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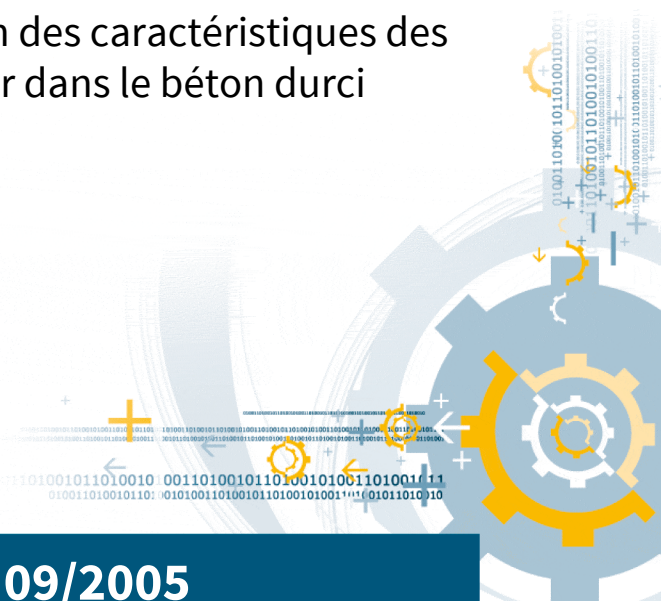
ILNAS-EN 480-11:2005

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

Zusatzmittel für Beton, Mörtel und
Einpressmörtel - Prüfverfahren - Teil 11:
Bestimmung von Luftporenkennwerten
in Festbeton

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

09/2005



National Foreword

This European Standard EN 480-11:2005 was adopted as Luxembourgish Standard ILNAS-EN 480-11:2005.

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EUROPEAN STANDARD ^{ILNAS-EN 480-11:2005} **EN 480-11**
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**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'essai - 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 28 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.



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Foreword

This European Standard (EN 480-11:2005) has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", 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 March 2006, and conflicting national standards shall be withdrawn at the latest by March 2006.

This document is part of the series EN 480 "Admixtures for concrete, mortar and grout – Test methods" which comprises the following

Part 1 *Reference concrete and reference mortar for testing*

Part 2 *Determination of setting time*

Part 4 *Determination of bleeding of concrete*

Part 5 *Determination of capillary absorption*

Part 6 *Infrared analysis*

Part 8 *Determination of the conventional dry material content*

Part 10 *Determination of water soluble chloride content*

Part 11 *Determination of air void characteristics in hardened concrete*

Part 12 *Determination of the alkali content of admixtures*

Part 13 *Reference masonry mortar for testing mortar admixtures*

Part 14 *Admixtures for concrete, mortar and grout - Test methods - Part 14: Measurement of corrosion susceptibility of reinforcing steel in concrete - Potentiostatic electro-chemical test method ¹⁾*

This document is applicable together with the other standards of the EN 480 series.

This document supersedes EN 480-11:1998.

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.

1) This part is under preparation

1 Scope

This document 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

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) 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 – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling*

ISO 1920-3, *Testing of concrete – Part 3: Making and curing test specimens*

3 Terms and definitions

For the purposes of this European Standard, the following terms and 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} .
 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**

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

3.9**length of traverse T_{tot}**

total distance traversed across the surface of the specimens during the test measurement. It is made up of two parts, the total traverse across the surface on solid phases, T_s , and across air voids, T_a , in each case the units are mm

3.10**chord length l**

distance along the traverse line across an air void, units are μm

3.11**chord length classification**

chord lengths across individual air voids are classified into classes based on the length of the chord. The total number of chords in any particular class, i , is designated by C_i . in 8.9 and Table 1 contain details of the boundary values for the classes

4 Principle

Hardened samples of air-entrained concrete are sectioned perpendicular to the original free upper surface to produce specimens for analysis. These specimens are then ground and polished to produce a smooth flat surface finish suitable for microscopic investigation.