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Guidelines for a procedure to support the European standardization of cements

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Guidelines for a procedure to support the European standardization of cements

Directrices générales pour l'obtention du soutien de la standardisation européenne des ciments

Leitlinien für ein Verfahren zur Unterstützung der europäischen Normung von Zement

This Technical Report was approved by CEN on 24 May 2016. It has been drawn up by the Technical Committee CEN/TC 51.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (CEN/TR 16912:2016) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by NBN.

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

Introduction

The willingness to improve construction products leads to the optimization of existing cements as well as to the development of new binders. Improvement may concern in particular the performance of the products, the reduction of production costs or the lowering of the environmental impact. With regards to the environment, a fundamental policy objective of the European Union is to encourage/incentivise a reduction in CO_2 emissions within a framework of sustainable development. Cement manufacturers are reducing their specific CO_2 emissions e.g. by the production of cements with a lower clinker content. At the same time, the expectations of contractors, ready-mixed concrete producers and precast concrete manufacturers should also be met by maintaining high levels of performance in cements and in the durability of concrete.

Existing cement standards, in particular EN 197-1, allow manufacturers to select cement compositions with low clinker content, i.e. CEM III/B and C, CEM IV/B, CEM V. However, these cements are often used for their good resistance to chemically aggressive environments but do not necessarily achieve, in concrete, the early age strength required where formwork is to be removed at less than 24 h.

Maintaining performance, in particular early strength and durability related characteristics, while reducing specific CO_2 emissions by the development of new types of cement is expected to be one of the main challenges of the coming years.

When considering such new cements intended to be used to produce structural concrete the question arises whether these products should be covered by European Standards or by European Technical Assessments (ETAs). For an answer, the various EU policy documents referenced in the bibliography should be considered, in particular the “Council Conclusions on standardization and innovation (Brussels, 25 September 2008)” [7] which highlight “the essential contribution which standardization can make towards developing innovation and competitiveness, by facilitating access to markets, enabling interoperability between new and existing products, services and processes, enhancing protection of users, giving consumers confidence in innovations and disseminating research results”. CEN and CENELEC have responded to all the EU initiatives and adopted, in October 2008, an integrated approach titled “Standardization Innovation and Research (STAIR)”. From this common approach of the EU and CEN, it is clear that European standardization may cover innovation.

An application to standardize a new cement should be submitted to the Technical Committee CEN/TC 51 based on a dossier introduced by the applicant who may, according to CEN/CENELEC Internal Regulations – Part 2:2015 [14], be a national standardization body (CEN Member), a CEN Technical Committee, the EU or EFTA Secretariat, an international organization or an European trade, professional, technical or scientific organization. It is essential that all applicants are aware in advance of the information they should provide to CEN/TC 51 in the dossier in order to demonstrate the fitness for intended use of the new cement. For this purpose, CEN/TC 51 has prepared this CEN Technical Report.

1 Scope

This CEN Technical Report provides guidance for the procedure to be followed in order to support the European standardization of new cements that are not covered by an existing European Standard.

The term "new cement" has been used in this document to describe its primary focus; however, this same guideline procedure may be used for other products to be standardized by CEN/TC 51.

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

EN 197-2, *Cement — Part 2: Conformity evaluation*

EN 206, *Concrete — Specification, performance, production and conformity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 197-1, EN 197-2 and EN 206 apply.

4 Procedure of application and standardization of a new cement

4.1 General information on standardization processes

For general information on the process of European product standardization, see http://boss.cen.eu/Pages/default.aspx.

4.2 Classification of new cements

The procedure to be followed in order to support the European standardization of a new cement depends on the type of the cement, i.e. on the question whether the new cement is similar to cements that already have been standardized by CEN/TC 51. Following this principle, new cements can be classified in the following three categories:

1) Category 1: cement from a new combination of traditional and well-tried constituents;

2) Category 2: cement basically corresponding to cement types defined in existing standards but containing one or more new constituents;

3) Category 3: cement differing substantially from those types defined in existing standards, e.g. produced with a new kind of clinker or based on different physicochemical phases/principles.

Cement of category 2 should be similar to common cements, i.e. its hydration should be based on the formation of calcium silicate hydrates (CSH).

4.3 General criteria for the assessment of new cements

The general requirements for assessing new cements differ depending on their classification according to 4.2; these requirements should be fulfilled before CEN/TC 51 considers the possibility of European standardization of a new cement:

— for cements of category 1, the mechanical, physical and chemical performances listed in 5.3 as well as durability related characteristics described in 5.4.3 should be assessed, taking into account the intended use of the cement.

— for cements of category 2, in addition to the requirements for cement of category 1, the potential environmental and health impacts of end-use construction products that incorporate the cement should be assessed as described in 5.4.4 and 5.4.5, respectively.

— for cements of category 3, in addition to the requirements for cement of category 2, also relevant practical experience should be gained under conditions approved by CEN/TC 51, e.g. through an ETA or another comparable procedure, for assessing the fitness for the intended use prior to identifying the general criteria, amongst other things, for the possibility of European standardization.

The categorization of new cements and the corresponding requirements are summarized in Table 1.

Table 1 — Categorization of new cements and the corresponding requirements

<table>
<tr><th><u>Category 1</u>
Cement from a new combination of constituents according to EN 197–1</th><th><u>Category 2</u>
Cement containing a minor amount of one or more new constituents</th><th><u>Category 3</u>
Cement differing substantially from those types defined in existing standards</th></tr>
<tr><td colspan="3">Assessment of
mechanical, physical and chemical performances</td></tr>
<tr><td colspan="3">Assessment of
durability related characteristics</td></tr>
<tr><td rowspan="3"></td><td colspan="2">Assessment of influence on
environmental performance</td></tr>
<tr><td colspan="2">Assessment of
possible health impact</td></tr>
<tr><td>Relevant practical experience gained under approved conditions prior to European standardization</td></tr>
</table>

4.4 Application for the standardization of a new cement

4.4.1 General

An application for the standardization of a new cement should be presented to CEN/TC 51 for approval using, as the basis of, the CEN form for a New Work Item (NWI) proposal (see http://boss.cen.eu/Pages/default.aspx) and a dossier (4.4.2). The dossier may be submitted with the application where considered by the applicant to be complete, alternatively initial proposals for testing procedures etc. may accompany the application (see 4.4.2).

4.4.2 The dossier and its contents

The dossier should provide the necessary information, especially to demonstrate the fitness for intended use of the new cement, i.e. in particular the following:

— definition and, where applicable, name and/or brand name of the product;

— intended use of the product including assumed working life of construction products made using the product;

— specific terms used for the product;

— information on patents and other intellectual property rights (IPR) that may be relevant for the standardization of the new cement;

— proposal concerning the categorization of the new cement according to 4.2;

— constituents of the product, for new constituents appropriate criteria for their characterization;

— description of the manufacturing process;

— packaging, transport and storage of the product;

— methods for the identification and testing of the product and its constituents, i.e. applicable testing standards and/or other test methods including equipment necessary for the testing laboratories;

— name and qualifying criteria for the competence of laboratories assigned to carry out the tests;

— results of tests carried out;

— proposal concerning the system for assessment and verification of constancy of performance (AVCP system) and the conformity criteria for the new cement.

The applicant is free to introduce – as a first step – the description of the product together with a proposal for the testing procedures (including all relevant testing conditions, see provisions given in 5.4) and for the laboratories (including qualification) designated to be assigned with the tests. This is recommended in particular for the testing of durability related characteristics. After approval of the proposal, the risk is lower that testing results are not accepted afterwards by CEN/TC 51.

Testing should be undertaken by competent laboratories. As a rule, the laboratories involved in the testing procedures should be accredited according to EN ISO/IEC 17025 for all testing methods to be used. If this is not or not completely possible, it is strongly recommended that the laboratories involved in the testing are approved by CEN/TC 51 on the basis of the information on the competence of the laboratory to be supplied by the applicant before undertaking the testing.

4.5 Evaluation and decision by CEN/TC 51

The evaluation of an application, and the dossier submitted by the applicant, and any decision to begin the standardization process for a new cement, are in the sole responsibility of CEN/TC 51.

The discussion and evaluation of the dossier will always be on a case-by-case basis. In this regard, distinction should be made between cements for normal structural application in construction and cements designed and produced intentionally for a specific use.

CEN/TC 51 may task one or more of its Working Groups and/or ask other CEN Technical Committees to contribute to the discussion and to the evaluation process.

The following aspects will be considered by CEN/TC 51 during the evaluation process:

— classification of the new cement according to 4.2 and its intended use;

— characteristics of the new cement which are relevant to its fitness for use;

— methods for the verification and assessment of the relevant product characteristics, i.e. test procedures proposed in the dossier to demonstrate the fitness for the intended use of the new cement;

— qualification of the testing laboratory/laboratories;

— test results;

— AVCP system and associated rules for the assessment and verification of constancy of performance of the new cement proposed in the dossier.

5 Assessment of fitness for use

5.1 Meaning of "fitness for use"

"Fitness for (the intended) use" of a construction product means that the product has such characteristics that the works in which it is to be incorporated can, if properly designed and built,

— satisfy the basic requirements for construction works when and where such works are subject to regulations containing such requirements and

— be fit for their intended use, account being taken of economy and in this connection satisfy the basic requirements for construction works for an economically reasonable working life, if normally maintained.

Therefore, it is necessary that the intended use of the new cement be clearly defined in the dossier.

5.2 Elements of the assessment of fitness for use

The assessment of the fitness of a new cement for its intended use should include the following:

— the identification of the characteristics of the new cement which are relevant to its fitness for use;

— the establishment of methods for the verification and assessment of the relevant product characteristics and the expression of the respective product performances;

— the demonstration of practical experiences for cement of category 3.

5.3 Characteristics of the new cement which are relevant to its fitness for use

The product characteristics given in Table 2 may be relevant to the fitness for use of the new cement. It should be stated and explained in detail in the dossier which of the characteristics are relevant and which are not, taking into account the intended use and the classification of the cement in a category according to 4.2. If other product characteristics not listed in Table 2 are relevant to the fitness for use of the new cement, this should in addition be stated and explained in the dossier.

Table 2 — Product characteristics of a new cement that may be relevant to its fitness for use

Product characteristics	**Mentioned in harmonized European Standards** [a]	**Test references**	**Notes**
Constituents and composition	EN 197–1, EN 413–1, EN 459–1, EN 13282–2, EN 14216, EN 14647, EN 15368, EN 15743		See 5.4.2
Compressive strength (early)	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 14647, EN 15743	EN 196–1	Requirements expressed in terms of strength classes and limits
Compressive strength (standard)	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 15368, EN 15743	EN 196–1	Requirements expressed in terms of strength classes and limits
Initial setting time	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 14647, EN 15368, EN 15743	EN 196–3 or EN 413–2	Requirements expressed in terms of lower limits
Final setting time	EN 413–1, EN 459–1	EN 196–3 or EN 413–2	Requirements expressed in terms of upper limits
Soundness (expansion)	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 15368, EN 15743	EN 196–3 or EN 459–2	Requirements expressed in terms of upper limits
Penetration depth of fresh mortar	EN 459–1	EN 459–2	Requirement expressed in terms of limits
Air content of fresh mortar	EN 413–1, EN 459–1, EN 15368,	EN 413–2 or EN 459–2	Requirement expressed in terms of upper limits
Water retention of fresh mortar	EN 413–1, EN 15368,	EN 413–2	Requirements expressed in terms of lower limits
Colour		EN 12878	
Density		EN 196–6	

Product characteristics	**Mentioned in harmonized European Standards** [a]	**Test references**	**Notes**
Fineness	EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 15368,	EN 196–6 or EN 459–2 or ISO 9277	Requirement expressed in terms of upper limits
Particle size distribution	EN 459–1,	EN 459–2	Requirement expressed in terms of limits
Heat of hydration	EN 197–1, EN 14216, EN 15743	EN 196–8 or EN 196–9	Requirements expressed in terms of upper limits
SO_3 content	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 14647, EN 15368, EN 15743	EN 196–2 or EN 459–2	Requirements expressed in terms of upper limits
Insoluble residue	EN 197–1, EN 14216, EN 15743	EN 196–2	Requirements expressed in terms of upper limits
Loss on ignition	EN 197–1, EN 14216, EN 15743	EN 196–2	Requirements expressed in terms of upper limits
Chloride content	EN 197–1, EN 413–1, EN 14216, EN 14647, EN 15743	EN 196–2	Requirements expressed in terms of upper limits
Sulphide content	EN 14647	EN 196–2	Requirements expressed in terms of upper limits
Alkali content	EN 14647	EN 196–2	Requirements expressed in terms of upper limits
Alumina content	EN 14647	EN 196–2	Requirement expressed in terms of limits
C_3A in clinker	EN 197–1	EN 196–2 [b]	Requirements expressed in terms of upper limits
Free calcium oxide (CaO)		EN 451–1	
Reactive calcium oxide		EN 196–2	
Reactive silicon dioxide		EN 196–2	
Water-soluble chromium (VI)		EN 196–10	See Regulation (EC) No 1907/2006 [11] of the European Parliament and of the Council (“REACH”), Annex XVII, entry 47
Total organic carbon (TOC)		EN 13639	
Total carbon (TC)		EN 13639	
Pozzolanicity	EN 197–1, EN 14216	EN 196–5	Requirements expressed in terms of limits

Product characteristics	**Mentioned in harmonized European Standards** [a]	**Test references**	**Notes**
Available lime	EN 459–1	EN 459–2	Requirement expressed in terms of lower limits
Reactivity of unslaked lime	EN 459–1	EN 459–2	Requirement expressed in terms of upper limits
Durability	EN 197–1, EN 413–1, EN 459–1, EN 13282–1, EN 13282–2, EN 14216, EN 14647, EN 15368, EN 15743		See 5.4.3
Release of dangerous substances	EN 197–1, EN 13282–1, EN 13282–2, EN 14216, EN 15743		See 5.4.4
Possible health impact			See 5.4.5

[a] Only harmonized European Standards prepared by CEN/TC 51 are listed in this column.

[b] The test method for the determination of C_3A content of clinker from an analysis of the final cement is under development in CEN/TC 51. Until the test method is finalised the C_3A content of clinker should be determined on the basis of the analysis of clinker as part of the manufacturer's Factory Production Control.

5.4 Methods for the assessment and verification of the relevant product characteristics

5.4.1 General

All product characteristics of the new cement relevant to its fitness for use should be verified by competent laboratories. The samples should be taken and prepared according to EN 196-7. As a rule, the methods given as “Test references” in Table 2 should be used. It is important that this include the basic conditions specified for the test procedures, e.g. pre-treatment, storage, curing conditions, temperature etc. However, due to the product characteristics of the cement or its constituents or its intended use, it may be necessary to modify test methods or to use other test methods. In these cases, the reasons for modification or for substitution of the test methods should be stated in the dossier.

The assessment of the product characteristics “Constituents and composition”, “Durability”, “Release of dangerous substances” and “Possible health impact” is described in more detail in 5.4.2, 5.4.3, 5.4.4 and 5.4.5.

5.4.2 Constituents and composition of the cement

The composition of the new cement, i.e. the composition limits of all cement constituents, and the characteristics of its constituents should be stated in the dossier particularly with regard to the categorization of the new cement (see 4.2 and 4.3).

The fulfilment of the stated composition limits of the new cement should be demonstrated by quantitative determination of the constituents according to CEN/TR 196-4 or by quantitative phase analysis by means of X-ray diffraction or by other suitable methods. The choice of the method(s) for the quantitative analysis should be described and justified in the dossier.

The fulfilment of the requirements on “main constituents” according to EN 197-1 should be demonstrated for these cement constituents, following the provisions given in EN 197-1.

New constituents, i.e. constituents not listed as cement constituent in EN 197-1, should be characterized and described in detail. As a rule, for each new constituent the characteristics given in Table 3 should be described by use of the methods also given in Table 3. However, if the determination of one or more characteristics of the new constituent(s) as given in Table 3 is not necessary or if the methods given are not considered suitable and need to be modified or replaced by other methods, this should be stated and explained in detail in the dossier. If further characteristics of the new constituent(s) are relevant to their applicability or to the fitness for use of the new cement, they should be stated and explained in the dossier, and the respective tests should be carried out by competent laboratories.

Table 3 — Characterization of constituents

Product characteristics	**Test reference**
Loss on ignition	EN 196–2
CO_2 and H_2O content	EN 196–2
Main elements (SiO_2, Al_2O_3, TiO_2, Fe_2O_3, Mn_2O_3, P_2O_5, CaO, MgO, Na_2O, K_2O)	EN 196–2
Sulfate content (SO_3)	EN 196–2
Sulphide content (S^{2-})	EN 196–2
Chloride content (Cl^-)	EN 196–2
Free calcium oxide (CaO)	EN 451–1
Insoluble residue	EN 196–2
Reactive calcium oxide (CaO)	EN 196–2
Reactive silicon dioxide (SiO_2)	EN 196–2
Elemental silicon (Si)	ISO 9286
Clay content	EN 933–9
Quantitative phase analysis	X-ray diffraction
Glassy material content	Polarized light microscopy or X-ray diffraction
Minor and trace elements	CEN/TR 16045
Total organic carbon content (TOC)	EN 13639
Total carbon content (TC)	EN 13639
Density	EN 196–6
Fineness	EN 196–6 or ISO 9277
Colour	EN 12878

5.4.3 Durability aspects

Durability relates to the concrete, mortar, grout and other construction products made from cement according to the application rules valid in the place of use with regard to the intended use of the cement. However, for the purpose of the standardization of a new cement, mortar and/or concrete tests should be performed in each case to assess the influence of the new cement on durability.

As a rule, the influence of the new cement on the following durability related characteristics of concrete/mortar should be determined:

— long-term stability;

— resistance against reinforcement corrosion (e.g. carbonation; resistance against chloride penetration, pH value of the pore solution);

— freeze–thaw resistance (without de-icing agent);

— freeze–thaw and de-icing agent resistance;

— shrinkage and expansion;

— sulfate resistance;

— seawater resistance;

— microstructure porosity and permeability.

If the determination of one or more of these characteristics is not necessary due to the intended use of the new cement, or if other characteristics are relevant, this should be stated and explained in detail in the dossier.

Tests should be carried out taking into account the information given in CEN/TR 16563.

Mortar for durability tests should be prepared according to EN 196-1. If this is not possible due to the cement characteristics, all modifications (e.g. changes in process of preparation, temperature, amount of water/cement/sand, admixture types, sources, content, etc.) should be explained and prescribed in detail in the dossier. In each case, the exact type of the new cement (e.g. constituents and composition, strength) used for the preparation of the mortar should be described.

Concrete for the durability tests should be fully prescribed and in addition to the specification requirements given in EN 206, this should include the prescription of

— the exact type of the new cement (e.g. constituents and composition, strength) used for the preparation of the concrete,

— aggregate types crushed or uncrushed and sources (e.g. Thames/Seine/Rhine/Tiber/Tagus Valley gravel),

— grading, shape and content of aggregates,

— admixture types, sources and content.

If the age of the mortar or concrete specimens at the start of the durability test is not defined by the description of the test method, this information should be provided in the dossier.

5.4.4 Environmental aspects

National regulations may require determination, declaration and verification of release/emission, and sometimes content, of dangerous substances, when construction products are placed on those markets. This may in particular become relevant for new cements of category 2 or category 3 according to 4.3.

For the purpose of the standardization of a new cement of category 2 or category 3 according to 4.3, tests should be performed in each case in order to assess the influence of the new cement on the environmental behaviour of the concrete, mortar, grout and other construction products produced from it.

The assessment should be based on the European Standards prepared by Technical Committee CEN/TC 351 “Construction Products – Assessment of release of dangerous substances”. In the absence of harmonized European test methods, determination, declaration and verification of content and/or

release/emission of dangerous substances should be done taking into account existing national provisions.

Reporting of the relevant information should be based on European Standards on sustainability of construction works being prepared by Technical Committee CEN/TC 350 “Sustainability of construction works”, i.e. EPDs.

The assessment of the release/emission of dangerous substances should deal with the following subjects:

— Release of regulated dangerous substances to soil, surface water and groundwater

  The content of trace elements of the new cement should be determined according to the methods given in CEN/TR 16045. Additionally, the determination of the release of trace elements using the tank leaching test according to CEN/TS 16637-2 on a concrete produced with the new cement may be necessary. In this case, the test specimens should be prepared according to CEN/TR 15678.

— Emission of dangerous substances into indoor air

  The content of organic additives of the new cement should be determined according to EN 13639. If the quantity of organic additives on a dry basis is greater than 0,2 % by mass of the cement, the determination of the emission of organic substances tested with the chamber test according to CEN/TS 16516 on a concrete produced with the new cement may be necessary. In this case, the test specimens should be prepared according to CEN/TR 15678.

— Radiation and radioactive emissions

  If the new cement contains constituents that could potentially lead to a significant level of radioactivity in the new cement, testing of the radioactivity may be necessary. In these cases, the radioactivity of the new cement should be tested according to prCEN/TS 00351014.

5.4.5 Possible health impact

The new cement and all its constituents should comply with the European Regulation (EC) No 1907/2006 [11], the so-called REACH Regulation, which places obligations on manufacturers, importers and downstream users.

In terms of this regulation, a cement constituent is a substance or a mixture of substances. Substances as such or in mixtures shall not be manufactured or placed on the market unless they have been registered in accordance with the REACH Regulation. Exemptions from that provision are given in Annex IV and in Annex V of the regulation, e.g. for substances which occur in nature like minerals if they are not chemically modified.

In the REACH registration dossier, the relevant physicochemical, toxicological and ecotoxicological information should be provided, as described in the REACH Regulation, Annex VI to Annex X. If necessary, a chemical safety assessment (CSA) should be performed and a chemical safety report (CSR) should be compiled.

If a constituent of the new cement (category 2) or the new cement itself (category 3) is a hazardous material, a classification and labelling according to European Regulation (EC) No 1272/2008 [10] as well as a safety data sheet (SDS) according to European Commission Regulation (EU) No 453/2010 [8] should be provided.

6 Patents and other intellectual property rights (IPR) relevant for the standardization of the new cement

CEN and CENELEC have developed an intellectual property rights (IPR) policy under the provision of the CEN-CENELEC Guide 8 [15] in order to provide practical guidance on how to deal with patent-related matters.

This CEN and CENELEC Patent Policy encourages the early disclosure and identification of patents that may relate to standards under development and provides for the incorporation of patented technology into new standards, on condition that the patent holder is ready to allow this either without financial compensation or at Fair, Reasonable and non-Discriminatory (FRAND) conditions to other standard users.

It should be noted that CEN and CENELEC are not involved in evaluating the relevance or essentiality of patents with regard to standards under development, interfering with licensing negotiations, or engaging in settling disputes on patents. These issues are left to the parties concerned.

Any parties participating in the work of CEN and CENELEC are requested, from the outset and to the best of their knowledge, to draw attention to any known patent or to any known pending application on patent that, according to their own judgment, may be considered as an essential patent for the standard.

For this reason, information should be given in the dossier whether patents, pending applications on patents or other intellectual property rights may be relevant for the standardization of the new cement.

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[11] *Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC*, OJ L 396, 30.12.2006, p. 1–849

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