients.

— The amount of pigment to be used will normally lie between 1,0 % and 5,0 % by mass of dry solids on the basis of the cement.

— The norm sand may be substituted by a clean sand passing a 2 mm sieve and retained on a 63 µm sieve, both in accordance with ISO 3310-1.

— To optimize dispersion of the pigment, whether a powder, granule or a liquid preparation, it is recommended that the sand and the pigment should be dispersed first and mixed for 20 s. Then add the water, mix for 20 s, add the cement, and continue mixing for a further 30 s to 60 s; the same procedure shall be used for the reference sample.

— The water content of liquid preparations shall be taken into account in the mix design.

— The mould should provide a cross-sectional area of not less than 30 mm by 30 mm. Other suitable moulds may be used instead of the steel mould.

— If a vibration-table or shock-table is not available, the effect may be simulated by repeatedly tapping the mould on a hard surface. To deaerate the mix, the mould should be filled and compacted in stages.

— If a humidified air chamber is not available for curing the test pieces, they may be stored for up to 48 h at ambient temperature in a desiccator filled to just below the support plate with water.

— The test sample and the reference sample shall be compacted and cured under identical conditions.

5.6.4.3 Evaluation of test

After curing for an additional 24 h under ambient conditions, split the test and the reference pieces and visually assess the colour strength of the split faces. If different, adjust the amount of pigment in the test mix and repeat 5.6.4.2 (with a new reference sample) until parity with the reference sample mix is achieved.

Calculate the test result in accordance with 5.6.2.3.

NOTE For further details, see Annex A.

5.7 Residue on sieve

For pigments in powder form determine the residue on a 90 µm sieve in accordance with EN ISO 787-7. For pigment blends, evidence of compliance is calculated from data recorded for constituent single pigments.

5.8 pH value

Determine the pH-value in accordance with EN ISO 787-9.

5.9 Alkali stability

5.9.1 General remarks

The test assesses the stability of pigments against the alkalinity of cement- and/or lime-based materials without the influence of outdoor weathering.

5.9.2 Preparation of test pieces

Prepare the test pieces in accordance with 5.6.4.2 using a cement as specified in 5.1.1.

5.9.3 Test procedure

Take the test pieces out of the mould after 24 h curing, place them in a desiccator filled with water to just below the supporting plate, and store for 6 d.

Store for a further 6 d in a covered glass or plastic container completely filled with water; replace the water after 2 d and after 4 d.

Allow the test pieces to dry for 3 d at room temperature in air, avoiding exposure to direct sunlight. At the same time prepare fresh reference pieces for comparison purposes. Cure under the same conditions for 24 h, take out of the mould and allow to dry for 2 d in air at room temperature, avoiding exposure to direct sunlight.

Test and reference pieces are split and compared visually, both on the split face and the smooth surfaces. If necessary, remove efflorescence by washing with diluted (approximately 5,0 %) hydrochloric or formic acid, thoroughly rewash with water and dry.

The pigment is regarded as being alkali stable if the test sample has remained similar to the reference sample.

Different cements can lead to a lightening of the split faces of the specimen as a result of the ongoing hydration process. Should testing point to an unsatisfactory colour stability of the pigment in the cement, the test shall be repeated using a pigment with established colour stability to determine whether the lightening of the split face is traceable to the hydration of the cement.

NOTE For further details, see Annex A.

5.10 Resistance to weathering

Resistance to weathering is evaluated by comparing a weathered specimen with an unweathered reference specimen; the test method shall be agreed between the interested parties.

Outdoor weathering shall be the reference method. The following basic rules apply:

— The test shall be conducted in the same building material to be coloured by the pigment.

— If several pigments are tested in relation to each other the test specimen shall be produced in an identical manner.

— Test specimen shall be free of coatings on their weather-exposed surfaces; for example pigmented or transparent acrylate coatings, mould release oils, water repellent impregnation's (e.g. silicones), etc.

— Reference specimen used for comparison shall be stored dry and in the dark. During the course of time a small degree of efflorescence may occur. This should be taken into account when comparing test and reference specimens.

— The test specimen shall be exposed at an angle of 45°, facing south.

— To avoid misinterpretation of the results, the first evaluation of the test specimen shall not take place until the unavoidable efflorescence has been removed by weathering. Experience demonstrates that this is usually the case after two years. This is recommended as the minimum exposure period subject to the agreement by the two parties.

— Exposure in one weathering location allows a reliable statement with respect to the resistance to weathering for that location only. If results are to be generalized, then test specimen shall be placed in different climatic and environmental conditions.

If admixtures are added this shall be mentioned in the test report.

NOTE For further details, see Annex A.

5.11 Thermal stability

The evaluation of the thermal stability of a pigment is only required if it is to be exposed to a temperature exceeding 80 °C during the manufacture of the building material.

The thermal stability of a pigment can play a role during the manufacture of building materials by a production process involving elevated temperature (e.g. autoclave curing). Such processes cannot be simulated by simple laboratory tests.

A test method shall be agreed between the interested parties.

5.12 Colour comparison against the standard pigment

5.12.1 General

The total colour difference attained in coloured cement or cement/lime bound construction material is determined by means of a special test method. The pigment (as defined in 3.1 to 3.5) shall be tested in a mortar mix in accordance with the following method. Testing may be carried out in accordance with alternative test methods with a proven correlation to this standard method.

The measurement of total colour difference shall be carried out well below the point of colour saturation in a given formulation. This is the point at which an increase in pigment loading produces no noticeable change in colour intensity.

Sampling shall be in accordance with 6.2.

5.12.2 Equipment and test materials

5.12.2.1 **Analytical balance**, capable of weighing to the nearest 0,01 g.

5.12.2.2 **Mixer**, as described in EN 196-1:2005, 4.4.

5.12.2.3 **Timer**

5.12.2.4 **Steel mould** for 10 cm × 10 cm blocks.

5.12.2.5 **Hydraulic press**, pressure force 110 kN.

5.12.2.6 **Colourimeter or Spectrophotometer**: light source C or D.

5.12.2.7 **Silica sand fractions** 0,2 mm to 1,0 mm and 1,0 mm to 2,0 mm.

5.12.2.8 Limestone powder (<5 % sieve residue on 90-µm sieve).

5.12.2.9 Grey Portland cement CEM I 42.5 R

5.12.2.10 Pigment to be used as a reference sample

5.12.3 Mortar formulation:

1 200 g	Silica sand 0,2 mm to 1,0 mm
600 g	Silica sand 1,0 mm to 2,0 mm
200 g	Limestone powder
500 g	Grey cement
175 g	Tap water, w/c value 0,35

Pigment: different quantities are to be used (by weight of solids for dispersions) as follows:

Inorganic coloured pigments	15,0 g
Inorganic black pigments	15,0 g (additionally 30,0 g titanium dioxide for reduction)
Carbon black	5,0 g (additionally 30,0 g titanium dioxide for reduction)
Organic pigments	5,0 g.

5.12.4 Test procedure

Place the sands, limestone powder and the pigment in the mixing vessel and stir dry for 10 s at a slow stirrer speed (approximately 140 min^{-1}). Pour the water into the middle of the mixture and when it has been absorbed add the cement. Continue mixing by stirring slowly (approximately 140 min^{-1}) for a further 200 s.

Weigh 600 g of the mixture into a polyethylene beaker, transfer it into the steel mould and press for approximately 2 s.

Colour measurement should be carried out immediately after pressing. Any contamination (e.g. mortar crumbs) shall be removed from the surface of the block. The measuring head of the calibrated colourimeter/spectrophotometer shall be laid flat close to a corner of the mortar block. The measurement is then repeated 3 more times at the other corners of the block and the values are averaged.

5.12.5 Evaluation of test

Determine the colour difference of the pigment under test against the relevant pigment standard.

The comparison shall be carried out with the same instruments and settings.

The total difference ΔE^*_{Lab} between two colours is the geometrical distance between their positions in the CIE 1976 ($L^*a^*b^*$) colour space (see EN ISO 11664-4), and is calculated by using the following formula:

$$\Delta E^*_{Lab} = \left[\left(\Delta L^* \right)^2 + \left(\Delta a^* \right)^2 + \left(\Delta b^* \right)^2 \right]^{\frac{1}{2}} \quad (4)$$

where

ΔL^* is the difference of L^* reference sample to L^* of test sample;

Δa^* is the difference of a^* reference sample to a^* of test sample;

Δb^* is the difference of b^* reference sample to b^* of test sample .

Tolerance: the pigment manufacturers shall state values.

6 Assessment and verification of constancy of performance – AVCP

6.1 General

The compliance of the pigments with the requirements of this standard and with the performances declared by the manufacturer in the DoP shall be demonstrated by:

— determination of the product type;

— factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performance(s).

6.2 Sampling

The sample taken for testing shall be representative of the pigment, traceable and clearly labelled. The quantity taken shall be not less than 4 times the amount required for testing and the remainder shall be retained for not less than 2 years.

Samples taken for quality control purposes shall be representative, as described in EN ISO 15528.

6.3 Conformity criteria

Conformity of pigment to this standard shall be proved in accordance with 6.4 and continually evaluated in accordance with 6.5. The properties and test methods for the initial testing and factory production control and the minimum testing frequencies for the factory production control by the manufacturer are specified in Table 1.

6.4 Product type determination

The product type determination shall be carried out by the manufacturer of the pigment, to prove the conformity of the pigment to the requirements of this standard.

The tests on single pigments shall be conducted in the form in which they are being introduced to the market (powder, granulate or aqueous preparation).

In the case of pigments in non-powder forms only the specimen with the highest amount of given dispersing, binding or other agents need to be tested.

For blends of single pigments - with or without extenders - in any of the three forms (powder, granulate or aqueous preparation), the tests shall be performed with the single pigments which form the blend.

An initial test is also required when

a) a new type of pigment is produced,

b) given types of dispersing, binding or other agents are changed or the amounts are increased.

The product type determination shall include tests specified in Table 1.

Table 1 — Properties, test methods, initial testing and minimum testing frequencies for the factory production control

Property	Test method	Initial testing	Frequency for the factory production control		
			Single Pigment	Pigment blend	Granulate or preparation
Setting time*	5.1.1	Yes	1 per 2 year	[c]	1 per 2 year
Compressive strength*	5.1.2	Yes	1 per 2 year	[c]	1 per 2 year
Composition of the pigments*	5.2.2	Yes	-	[b]	-
Water soluble substances*	5.2.3	Yes	1 per batch[f]	[b]	1 per batch
Soluble chloride*	5.2.4	Yes	1 per 2 year 1 per batch[a, d]	[b]	1 per 2 year 1 per batch[a, d]
Total chlorine*	5.2.5	Yes	1 per 2 year 1 per batch[a, d]	[a b]	1 per 2 year 1 per batch[a, d]
Loss on ignition*	5.3	Yes	1 per 2 year	[b]	1 per 2 year
Relative colour strength	5.6[e]	Yes	1 per batch	1 per batch	1 per batch
Residue on sieve	5.7	Yes	-	-	-
pH value	5.8	Yes	-	-	-
Alkali stability	5.9	Yes	-	-	-
Resistance to weathering	5.10	Yes	-	-	-
Thermal stability	5.11	Yes	-	-	-
Colour comparison in reduction against pigment standard	5.12	Yes	1 per batch	1 per batch	1 per batch

[a] If the initial test shows no significant difference between total chlorine content and water soluble halides content only one of the two properties need to be determined.

[b] For pigment blends, evidence of compliance may be calculated from data recorded for constituent single pigments.

[c] Not to be tested – refer to constituent single pigment data.

[d] Only for Category B

[e] For the initial testing, method 5.6.4 shall be used.

[f] The testing frequency may be reduced to once per day for a series of consecutive production runs of any given product conforming to category A.

* Mandated requirements (see Annex ZA).

6.5 Factory production control

6.5.1 Concept

6.5.1.1 Introduction

Production control means the permanent internal control of production of pigment or pigment blend (powder, granulate or preparation) exercised by the manufacturer and consists of internal quality control (see 6.6) and factory production control of samples of pigment taken at the point of release (see 6.5.1.5).

The measures which are carried out for a certification according to EN ISO 9000 by the producer should be accepted for the production control according to this standard.

6.5.1.2 Works' quality manual

The manufacturer's documentation and procedures for the production control shall be described in a works' quality manual, which shall adequately describe, among other things:

a) the quality aims and the organizational structure, responsibilities and powers of the management with regard to product quality and the means to monitor the achievement of the required product quality and the effective operation of the internal quality control (see 6.6);

b) the manufacturing and quality control techniques, processes and systematic actions that will be used (see 6.6.1, 6.6.3 and 6.5.1.6);

c) the inspections and tests that will be carried out before, during and after manufacture, and the frequency with which they will be carried out (see Table 1).

The works' quality manual prepared by the manufacturer for each production plant shall include an adequate system of documentation (see 6.5.1.4 and 6.5.1.8).

The works' quality manual shall address and document the procedures operated to ensure that the pigment conforms to the technical specifications. The manual may reference associated documents which provide further details of the factory production control of samples and the internal quality control. For the purpose of this scheme, the term works' quality manual shall be considered to include these associated documents.

6.5.1.3 Management systems

6.5.1.3.1 Quality policy statement

The works' quality manual shall include a statement by management defining its quality policy, objectives and commitments to the attainment of product quality.

6.5.1.3.2 Management representative

The manufacturer shall appoint a management representative who, irrespective of other responsibilities, shall have defined authority and responsibility for ensuring that the requirements of EN 12878 for the evaluation of conformity are implemented and maintained.

6.5.1.3.3 Internal audits and management review

In order to ensure the continuing suitability and effectiveness of the work's quality manual to meet the requirements of EN 12878, the manufacturer shall perform at least once per year:

a) internal audits covering the scope of 6.5;

b) a management review of the production control, taking into account records of the internal audits.

6.5.1.3.4 Training

The works' quality manual shall describe the measures taken to ensure that all the personnel involved in operations that can affect internal quality control and product quality have appropriate experience or training. Appropriate records shall be retained.

6.5.1.4 System of documentation

6.5.1.4.1 Document control

The management representative shall be responsible for the control of all documents and data related to the production control and to this scheme for the evaluation of conformity.

This control shall ensure that the appropriate issues of all documents are available at essential locations, that obsolete documents are withdrawn and that changes or modifications to any document are effectively introduced.

A master list shall be established to identify the current version of documents in order to prevent the use of non-applicable documents.

6.5.1.4.2 Quality records

The manufacturer shall retain records of production control for at least 5 years.

6.5.1.5 Sampling and testing

The manufacturer shall operate a system of factory production control testing for each certified pigment. This system shall be used to demonstrate conformity to the requirements in the clause entitled “Conformity criteria”. The properties to be tested, the testing methods, the minimum frequency of factory production control testing during routine testing and initial period testing and the conformity criteria shall be in accordance with the basic requirements given in Table 1. Testing may be carried out in accordance with alternative test methods with a proven correlation to the standard methods. For pigments not being dispatched continuously, the frequency of testing and the point of sampling shall be as specified in the works' quality manual.

All test data shall be recorded.

6.5.1.6 Corrective action

The works' quality manual shall document procedures for the review and adjustment of the production control in case of non-conformity.

The actions taken in the event of non-conformity shall be recorded in a report subject to inspection during the management review.

In the event of pigment yielding a test result not conforming to the single result limit value conformity criteria specified in this standard, the manufacturer shall immediately determine the affected quantity, take appropriate action to prevent the dispatch of this quantity and inform the affected customer if such pigment has been released. In addition, the manufacturer shall immediately determine the causes of such non-conformity, take corrective actions and undertake a review of all relevant production control procedures. All such actions and findings shall be appropriately recorded in a report subject to inspection during the management review.

NOTE The certification body may require to be kept informed of these actions and findings.

6.5.1.7 Measuring and test equipment for factory production control testing

The equipment used for factory production control testing shall be regularly checked and calibrated in accordance with procedures and frequencies laid down in the works' quality manual.

The works' quality manual shall document procedures to ensure that all personnel involved in factory production control testing have appropriate experience and training. Appropriate records shall be retained.

6.5.1.8 Quality records

The manufacturer shall retain records of the factory production control test results and appropriate records on test equipment for at least 5 years.

6.6 Internal quality control

6.6.1 Process control

6.6.1.1 General

The works' quality manual shall describe the parameters for process planning, process control and testing, inspection, corrective action, verification, dispatch and the associated records.

Depending on the installation, the following measures shall be provided:

— in-process testing of pigment properties;

— silos of adequate capacity for storage of the pigment produced allowing a proper identification of the product and giving possibilities of taking spot samples at any time without prior notice.

6.6.1.2 Provisions for processing plants

In production plants for controlled processing of pigment the relevant information all operating steps in the process shall be documented in the works' quality manual by the manufacturer in agreement with the certification body. The following data shall be at least part of this documentation:

— the production location from which the pigment originates;

— an acknowledgement that the pigment is according to this standard;

— the documented suitability.

6.6.1.3 Control of off-specification production

The works' quality manual shall contain procedures to ensure that off-specification production is adequately managed.

6.6.2 Measuring and testing

6.6.2.1 Inspection, measuring and test equipment

The equipment for in-process inspection and testing shall be regularly checked and calibrated in accordance with the procedures and frequencies laid down in the works' quality manual.

6.6.2.2 Inspection and test status

Procedures for the inspection and test status through the stages of manufacture shall be detailed in the works' quality manual. These shall include procedures for the control of off-specification intermediate materials.

6.6.3 Handling, storage, packaging and delivery

The works' quality manual shall describe the precautions taken for the protection of the quality of the pigment while under the responsibility of the manufacturer. It shall include a description of the procedures used at depots. Delivery documentation shall allow traceability to the producing works.

6.7 Frequency of inspections

The inspections shall normally be carried out once per year.

Annex A
(informative)

Further information regarding test methods

A.1 Reference to 5.6.2 "*Relative colour strength in barites white Portland cement CEM I (dry mix)*" and 5.6.3 "*Determination of relative colour strength in barytes (wet mix)*"

Prior to testing, the suitability of the white Portland cement (CEM I) should be confirmed by making several mixes at the same pigment loading using different shake times and comparing the results. If the colour strength of a mix drops noticeably after a shake duration of about 10 min the white material is unsuitable.

The sensitivity of a pigment to grinding may also be a problem, although this phenomenon is rare with inorganic pigments. Breakdown of pigment particles may be recognized by an apparent change in hue and colour strength as dispersion time increases. In such cases, any other method of determining colour strength also becomes problematic.

Aqueous pigment preparations have a limited storage life due to their tendency to settle. They are therefore not suitable for long term use as a reference sample.

A.2 Reference to 5.9 "*Alkali stability*"

Because of the longer curing time, exposed faces of split test pieces contain a higher proportion of fractured aggregate particles than the younger reference pieces. Because of the inherent colour of the split aggregate, comparative visual assessment becomes more difficult.

A.3 Reference to 5.10 "*Resistance to weathering*"

The term resistance to weathering includes phenomena such as chemical stability (e.g. some ultramarine blues), light fastness (most organic pigments) and erosion of pigment particles from the cement matrix.

The result of the resistance to outdoor weathering test is dependent on several factors (e.g. composition of the concrete, water cement ratio, compaction, admixtures, etc) which influence the degree of efflorescence. Any residual efflorescence affect the result.

Use of a single cement mortar as the test medium and/or outdoor exposure at a single location does not give results that can be generalized.

Accelerated and/or artificial weathering test(s) may be agreed between the interested parties.

To date, no laboratory test procedure has been identified which satisfactorily reproduces the effects of natural weathering.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under the mandate M/128, “Products related to concrete, mortar and grout” given to CEN by the European Commission and the European Free Trade Association.

If this European standard is cited in the Official Journal of the European Union (OJEU), the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the pigments for the colouring of building materials based on cement and/or lime intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as in Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1.

Table ZA.1 — Relevant clauses for pigments and intended use

Product: Pigments for the colouring of building materials based on cement and/or lime **Intended use:** Coloration of building materials based on cement, cement/lime combinations and mortar			
Essential characteristics	**Clauses in this and other European Standard(s) related to essential characteristics**	**Regulatory classes**	**Notes**
Setting time	4.1.2	–	pass/fail
Compressive strength	4.1.3	–	declaration of category
Composition of the pigments	4.2.2	–	pass/fail
Water soluble substances	4.2.3	–	declaration of category
Soluble chloride	4.2.4	–	declaration of category
Total chlorine	4.2.5	–	declaration of category
Loss on ignition	4.3	–	declare
Emission of radioactivity and release of dangerous substances	4.4, 4.5	–	

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential characteristics for the intended use of the product.

In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option “No performance determined” (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

ZA.2 Procedure for AVCP of pigments for use in the colouring of building materials based on cement and cement/lime combinations

ZA.2.1 Systems of Assessment and verification of constancy of performance (AVCP)

The AVCP system of pigments for use in the colouring of building materials based on cement and cement/lime combinations indicated in Table ZA.1, established by EC Decision(s) 1999/469/EEC of 15 June 1999 published as OJ L184 and amended by the Commission Decision 2001/596/EC (published as L209) is shown in Table ZA.2 for the indicated intended use(s) and relevant level(s) or class(es) of performance.

Table ZA.2 — System of AVCP

Product(s)	Intended use(s)	Level(s) or class(es) of performance	AVCP system(s)
Additions (Type I)	For concrete, mortar and grout	-	2+
System 2+: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.3 including certification of the factory production control by a notified production control certification body on the basis of initial inspection of the manufacturing plant and of factory production control as well as of continuous surveillance, assessment and evaluation of factory production control.			

The AVCP of the pigments for use in the colouring of building materials based on cement and cement/lime combinations in Table ZA.1 shall be according to the AVCP procedures indicated in Table ZA.3 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

Table ZA.3 — Assignment of AVCP tasks for the pigments for use in the colouring of building materials based on cement and cement/lime combinations under system 2+

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	6.5
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use which are declared	6.4
	Further testing of samples taken at factory according to the prescribed test plan	Essential characteristics of Table ZA.1 relevant for the intended use which are declared	6.5.1
Tasks for the notified production control certification body	Initial inspection of the manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which are declared. Documentation of the FPC.	6.5
	Continuous surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1, relevant for the intended use which are declared. Documentation of the FPC.	6.5

ZA.2.2 Declaration of performance (DoP)

ZA.2.2.1 General

The manufacturer draws up the DoP and affixes the CE marking on the basis of the different AVCP systems set out in Annex V of the Regulation (EU) No 305/2011:

In case of products under system 2+

— the determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; the factory production control and the testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and

— the certificate of conformity of the factory production control, issued by the notified production control certification body on the basis of:

  — initial inspection of the manufacturing plant and of factory production control, and

  — continuous surveillance, assessment and evaluation of factory production control.

ZA.2.2.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011.

According to this Regulation, the DoP shall contain, in particular, the following information:

— the reference of the product-type for which the declaration of performance has been drawn up;

— the AVCP system or systems of the construction product, as set out in Annex V of the CPR;

— the reference number and date of issue of the harmonized standard which has been used for the assessment of each essential characteristic;

— where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

a) the intended use or uses for the construction product, in accordance with the applicable harmonized technical specification;

b) the list of essential characteristics, as determined in the harmonized technical specification for the declared intended use or uses;

c) the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;

d) where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared;

e) the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market;

f) for the listed essential characteristics for which no performance is declared, the letters “NPD” (No Performance Determined).

Regarding the supply of the DoP, Article 7 of the Regulation (EU) No 305/2011 applies.

The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No 1907/2006, (REACH) shall be provided together with the DoP.

[In case of structural products, methods for determining the properties related to Basic Work Requirement (BWR) N° 1 “Mechanical resistance and stability” (including such aspects of BWR N°4 “Safety in use”, which relate to mechanical resistance and stability) and aspects of BWR N° 2 “Resistance to fire”, to be declared as information accompanying the CE marking.

The relevant TCs shall complete the Annex ZA included in candidate harmonized standards under development and shall provide for one or several or all methods on the basis of relevant CEN Guidance document]

ZA.2.2.3 Example of DoP

The following gives an example of a filled-in DoP for vertical air/flue terminals:

DECLARATION OF PERFORMANCE
No. 001-DOP-2013/05/12

1. Unique identification code of the product-type:

   Pigment A

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4):

   Pigment A – PA/125

3. Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:

   In concrete, mortar and grout applications.

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5):

   AnyCo SA,
   PO Box 21
   B-1050 Brussels, Belgium
   Tel. +32987654321
   Fax: +32123456789
   Email: anyco.sa@provider.be

5. Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2):

   Anyone Ltd
   Flower Str. 24
   West Hamfordshire
   UK-589645 United Kingdom
   Tel. +44987654321
   Fax: +44123456789
   e-mail: anyone.ltd@provider.uk

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V:

System 2+

7. In case of the declaration of performance concerning a construction product covered by a harmonized standard:

Notified factory production control certification body No. 4567 performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and evaluation of factory production control and issued the certificate of conformity of the factory production control.

8. Declared performance

Essential characteristics	Performance	Harmonized technical specification
Setting time	**Pass**	EN 12878: 2014
Compressive strength	**Category A**	
Composition of pigments	**Pass**	
Water soluble substances	**Category A**	
Soluble chloride	**Category A**	
Total chloride	**Category A**	
Loss of ignition	**2 %**	
Emision of radioactivity and release of dangerous substances	**NPD**	

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

……
(name and function)

…….…… …….……
(place and date of issue) (signature)

ZA.3 CE marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly:

— to the packaging

or

— to the accompanying documents.

The CE marking shall be followed by:

— the last two digits of the year in which it was first affixed;

— the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;

— the unique identification code of the product-type;

— the reference number of the declaration of performance;

— the level or class of the performance declared;

— the dated reference to the harmonized technical specification applied;

— the identification number of the notified body;

— the intended use as laid down in the harmonized technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

Figure ZA.1 gives an example of the information related to products subject to AVCP under each of the different systems to be given on the packaging or on the accompanying documents.

CE 4567	*CE marking, consisting of the "CE"-symbol*
AnyCo Ltd, PO Box 21, B-1050, Brussels, Belgium **14** 001-DOP-2013/05/12	*Identification number of the notified production control certification body* *Name and the registered address of the manufacturer, or identifying mark* *Last two digits of the year in which the marking was first affixed* *Reference number of the DoP*
EN 12878:2014 Pigment PA/125 intended to be used in concrete, mortar and grout applications	*No. of European Standard applied, as referenced in OJEU* *Unique identification code of the product-type* *Intended use of the product as laid down in the European Standard applied*
Setting time: Pass **Compressive strength:** Category A **Composition of the pigments:** Pass **Water soluble substances:** Category A **Soluble chloride:** Category A **Total chlorine:** Category A **Loss on ignition:** 2 % **Dangerous substances:** NPD	*Level or class of the performance declared*

Figure ZA.1 — Example CE marking information of pigments under AVCP system 2+

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[6] EN ISO 9000, *Quality management systems - Fundamentals and vocabulary (ISO 9000)*

[7] EN ISO 11664-4, *Colorimetry - Part 4: CIE 1976 L*a*b* Colour space (ISO 11664-4)*

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