

Belysningsstolpar –
Del 4: Krav för belysningsstolpar av betong

Lighting columns –
Part 4: Requirements for reinforced and prestressed
concrete lighting columns

Europastandarden EN 40-4:2005 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 40-4:2005.

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Lighting columns - Part 4: Requirements for reinforced and prestressed concrete lighting columns

Candélabres d'éclairage public - Partie 4: Prescriptions pour les candélabres d'éclairage public en béton armé et en béton précontraint

Lichtmaste - Teil 4: Anforderungen an Lichtmaste aus Stahl- und Spannbeton

This European Standard was approved by CEN on 27 October 2005.

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Foreword

This document (EN 40-4:2005) has been prepared by Technical Committee CEN/TC 50 "Lighting columns and spigots", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by August 2007.

This document supersedes EN 40-4:1982.

This document has been prepared under Mandate M/111 "Circulation fixtures" given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of the EU Directive 89/106/EEC.

For relationship with EU Directive 89/106/EEC see informative Annex ZA, which is an integral part of this document.

For common aspects reference is made to EN 13369:2004, *Common rules for precast products*, from which also the relevant requirements of the EN 206-1:2000, *Concrete — Part 1: Specification, performances, production and conformity* are taken.

The references to EN 13369:2004 by precast concrete product standards are intended to make them homogeneous and to avoid repetitions of similar requirements.

This document defines in Annex ZA the application methods of CE marking to products designed using the relevant Eurocodes (normally EN 1992-1-1:2004 and EN 1992-1-2). Where, in default of applicability conditions of Eurocodes to the works of destination, design provisions other than Eurocodes are used for mechanical strength and/or fire resistance, the conditions to affix CE marking to the product are described in ZA.3.5.

This document is the fourth in a series relating to specifications for "Lighting columns". At present the Parts of this standard are as follows:

Part 1: Definitions and terms

Part 2: General requirements and dimensions

Part 3: Design and verification

3-1: Specification for characteristic loads

3-2: Verification by testing

3-3: Verification by calculation

Part 4: Requirements for reinforced and prestressed concrete lighting

Part 5: Requirements for steel lighting columns

Part 6: Requirements for aluminium lighting columns

Part 7: Requirements for fibre reinforced polymer composite lighting columns

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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 Scope

This document specifies requirements for reinforced and prestressed concrete lighting columns. It applies to columns not exceeding 20 m height for post top lanterns and columns with brackets not exceeding 18 m height for side entry lanterns.

This document specifies:

- a) performance related to the essential requirement of resistance to horizontal (wind) loads, measured in accordance with EN 40-3;
- b) performance under vehicle impact (passive safety) in support of the Essential Requirement No. 4 Safety in use, measured in accordance with the corresponding test methods included in this document or available in separate European Standards.

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 40-1:1991, *Lighting columns — Part 1: Definitions and terms*

EN 40-2:2004, *Lighting columns — Part 2: General requirements and dimensions*

EN 40-3-1, *Lighting columns — Part 3-1: Design and verification — Specification for characteristic loads*

EN 40-3-2, *Lighting columns — Part 3-2: Design and verification — Verification by testing*

EN 40-3-3, *Lighting columns — Part 3-3: Design and verification — Verification by calculation*

EN 1992-1-1:2004, Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings

EN 10204, *Metallic products — Types of inspection documents*

EN 12390-5, *Testing hardened concrete — Part 5: Flexural strength of test specimens*

EN 12767, *Passive safety of support structures for road equipment — Requirements and test methods*

EN 13369:2004, Common rules for precast concrete products

EN 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 40-1:1991, EN 1992-1-1:2004, EN 13369:2004 and the following apply.

3.1

spun concrete

concrete compacted by pressure and vibration using a rotating mould (centrifugal force)

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3.2

product family

number of lighting columns, for the purposes of testing and/or calculation (including ITT and FPC testing), where the manufacturer can demonstrate that the results for a characteristic from any one product in the family are representative for all other lighting columns within that same family. A product may be in different families for different characteristics.

NOTE At the plenary meeting of CEN/TC 50 on 5th October 2004 the above definition of product family was agreed. It was also agreed that it should be added to EN 40-1 on next revision. As it is not in the current version of EN 40-1, it is repeated above.

4 Materials

Materials shall conform to EN 13369:2004, 4.1.

5 Geometrical properties

5.1 General

Product dimensions shall conform to EN 40-2 and where applicable defined on the basis of the specific design and calculations.

5.2 Production tolerances

Production tolerances shall conform to EN 40-2, the total length being measured from ground level. Dimensions shall be measured in accordance with 13.2.2.

The tolerance on column mass shall be $\pm 10\%$.

6 Design and design verification

The column shall be designed to safely sustain the dead loads and the wind loads specified in EN 40-3-1, and shall be verified in accordance with one of the following methods:

- a) **Clauses 7.1 and 12.2.2**
- b) **Compliance with 7.1 and EN 13369 (for common rules), and the following:**
 - geometrical data (main dimensions and main cross sections, including tolerances) of the lighting column as Clause 5 and 7.5; and
 - properties of the materials and constituents products used that are needed to determine, according to the national provisions valid in the place of use, or possible use, the resistance to horizontal loads.
- c) **Compliance with the purchaser's specific design**

It may be assumed by the manufacturer that where he is requested to produce the lighting column following the provisions of the client's specific design details supplied by the purchaser, such provisions are compliant with requirements for regulatory marking in the place of intended destination.

7 Construction and properties

7.1 Concrete

The production of concrete shall conform to EN 13369:2004, 4.2. The concrete used for reinforced concrete columns must conform to compressive strength class C 30/37 or higher in accordance with EN 206-1. The concrete used for prestressed concrete lighting columns shall conform to compressive strength class C 35/45 or higher.

7.2 Surface characteristics

When determined in accordance with 13.2.1, the surface of the column shall be free from damage that may adversely affect its structural integrity or reduce its durability.

In the absence of regulatory requirements or specifications to the contrary, blemishes or surface irregularities are admissible, but shall be limited to:

- a) diameter \leq 25 mm;
- b) depth \leq 5 mm providing the cover is not reduced below the minimum values specified in 7.3.

The maximum crack width caused by shrinkage or temperature in the cement rich layer shall not exceed 0,2 mm.

The finishing of the surface shall be considered acceptable providing that the requirements of this document are not adversely affected.

7.3 Durability and cover to reinforcement

The requirements for durability shall be in accordance with EN 13369:2004, 4.3.7.

For products with a design working life not exceeding 30 years, Annex A shall apply.

7.4 Dangerous substances

Materials used in products shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material.

NOTE Attention is drawn to the maximum permitted levels of dangerous substances as governed by national regulations of the Member State of destination.

7.5 Detailing

7.5.1 Spacing of bars

Where verified by testing in accordance with EN 40-3-2, the minimum space between individual bars and/or external parts of bundles of reinforcing material shall be at least:

- a) with respect to casting:
 - the maximum aggregate size;
- b) with respect to anchoring and bonding:
 - 1) $\frac{2}{3}$ of the relevant equivalent diameter of reinforcing material (for reinforcing material);

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- 2) the nominal diameter of tendons with a minimum of 8 mm (for prestressing material).

The above rules shall not apply to splices.

7.5.2 Transverse reinforcement

7.5.2.1 Reinforced concrete columns (for spun concrete see 7.5.2.3)

The maximum pitch of spirals or spacing of link shall result either from the design or from type tests. In particular, when load-bearing capacity of the column is verified by testing in accordance with EN 40-3-2, the maximum distance between transverse reinforcements units shall be according to the results, with a maximum of 1,50 m.

7.5.2.2 Prestressed concrete columns (for spun concrete see 7.5.2.3)

Where verified by tests defined in EN 40-3-2, transverse reinforcement shall not be necessary.

7.5.2.3 Reinforced or prestressed spun concrete columns

The minimum transverse reinforcement ratio shall be:

- a) for column diameters at the foot equal to or greater than 800 mm, 0,15 % of the longitudinal concrete section;
- b) for column diameters at the foot less than 400 mm, 0,05 % of the longitudinal concrete section;
- c) for column diameters at the foot equal to or less than 800 mm and greater than 400 mm by linear interpolation between the above mentioned values.

8 Protection against mechanical impact

A type test shall be carried out on each type of column base, or part, provided that each end of the part extends at least 0,3 m above and below the door opening. The test shall conform to an impact protection category of IK08 as specified in EN 62262 with the door fitted.

The test equipment shall be either impact pendulum hammer or vertical free fall hammer. The manufacturer shall declare the test method used.

NOTE A single test method will be adopted when the EN 40 series of product standards is revised.

The number of impacts shall be five and shall be applied around the circumference at the mid height of the door. For circular columns these shall be equally spaced around the remaining circumference excluding the door. For octagonal columns these shall be on each of the adjacent faces excluding the door.

After testing, no visible crack shall appear.

The test shall validate those products with an outside diameter (or flat dimension) equal to or less than the diameter being tested, with the same wall thickness and material strength.

For mechanical impact test, a type shall be defined by the shape, the dimensions and type of concrete/reinforcement of the section at mid door height.

For sections other than circular or octagonal, the provisions defined above shall apply.

9 Apertures and cable ways

9.1 Door openings and cable entry slots

The door opening and the cable entry slots shall conform to EN 40-2:2004, 4.3 and 4.4. Door openings shall be designed in accordance with EN 13369:2004, 4.3.3.

9.2 Internal finish and sharp edges

9.2.1 Cableways

Cableways shall conform to the requirements of EN 40-2:2004, 4.4.4.

9.2.2 Access points

All access points used for the installation and fitting of electrical equipment shall be free from rough edges and burrs.

10 Marking and labelling

All columns and brackets shall be clearly and durably marked with:

- a) name or symbol of the manufacturer;
- b) year of manufacture;
- c) reference to this document;
- d) unique product code.

The marking shall be formed either in the material or by painting, hard stamping or by a securely fixed label.

Where applicable, such marking shall not obscure or lead to confusion with regulatory marking.

NOTE For CE marking refer to Annex ZA.

11 Technical documentation

11.1 General

The detailing of the column, including geometrical data with the complementary properties of materials and inserts, shall be given in technical documentation, which includes the construction data, such as the dimensions, tolerances, layout of reinforcement, the concrete cover, required support conditions and lifting conditions.

For columns designed in accordance with 6 a), mounting and fixing details shall be provided.

The composition of technical documentation is given in EN 13369:2004, Annex O.