

Admixtures for concrete, mortar and grout — Test methods —

Part 11: Determination of air void characteristics in hardened concrete

The European Standard EN 480-11:1998 has the status of a
British Standard

ICS 91.100.30

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents



Document Sharing Hub

National foreword

This part of BS EN 480 has been prepared by Subcommittee B/517/3 and is the English language version of EN 480-11:1998, *Admixtures for concrete, mortar and grout — Test methods — Part 11: Determination of air void characteristics in hardened concrete*, published by the European Committee for Standardization (CEN).

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

This standard is part of a package of standards comprising BS EN 480 Parts 1, 2, 4, 5, 6, 8, 10, 11 and 12, and BS EN 934 Parts 2 and 6. When all the standards in this package have been published, BS 5075 Parts 1, 2 and 3 will be amended by deleting all the clauses that conflict with the package.

This standard has been prepared to provide a method to test air entraining admixtures for concrete for conformity to BS EN 943-2. It may find wider use to provide data on the air void spacing in air entrained concrete. The method is not used for testing air entraining/plasticizing admixtures for mortar covered by prEN 934-3.

The UK has drawn the attention of CEN to some errors that have been corrected in this English language version.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

Amendments issued since publication

Amd. No.	Date	Text affected

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 February 1999

© BSI 02-1999

ISBN 0 580 30794 8

ICS 91.100.10; 91.100.30

Descriptors: construction materials, concrete, hardened concrete, mortars: material, grouting, concrete admixtures, tests, characteristics, void fractions, air

English version

Admixtures for concrete, mortar and grout — Test methods — Part 11: Determination of air void characteristics in hardened concrete

Adjuvants pour bétons, mortiers et coulis —
Méthodes d'essais —
Partie 11: Détermination des caractéristiques des
vides d'air dans le béton durci

Zusatzmittel für Beton, Mörtel und
Einpreßmörtel — Prüfverfahren —
Teil 11: Bestimmung von Luftporenkennwerten in
Festbeton

This European Standard was approved by CEN on 16 October 1997.

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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

© 1998 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104, Concrete (performance, production, placing and compliance criteria), 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 April 1999, and conflicting national standards shall be withdrawn at the latest by April 1999.

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

Contents

		Page
Foreword		2
1 Scope		3
2 Normative references		3
3 Definitions		3
3.1 Air void		3
3.2 Total air content A		3
3.3 Paste Content P		3
3.4 Specific surface of air void system α		3
3.5 Spacing factor $\bar{L}$		3
3.6 Air void distribution		3
3.7 Micro air content A_{300}		3
3.8 Traverse line		3
3.9 Length of traverse T_{tot}		4
3.10 Chord length l		4
3.11 Chord length classification		4
4 Principle		4
5 Equipment		4
5.1 General		4
5.2 Specimen preparation		4
5.3 Microscopical analysis		4
6 Specimen production and preparation		5
6.1 Specimen production		5
6.2 Preparation of test surface		5
	7 Microscopical procedure	6
	7.1 Basic procedure	6
	7.2 Values recorded	6
	8 Calculations	7
	8.1 Data obtained	7
	8.2 Total traverse length	7
	8.3 Total air content	7
	8.4 Total number of chords measured	7
	8.5 Specific surface of the air	7
	8.6 Paste: air ratio	7
	8.7 Spacing factor	7
	8.8 Micro-air content	7
	8.9 Air void distribution	7
	8.9.1 Basis of calculation	7
	8.9.2 Calculation of chord frequency	7
	8.9.3 Calculation of void frequency	8
	8.9.4 Calculation of void distribution	8
	8.9.5 Calculation of air content	8
	8.9.6 Presentation of results	8
	8.9.7 Column contents	8
	9 Test report	8
	Annex A (informative) Theoretical basis of calculations involved in Table 1	10
	Annex B (informative) Worked example of the calculation of air void distribution	11

1 Scope

This European Standard describes a test method for determination of the air void structure in a hardened concrete sample which contains entrained air. The air void structure is described by means of the following parameters, which are defined in clause 3:

- i) total air content;
- ii) specific surface of air void system;
- iii) spacing factor;
- iv) air void size distribution;
- v) micro air content.

The method as described is only suitable for use on hardened concrete specimens where the original mix proportions of the concrete are accurately known and the specimen is representative of these mix proportions. This will generally be the case only where the concrete concerned is produced in a laboratory.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 480-1, *Admixtures for concrete, mortar and grout — Test methods — Part 1: Reference concrete and reference mortar for testing.*

EN 934-2, *Admixtures for concrete, mortar and grout — Concrete admixtures — Part 2: Definitions and requirements.*

ISO 2736-2, *Concrete tests — Making of test specimens — Part 2: Making and curing of test specimens for strength tests.*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1

air void

space enclosed by the cement paste that was filled with air or other gas prior to the setting of the paste. This does not refer to voids of submicroscopic dimensions, such as the porosity inherent in a hydrated cement paste. For the purposes of this test method, all voids within the cement paste are considered that are visible at the test magnification with an intercepted chord length of up to 4 mm, other than obvious cracks

3.2

total air content A

proportion of the total volume of the concrete that is air voids; expressed as a percentage by volume

3.3

paste content P

proportion of the total volume of the concrete that is hardened cement paste, expressed as a percentage by volume. This is the sum of the proportional volumes of cement, mixing water and any admixtures present. For the purposes of this test method it is calculated from the batch weights of the test concrete

3.4

specific surface of air void system α

calculated parameter representing the total surface area of the air voids divided by their volume; units are mm^{-1} . The calculation method used is based on the average chord length and is valid for any system of spherical voids

3.5

spacing factor $\bar{L}$

calculated parameter related to the maximum distance of any point in the cement paste from the periphery of an air void, measured through the cement paste; units are mm. The calculation of this parameter assumes that all air voids present are of uniform size and are evenly distributed through the cement paste such that the model system has the same total volume and surface area as the real system

NOTE This model is an approximation; the value obtained is probably larger than the actual value.

3.6

air void distribution

set of calculated values of the number and/or volume of air voids of various diameters within the hardened cement paste

NOTE The model used for this calculation assumes that only voids having diameters of certain discrete values are present. This model will therefore lie between the real case and the single diameter model that is used in the calculation of the spacing factor. A graphical representation of the distribution can be obtained by plotting the volume of air attributable to each size of void, either as a volume percentage of the cement paste or as a proportion of the total air content.

3.7

micro air content A_{300}

calculated parameter representing the air content attributed to air voids of 0,3 mm (300 μm) diameter or less; the value for this parameter is obtained during the calculation of the air void distribution

3.8

traverse line

one of a series of lines across the polished specimen face traced by the relative motion of the microscope and specimen during the test