Irish Standard
I.S. EN 14647:2005

Calcium aluminate cement - Composition, specifications and conformity criteria

I.S. EN 14647:2005

Incorporating amendments/corrigenda issued since publication:
EN 14647:2005/AC:2006

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:
EN 14647:2005

Published:
19 October, 2005

This document was published
under the authority of the NSAI
and comes into effect on:
7 December, 2005

ICS number:
91.100.10

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W **NSAI.ie**

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN 14647:2005

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14647:2005/AC

November 2006
Novembre 2006
November 2006

ICS 91.100.10

English version
Version Française
Deutsche Fassung

Calcium aluminate cement - Composition, specifications and conformity criteria

Ciment d'aluminates de calcium - Composition, spécifications et critères de conformité

Tonerdezement - Zusammensetzung, Anforderungen und Konformitätskriterien

This corrigendum becomes effective on 29 November 2006 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 29 novembre 2006 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 29.November 2006 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.

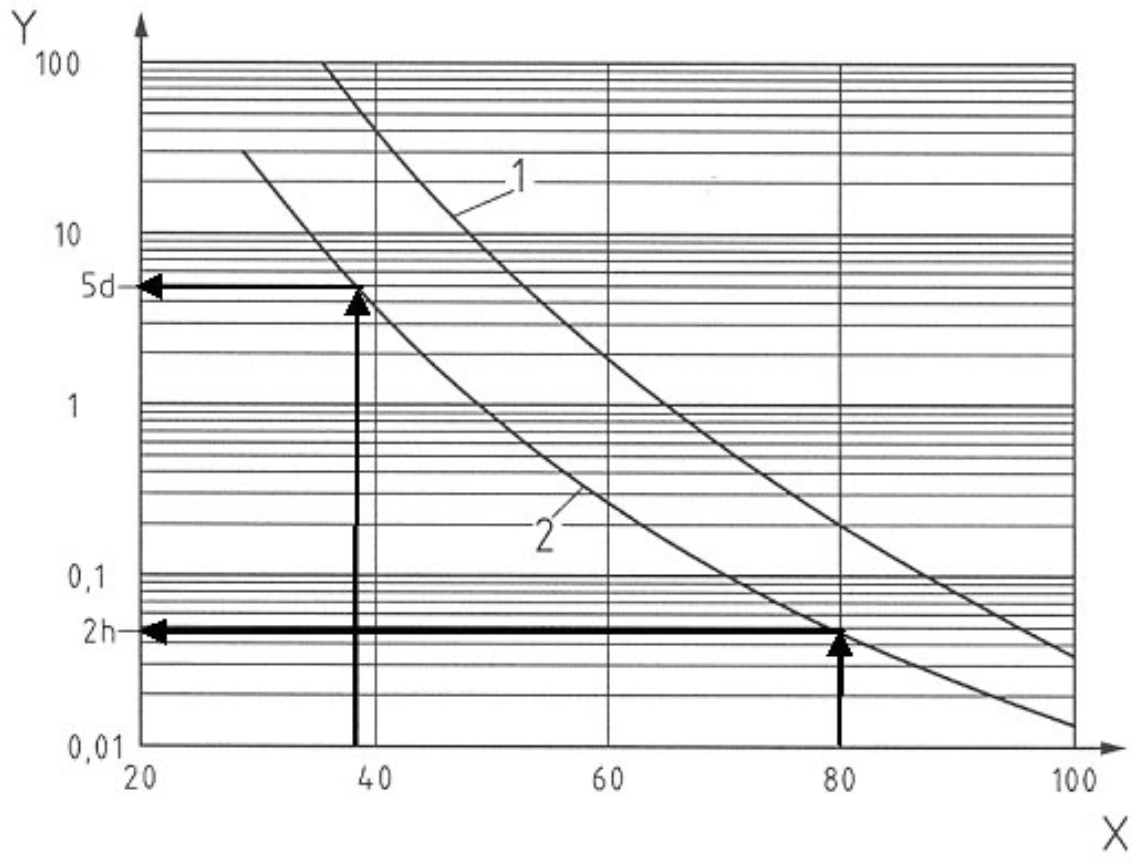
EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No.:EN 14647:2005/AC:2006 D/E/F

English version

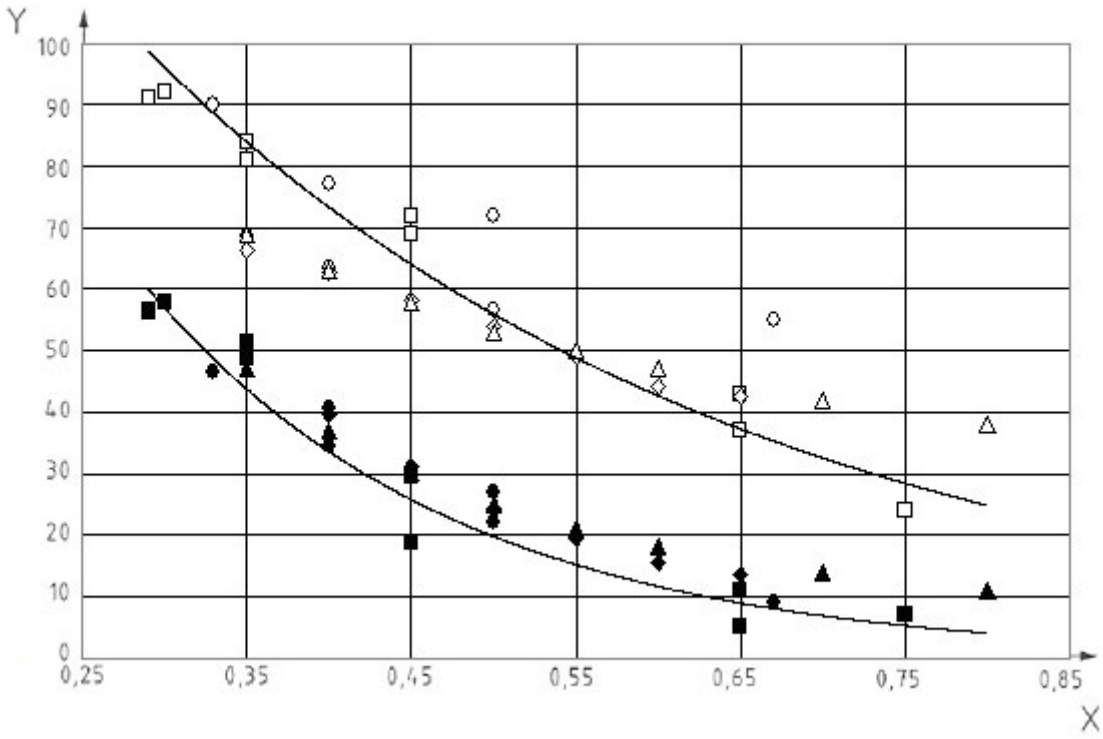
Replace figures A.1 and A.3 by the following:



Key

1 Samples were pre-cured for 24 h at 20°C and then cured at the given temperature under water.
2 Samples were placed directly under water (without pre-curing) at the given curing temperature.
Y Time to reach minimum strength (days-log scale)
X Curing Temperature (°C)

Figure A.1 - Time to reach minimum strength after conversion at different curing temperatures



Key

Y Compressive Strength on cubes (MPa)

X Total Water/Cement Ratio

○ George (1990) - Before conversion

● George (1990) - After conversion

□ Neville (1994) - Before conversion

■ Neville (1994) - After conversion

◇ Robson (1962) - Before conversion

◆ Robson (1962) - After conversion

△ BRE (1988) - Before conversion

▲ BRE (1988) - After conversion

Figure A.3 – Relation between total water/cement ratio and compressive strength of CAC concrete before and after conversion

I.S. EN 14647:2005

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14647

October 2005

ICS 91.100.10

English Version

Calcium aluminate cement - Composition, specifications and conformity criteria

Ciment d'aluminates de calcium - Composition, spécifications et critères de conformité

Tonerdezement - Zusammensetzung, Anforderungen und Konformitätskriterien

This European Standard was approved by CEN on 22 July 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14647:2005: E

Contents

Page

Foreword

This European Standard (EN 14647:2005) has been prepared by Technical Committee CEN/TC 51 “Cement and building limes”, the secretariat of which is held by IBN/BIN.

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 April 2006, and conflicting national standards shall be withdrawn at the latest by July 2007.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this European Standard.

The requirements in this European Standard are based on the results of tests on cement in accordance with EN 196-1, -2, -3, -5, -6, and –7. The scheme for the evaluation of conformity of calcium aluminate cement is specified in EN 197-2.

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

Introduction

Calcium aluminate cement was developed during the latter stages of the nineteenth century as an alternative to calcium silicate cement (Portland cement) to prevent structural elements from serious sulfate attack.

Whilst it is suitable for sulfate resistance it was also found to be exceptionally rapid hardening and resistant to high temperatures. It was this rapid hardening property that led to more general use particularly in precast applications.

The hydration of calcium aluminate cement is substantially different from that of Portland cement in that the calcium aluminate hydrates formed depend upon the temperature at which hydration takes place. At low and normal temperatures (less than 40 °C) the hydration process leads to a temporarily high strength. This situation can last for several days or many years, depending mainly upon temperature and humidity, before stable long term hydrates develop. This process, known as conversion, is inevitable. It is the result of a phase transition in the hardened paste of cement and is accompanied by a decrease in strength to a minimum stable level.

Misunderstanding of this conversion process and unsuccessful attempts to maintain the temporary high strength led to failures in several countries during the 1960's and 1970's. In one of the reported failures, the strength of concrete, made with calcium aluminate cement, was reduced even further as a result of chemical attack. Chemical resistance is reduced when porosity of concrete is increased by a high water/cement ratio and conversion. As a result, calcium aluminate cement has been, and remains, excluded from the list of cements permitted in structural concretes in some countries.

Guidance for the correct use of this cement is given in Annex A. It includes a method which allows the long term strength, i.e. after conversion, to be predicted.

NOTE 1 Calcium aluminate cement can be produced in a blastfurnace, using a process of reductive fusion (a method used in Germany until the 1980's) but the cement will have a high level of sulfides which would exclude it from this European Standard.

NOTE 2 Calcium aluminate cement has previously been known by several alternative names in different countries, e.g.

— high alumina cement;

— aluminous cement;

— high alumina melted cement.

1 Scope

This European Standard gives a general definition of calcium aluminate cement and its composition. It includes requirements for the mechanical, physical and chemical properties and also states the conformity criteria and the related rules.

Calcium aluminate cement used as a constituent material of formulated mixes for specific applications (e.g. dry mixes) is outside the scope of this European Standard.

NOTE Guidance for the correct use of calcium aluminate cement in concrete and mortars is given in Annex A.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 197-2:2000, *Cement — Part 2: Conformity evaluation*

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

EN 196-2, *Methods of testing cement — Part 2: Chemical analysis of cement*

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

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

3 Terms and definitions

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

3.1
autocontrol testing
continual testing by the manufacturer of cement spot samples taken at the point(s) of release from the factory/depot

3.2
control period
period of production and dispatch identified for the evaluation of the autocontrol test results

3.3
characteristic value
value of a required property outside of which lies a specified percentage, the percentile P_k of all the values of the population

3.4
specified characteristic value
characteristic value of a mechanical, physical or chemical property which in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached

3.5
single result limit values
value of a mechanical, physical or chemical property which - for any single test result - in the case of an upper limit is not to be exceeded or in the case of a lower limit is, as a minimum, to be reached