BRITISH STANDARD

BS EN
12843:2004

Precast concrete products — Masts and poles

The European Standard EN 12843:2004 has the status of a British Standard

ICS 29.240.20; 91.100.30

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 12843:2004.

EN 12843 is a candidate "harmonized" European Standard and fully takes into account the requirements of the European Commission mandate M/100, *Precast concrete products*, given under the EU Construction Products Directive (89/106/EEC), and is intended to lead to CE marking. The date of applicability of EN 12843 as a harmonized European Standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the *Official Journal of the European Communities*.

The Commission in consultation with Member States has agreed a transition period for the co-existence of harmonized European Standards and their corresponding national standard(s). It is intended that this period will comprise a period, usually nine months, after the date of availability of the European Standard, during which any required changes to national regulations are to be made, followed by a further period, usually of 12 months, for the implementation of CE marking. At the end of this co-existence period, the national standard(s) will be withdrawn.

EN 12843 is the subject of transitional arrangements agreed under the Commission mandate. In the UK, there are no corresponding national standards of national origin.

The UK participation in its preparation was entrusted to Technical Committee, B/524, Precast concrete products, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

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EUROPEAN STANDARD

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EN 12843

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English version

Precast concrete products - Masts and poles

Produits préfabriqués en béton - Mâts et poteaux

Betonfertigteile - Maste

This European Standard was approved by CEN on 24 June 2004.

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
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Ref. No. EN 12843:2004: E

Contents

The numbering of clauses is strictly related to EN 13369, *Common rules for precast concrete products*, at least for the first three digits. When a clause of EN 13369 is not relevant or included in a more general reference of this standard, its number is omitted and this may result in a gap on numbering

Foreword

This document (EN 12843:2004) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR, and was examined by and agreed with a joint working party appointed by the Liaison Group CEN/TC 229 – CEN/TC 250, particularly for its compatibility with structural Eurocodes.

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 2005, and conflicting national standards shall be withdrawn at the latest by June 2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Construction Products Directive(89/106/EEC) of European Union (EU)..

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

This standard is one of a series of product standards for precast concrete products.

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

The references to EN 13369 by CEN/TC 229 product standards are intended to make them homogeneous and to avoid repetitions of similar requirements.

Eurocodes are taken as a common reference for design aspects. The installation of some structural precast concrete products is dealt with by *ENV 13670-1 : Execution of concrete structures – Part 1 : Common rules*, which has at the moment the status of an European Prestandard. In all countries it can be accompanied by alternatives for national application and it shall not be treated as a European Standard.

The programme of standards for structural precast concrete products comprises the following standards, in some cases consisting of several parts :

— EN 1168, *Precast concrete products - Hollow core slabs*

— prEN 12794, *Precast concrete products - Foundation piles*

— EN 12843, *Precast concrete products – Masts and poles*

— EN 13224, *Precast concrete products - Ribbed floor elements*

— EN 13225, *Precast concrete products – Linear structural elements*

— EN 13693, *Precast concrete products – Special roof elements*

— prEN 13747, *Precast concrete products – Floor plates for floor systems*

— prEN 13978, *Precast concrete products – Precast concrete garages*

— prEN 14843, *Precast concrete products - Stairs*

— prEN 14844, *Precast concrete products – Box culverts*

— prEN 14991, *Precast concrete products – Foundation elements*

— prEN 14992, *Precast concrete products – Wall elements: Products properties and performances*

— prEN 15037, *Precast concrete products – Beams for beam-and-block floor systems*

This standard defines in Annex ZA the application methods of CE marking to products designed using the relevant EN Eurocodes (EN 1992-1-1 and EN 1992-1-2). Where, in default of applicability conditions of EN Eurocodes to the works of destination, design provisions other than EN Eurocodes are used for mechanical strength and/or fire resistance, the conditions to affix CE marking to the product are described in ZA.3.4.

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

Products covered by the present standard are structural units mainly designed to resist relevant actions resulting from their specific use.

It is in line with the relevant general requirements (EN 1992-1-1 and EN 1992-1-2, EN 13369, EN 206-1, prEN 50423:2004).

It gives, where applicable, requirements related to ambient condition and exposure classes for concrete covers.

In general EN 1991 1-1, Eurocode 1, Actions on structures is applicable for actions, but specific uses may require additional information (e.g. wind turbines, overhead electrical lines, overhead electrical lines for railways, trams and similar).

In Clauses 4.3.3 and 4.3.8 this standard includes specific provisions resulting from the application of EN 1992-1-1 rules made specific for the concerned product. The use of these provisions is consistent with a design of works made with EN 1992-1-1.

1 Scope

This document specifies requirements for precast concrete poles (also commonly called masts) (either all of a piece or composed of elements), reinforced and/or prestressed as structural elements; they may be hollow or solid and may receive or include additional components (e.g. cross-arms, platforms etc.), inserts and connectors. Additional elements may be connected to pole elements.

Structures made from such elements in mono- or multi-legged form may be used for :

— overhead electrical lines ;

— telecommunication lines ;

— overhead electrical lines for railways, trams and similar ;

— supports for lighting ;

— supports for loudspeaker installation ;

— antenna and telecommunication poles ;

— supports for wind turbines ;

— and similar installations.

This document does not cover lighting columns for use in traffic circulation areas.

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

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

EN 13369:2004, *Common rules for precast concrete products*.

3 Terms and definitions

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

3.1
pole (or mast)
upright slender structure fixed rigidly at the foot

3.2
foot
lower end of a pole

3.3
top
upper end of a pole

3.4
pole length
length from foot to top

3.5
embedment length
length of the pole segment firmly fixed in the surrounding of earth or foundation

3.6
specific complementary provision
provision valid in the place of use, such as client's order, or national (non conflicting) complementary standard, specific to a product covered by the present standard

3.7
shock concrete
concrete compacted by mechanical shock, e.g. by using excentric shafts to lift and drop casting table

3.8
spun concrete
concrete compacted by pressure and vibration using a rotating mould (centrifugal force)

3.9
vacuum concrete
concrete exposed to a vacuum, (so the enclosed air and some water are driven to the surface and sucked away, when relieving the vacuum, the air pressure compacts the concrete)

3.10
vibrated concrete
concrete compacted by vibrators which may be internal, external or other surface types

3.11
pole straightness
maximum allowable deviation of the pole with respect to a line along its total length

4 Requirements

4.1 Material requirements

4.1.1 General

For general aspects, constituent materials of concrete, reinforcing and prestressing steel, inserts and connectors, the relevant clauses of EN 13369:2004, Clause 4.1 shall apply. In particular the ultimate tensile and tensile yield strength of steel shall be considered.

NOTE The missing numbers correspond to the clauses of EN 13369 included in the general references made in this subchapter.

4.1.5 Inserts and connectors

Where applicable inserts and connectors shall comply with complementary requirements, valid in the place of use of the poles.

4.2 Production requirements

The production of concrete shall comply with EN 13369:2004, Clause 4.2, except for the concrete strength classes (4.2.2.1) that shall be at least C 30/37 for reinforced poles and C 35/45 for prestressed poles; provisions valid in the place of use may require higher values. In particular the compressive strength of concrete shall be considered.

4.3 Finished product requirements

NOTE The missing numbers correspond to the clauses of EN 13369:2004 which are not relevant for the purposes of this standard.

4.3.1 Geometrical properties

Product dimensions shall be defined on the basis of the specific design and calculations. Complementary provisions can be given or referred to in the client's order.

4.3.1.1 Production tolerances

Table 1 shall apply for production tolerances. More stringent values may be required. Dimensions shall be measured in accordance with 5.2.2.

Table 1 — Permitted deviations related to work dimension

Parameter	Permitted deviations
Pole length	± 1 % with a maximum of 100 mm
Crossectional outer dimensions	+ 10 % -5 % with a maximum of + 20 mm and of – 15 mm
Pole straightness (where applicable)	± 0.3 % of the total length of the unit
Pole mass	+ 10 % – 5 % of the nominal mass

4.3.2 Surface characteristics

When determined according to Clause 5.2.1, the surface of the pole shall be free from damage that may adversely affect its structural integrity or reduce its durability.

In the absence of special provisions, blemishes or surface irregularities are admissible, but shall be limited to :

— diameter ≤ 25 mm ;

— depth ≤ 5 mm providing the cover is not reduced below the minimum values in 4.3.7.1.

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

Finishing of the surface is acceptable providing that the requirements of this document are not adversely affected.

4.3.3 Mechanical resistance

Bearing capacity is defined following 4.3.3 of EN 13369:2004. Specific complementary provisions on the actions applied on the pole may be specified by the user/authorities, e.g. :

— permanent actions ;

— variable actions ;

— accidental actions ;

— other actions (e.g. manipulation, transport, dynamic effects).

Where specific complementary provisions define two (or more) loads in relation to each axis of symmetry and corresponding requirements, these shall include at least two from the following requirements :

— a flexural load with its permissible deformation ;

— ultimate flexural load, or its serviceability limit load ;

— ultimate torsional load, and their compliance criteria.

Mechanical resistance shall be verified either by calculation or by calculation aided by testing.

For calculation, 4.3.3.2 of EN 13369:2004 shall be applied.

For calculation aided by testing, 4.3.3.3 of EN 13369:2004 and 5.5 of this document shall be applied. For the first verification by testing of a calculation method for precise production conditions, using a defined type of concrete and steel, five tests, as described in 5.5 and covering the range of design stress of the products sections, shall be performed. Where this calculation method is applied to two plants or more, with the same production conditions, complementary verification tests covering the stress range shall be performed on three poles of the yet untested production.

4.3.4 Resistance and reaction to fire

4.3.4.4 Reaction to fire

Clause 4.3.4.4 of EN 13369:2004 shall apply

4.3.7 Durability

For general aspects, surface integrity, steel corrosion resistance, freeze-thaw and water absorption, the relevant Clauses 4.3.7 of EN 13369:2004 shall apply.

4.3.7.4 Concrete cover

Concrete cover shall be according to class A or to class B.

Class A corresponds to the application of Annex B of the present document, it may be used for products with a design working life not exceeding 30 years and when a specific larger cover is not required by the client.

Class B corresponds to the application of clause 4.3.7.4 of EN 13369:2004, it shall be used for a longer design working life or when required by the client.

4.3.8 Detailing

For specific applications, the clauses hereafter may be replaced by relevant clauses of EN 1992-1-1: 2004 and the product marked accordingly.

4.3.8.1 Spacing of bars

When the calculation method has been positively submitted to the relevant tests defined in 5.5.2, the minimum space between individual bars and/or external parts of bundles of reinforcing steel may be :

— with respect to casting : the maximum aggregate size and ;

— with respect to anchoring and bonding :

  — 2/3 of the relevant equivalent diameter of reinforcing steel (for reinforcing steel) ;

  — the nominal diameter of tendons with a minimum of 8 mm (for prestressing steel).

The above rules do not apply to splices.

4.3.8.2 Transverse reinforcement

4.3.8.2.1 Reinforced concrete poles (for spun concrete see 4.3.8.2.3)

Transverse reinforcements are designed according to transverse loads defined either by the producer's declaration or by a specific order. The maximum pitch of spirals or spacing of links shall result either from the design or from experience according to the state of the art. In particular, when load bearing capacity of the pole is verified by testing according to 5.5, the maximum distance between two transverse reinforcements shall be defined according to the results, with a maximum of 1,50 m.

4.3.8.2.2 Prestressed concrete poles (for spun concrete see 4.3.8.2.3)

Where verified by tests defined in 5.5 and justified by experience, transverse reinforcement is not necessary.

4.3.8.2.3 Reinforced or prestressed spun concrete poles

The minimum transverse reinforcement ratio shall be :

— for pole diameters at the foot greater than or equal to 800 mm, 0,15 % of the longitudinal concrete section ;

— for pole diameters at the foot less than or equal to 400 mm, 0,05 % of the longitudinal concrete section ;

— for pole diameters at the foot less than 800 mm and greater than 400 mm by linear interpolation between the above mentioned values.

4.3.9 Earth

Where applicable, an internal earth connection with appropriate terminals may be incorporated into the pole. Reinforcement may be used as an earth conductor.

5 Test methods

5.1 Tests on concrete

Clause 5.1 of EN 13369:2004 shall be applied.

5.2 Measuring of dimensions and surface characteristics

5.2.1 Appearance of surface finish

For units made with special surface finishes, acceptance testing should be on the basis of comparison with a sample prepared by the manufacturer and approved by the purchaser.

This comparison shall be made under daylight and dry conditions and from a distance corresponding to normal usage.

5.2.2 Measurement of dimensions

Dimensions shall be measured with devices having an accuracy of ± 1,0 mm, except for pole length. For pole length the accuracy shall be ± 0,5 %. The measuring devices and testing methods shall be described in the manufacturer's quality documents.

5.4 Concrete cover

The testing of the concrete cover of the reinforcement may be destructive or non-destructive, it shall be performed with an accuracy of ± 2,0 mm. The method used for this testing shall be described in the factory production control.

5.5 Mechanical resistance, verification by testing

5.5.1 General

For the verification by testing of a calculation method, the test method described in 5.5.2. and 5.5.3 shall be applied. The producer's declaration or the purchaser's requirements may state complementary requirements for this testing method. The age of the tested poles shall not be less than 28 days (which is the recommended age) and not be more than 40 days.

The test is composed of :

— actions and deflections measured during bending moment testing stages ;

— load when the first transversal crack appears in case of prestressed concrete ;

— place of section crack (when required) ;

— ultimate load ;

— ultimate torsional load.

Results are compared with the requirements derived from 4.3.3.

5.5.2 Bending test

5.5.2.1 Testing device

The test shall be carried out on a horizontal pole, rigidly embedded, resting on mobile supports that must avoid effects due to its weight and allow its free movement.

The embedment test length is defined by the requirements either in the producer's declaration or in the purchaser's requirements. It defines the embedment cross section. Unless defined either in the producer's declaration or in the purchaser's requirements, loads shall be applied at 90° (± 5°) of the non deformed central axis of the pole extremity, i.e. on the arc of the deformed pole as shown in Figure 1. The loading speed, applied under force control, shall be limited to 100 N/s without any shock or impact. An accuracy of ± 3 % is required on the applied test loads and on the measured deflections.

5.5.2.2 Elastic test

Carry out the load application as follows :

Stage 0, stabilisation stage.

Before measuring, a force F_0 to stabilise the embedment is applied in accordance to purchaser requirements or to complementary provisions.

Stage 1, elastic stage.

Apply successively at least two other forces ($F_1 < F_2$) and release them in accordance either with producer's declaration or with purchaser's requirements. The deflection f shall be measured (at the nearest mm) in the same direction as the applied force, between zero position (after stage zero) and the position under F.

The report shall give all the values F and the corresponding deflections f measured. Figure 2 gives an example of diagram showing the forces F_0, F_1, F_2 with the corresponding deflections $f_0 f_1 f_2$.

The values measured shall be compared with the results of the calculation method, these values shall be inside the tolerances indicated either in the producer's declaration or in the purchaser's requirements.

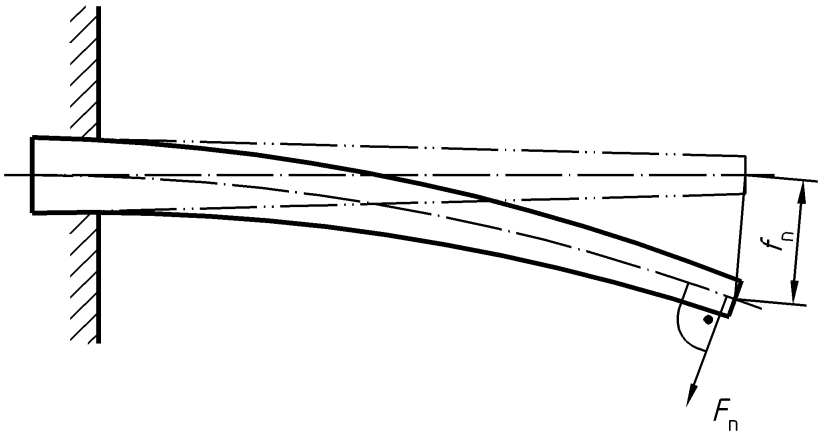
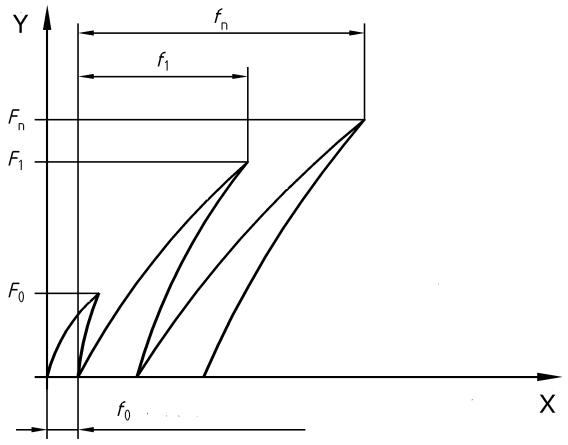


Figure 1 — Bending test principle



Key

X Force
Y Deflection
F_0 Zero position

Figure 2 — Elastic bending test

5.5.3 Load bearing capacity test

The test shall be carried out with the testing device as defined in 5.5.2.1.

Before test, a force F_o to stabilize the embedment is applied in accordance with purchaser's requirements or with complementary provisions.

The force F shall be applied, in accordance with either the producer's declaration or the purchaser's requirements, up to the ultimate force (F_u) which is the maximum force measured by the testing device.

The result shall be the force F_u corresponding to the ultimate value in kN.

5.5.4 Torsion test

5.5.4.1 Requirements for testing device

The test shall be carried out on a pole in horizontal position (see Figure 3). The top of the pole shall be free to rotate and deflection shall be avoided. The embedment test length is defined by the requirements of the purchaser or by producer's declaration. It defines the embedment cross section. The increase of the torsion moment shall be limited to 100 Nm/s without any shock or impact. An accuracy of ±3 % shall be required on the applied test loads.

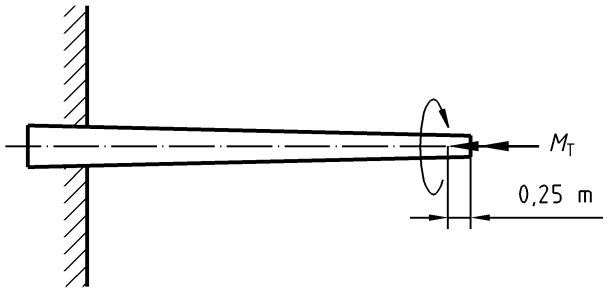


Figure 3 — Torsion test principle

5.5.4.2 Test method

The torsional moment shall be applied at 0,25 m from the top. The torsional moment shall be applied up to the ultimate value which is the maximum value measured by the testing device.

The result shall be the moment corresponding to the ultimate value in kNm.

6 Evaluation of conformity and compliance criteria

6.1 General

Compliance of the product with the requirements of this document shall be demonstrated by :

— initial type testing ;

— factory production control.

Clause 6.1 of EN 13369:2004 shall apply.

6.2 Type testing

Clause 6.2 of EN 13369:2004 shall apply. Specific complementary provisions may define compliance criteria.

Previous type tests (or tests) executed before the application of the present standard may be used as type tests provided they are related to the same product family with a same or more demanding test method.

6.3 Factory production control

EN 13369:2004, 6.3 shall apply.

Inspection schemes for poles shall be conducted in accordance with Annex A of the present standard and EN 13369:2004, Annexes D.1 to D.3 and D.5. The test on the potential compressive strength in EN 13369:2004, Annex D.3.1 item 8 may be replaced by flexural strength test (according to EN 12390-5) on moulded specimens, provided the required flexural strength has been determined during type testing.

7 Marking and labelling

Each pole shall be identified either by an identification plate or by concrete indentation printing. The identification plate shall be produced from a non-corrosive material. The plate shall have suitable anchoring to ensure permanent bond to the pole.

Using the markings it shall be possible to find the product’s specifications.

Each produced element shall be indelibly labelled to show at least :

— the identification of the producer ;

— the identification of the place of production ;

— the identification number of the element ;

— the type of the pole ;

— the critical/global performance (i.e. top load, length) ;

— the date of casting.

The type of the pole and the critical/global performance may be combined.

The identification number and the date of casting may be combined in one designation (e.g. last two digits of the year and serial number).

NOTE For CE marking see Annex ZA.

8 Technical documentation

8.1 General

The detailing of the element, with respect to geometrical data and complementary properties of materials and inserts, shall be given in technical documentation, which includes the construction data, such as the dimensions, the tolerances, the layout of reinforcement, the concrete cover, the expected transient and final support conditions and lifting conditions.

The composition of technical documentation is given in Clause 8 of EN 13369:2004.

8.2 Handling, storage and transportation

The manufacturer shall give information for handling and storage to prevent damage or deterioration. He shall also give information for supporting and attaching the pole segment to the vehicle used for transport.

8.3 Traceability

Delivered product or products batches shall be definitely identifiable and traceable with regard to their production data. For this purpose, the manufacturer shall establish and maintain the records required in the relevant technical specification, and shall mark the products or their delivery documents accordingly.

Annex A
(normative)

Inspection scheme

This annex is complementary to items 3 to 5 of D.4.1 of Table D.4 of EN 13369:2004.

Table A.1 — Finished product inspection

	SUBJECT	METHOD	PURPOSE	FREQUENCY
1	Compressive strength of concrete	According to EN 13369:2004, 5.1.1.	Conformity with the requirements of this standard	1 test of 3 specimens every production week
2	Final inspection of the product	Visual check Dimensions Concrete cover	Conformity with the requirements of this standard	Every product
3	Marking/Labelling of the product	Visual check	Conformity with the requirements of this standard	Every product
4	Storage of the product	Visual check	Conformity with the requirements of this standard Segregation of non-conforming products	Daily
5	Delivery of the product	Visual check	Correct delivery age, loading and loading documents	Every product

Annex B
(normative)

Concrete cover

This annex applies to masts and poles with a design working life not exceeding 30 years.

Referring to the ambient conditions of EN 13369:2004, Table A.1, the minimum concrete cover, determined according to 5.3, shall be in accordance with Table B.1 and the following conditions :

Table B.1 — Minimum concrete cover

(dimensions in millimetres)

		Longitudinal steels		Stirrups or spirals	
Ambient conditions	Exposure classes	≥ C40/50	< C40/50	≥ C40/50	< C40/50
C	XC2/XC3	15	20	10	15
D	XC4	15	20	10	15
E	XD1/XS1	20	25	15	20
F	XD2/XS2	25	30	20	25

— for bar diameters greater than 20 mm the values given by Table B.1 shall be increased by 5 mm. When a steel with corrosion protection is used, the concrete cover given in Table B.1 may be reduced by 5 mm. Inside hollow core poles the concrete cover may be decreased by 5 mm ; in any case the minimum concrete cover shall not be less than 8 mm ;

— within holes of a diameter equal or less than 30 mm the concrete cover is not significant ;

— when the concrete class is ≥ 50/60 and its water absorption is less than 3,5 % the concrete cover given in Table 1 may be reduced by 5 mm ; in any case, the minimum concrete cover shall not be less than 10 mm for stirrups or spirals and shall not be less than 15 mm for longitudinal steel (excepted for inside hollow core poles as defined above).

Annex Y
(informative)

Choice of CE marking method

Y.1 General

The producer should choose to apply, for CE marking, one of the alternative methods described in ZA.3, on the basis of the following conditions.

Y.2 Method 1

The declaration of geometrical data and material properties as specified in ZA.3.2 may be applied when the following condition occurs :

— off the shelf and catalogue products.

Y.3 Method 2

The declaration of product properties determined following this standard and EN Eurocodes, as specified in ZA.3.3, should be applied when the following condition occurs :

— precast product with product properties declared by the producer.

Y.4 Method 3

The declaration of compliance with a given specification as specified in ZA.3.4 may be applied when the following condition occurs :

— all other cases than Y.1 and Y.2.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under the mandate M/100 "Precast Concrete Products" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the masts and poles covered by this annex for the intended uses indicated herein ; reference shall be made to the information accompanying the CE marking.

WARNING — Other requirements and other EU Directives, not affecting the fitness for intended uses, may be applicable to the masts and poles falling within the scope of this standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this Standard, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm).

This annex establishes the conditions for CE marking of masts and poles made of reinforced or prestressed concrete, used for overhead electrical lines, telecommunication lines, overhead electrical lines for railways, trams and similar, supports for lighting, supports for loudspeaker installation, antenna and telecommunication poles, supports for wind turbines, and similar installations and shows the relevant clauses applicable.

This annex has the same scope as Clause 1 of this standard and is defined by Table ZA.1.

Table ZA.1 — Relevant clauses

Essential characteristics		Requirement clauses in this standard	Levels and/or class(es)	Notes and Unit
Compressive strength (of concrete)	All methods	4.2 Production requirements	None	N/mm^2
Ultimate tensile and tensile yield strength (of steel)	All methods	4.1.3 Reinforcing steel and 4.1.4 Prestressing steel of EN 13369:2004	None	N/mm^2
Mechanical strength (by calculation)	Method 1	Information listed in ZA.3.2	None	Geometry and materials
	Method 2	4.3.3 Mechanical resistance	None	kNm, kN, kN/m
	Method 3	Design specification	None	
Detailing	All methods	4.3.1 Geometrical properties 8 Technical documentation	None	mm /
Durability against corrosion	All methods	4.3.7 Durability	None	Ambient conditions
Durability against freeze-thaw (for exposed applications)	All methods	4.3.7 Durability	None	Exposure classes

Method 1 = declaration of geometrical data and material properties (see ZA.3.2) ;

Method 2 = declaration of the value of the product properties (see ZA.3.3) ;

Method 3 = declaration of compliance with given design specification (see ZA.3.4).

The producer shall select when he applies each method in accordance with Annex Y.

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements for that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor to declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see Clause ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for attestation of conformity of masts and poles

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of masts and poles, for the essential characteristics indicated in table ZA.1, in accordance with the decision of the Commission 1999/94/EC of 25 January 1999 as given in Annex III of the Mandate M/100 "Precast concrete products", is shown in Table ZA.2, for the indicated intended use and relevant levels or classes :

Table ZA.2— System of attestation of conformity

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Masts and posts	Structural	-	2+
System 2+ : See Directive 89/106 (CPD) Annex III-2 (ii) First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control.			

The attestation of conformity of masts and poles, for the essential characteristics indicated in Table ZA.1, shall be based on the evaluation of conformity procedure indicated in Table ZA.3, resulting from the application of the clauses of this or other European Standards indicated therein.

Table ZA.3 — Assignment of evaluation of conformity tasks for masts and poles under system 2+

Tasks			Content of the tasks	Evaluation of conformity clauses to apply
Tasks for the manufacturer		Initial type testing	All characteristics of Table ZA.1.	6.2
		Factory production control	Parameters related to all characteristics of Table ZA.1.	6.3
		Further testing of samples taken at the factory	All characteristics of Table ZA.1.	6.2.3 of EN 13369:2004
Tasks for the notified body	Certification of factory production control on the basis of :	Initial inspection of factory and of factory production control	— compressive strength (of concrete) ; — ultimate tensile and tensile yield strength ; — detailing ; — durability.	6.1.3.2 a and 6.3 of EN 13369:2004
		Continuous surveillance, assessments and approval of factory production control	— compressive strength (of concrete) ; — ultimate tensile and tensile yield strength ; — detailing ; — durability.	6.1.3.2 b and 6.3 of EN 13369:2004

ZA.2.2 EC Certificate and Declaration of conformity

When compliance with the conditions of this Annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include :

— name and address of the manufacturer, or his authorised representative established in the EEA, and the place of production ;

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking ;

— provisions to which the product conforms (e.g. Annex ZA of this EN) ;

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.) ;

— the number of the accompanying factory production control certificate ;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain, in addition to the information above, the following :

— name and address of the notified body ;

— the number of the factory production control certificate ;

— conditions and period of validity of the certificate, where applicable ;

— name of, and position held by, the person empowered to sign the certificate.

The above mentioned declaration and the certificate shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

ZA.3.1 General

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the product (or when not possible it may be on the accompanying label, the packaging or on the accompanied commercial documents e.g. a delivery note).

The following information shall be added to the CE marking symbol :

— identification number of the certification body ;

— name or identifying mark and registered address of the producer ;

— the last two digits of the year in which the marking is affixed ;

— number of the EC factory production control certificate ;

— reference to this European Standard ;

— description of the product: generic name and intended use ;

— information on those relevant essential characteristics taken from Table ZA.1 which are listed in the relevant Clause ZA.3.2, ZA.3.3 or ZA.3.4 ;

— "No performance determined" for characteristics where this is relevant.

The "No performance determined" (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

In the following subclauses the conditions are given for the application of CE marking. Figure ZA.1 gives the simplified label to affix to the product, containing the minimum set of information and the link to the accompanying document where the other required information are given. For what concern the information on essential characteristics, some of them may be given by an unambiguous reference to :

— technical information (product catalogue) (see ZA.3.2) ;

— technical documentation (ZA.3.3) ;

— design specification (ZA.3.4).

The minimum set of information to be put directly in the affixed label or in the companying document is given in Figures ZA.2, ZA.3 and ZA.4.

ZA.3.1.1 Simplified label

In the case of simplified label the following information shall be added to the CE marking symbol:

— name or identifying mark and registered address of the producer ;

— identification number of the unit (to ensure traceability) ;

— the last two digits of the year in which the marking is affixed.

The same identification number shall mark, in the accompanying documents, the information related to the unit.

Figure ZA.1 gives a model for the simplified label for CE marking.

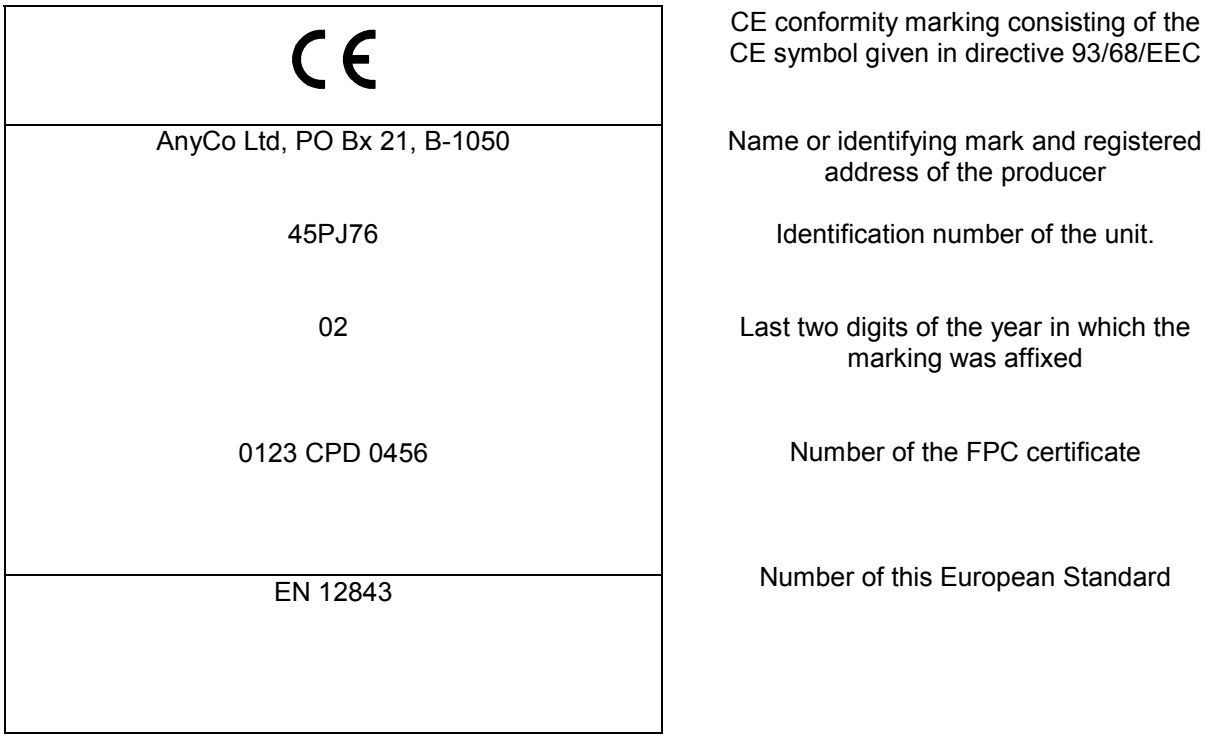


Figure ZA.1 — Example of simplified label

For small elements or for product stamping reasons, the size can be reduced by removing reference to EN and/or to FPC certificate.

ZA.3.2 Declaration of geometrical data and material properties

(Method 1 to determine properties relating to essential requirements "mechanical resistance and stability").

Figure ZA.2 gives, for a type of pole, the model CE marking inclusive of the information needed to determine, according to design regulation valid in the place of use, the properties related to mechanical resistance and stability, including aspects of durability and serviceability.

Referring to Table ZA.1 and to the information quoted in the list of ZA.3.1, the following properties shall be declared :

— compressive strength of concrete ;

— ultimate tensile strength of reinforcing steel ;

— tensile yield strength of reinforcing steel ;

— ultimate tensile strength of prestressing steel ;

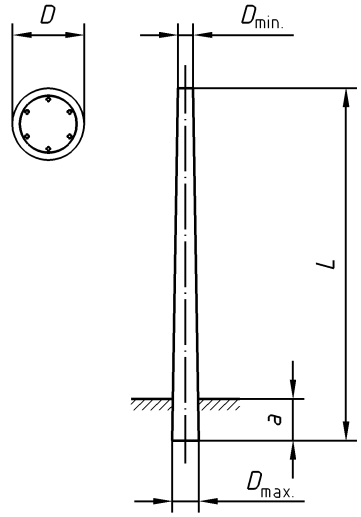
— tensile 0,1 proof stress of prestressing steel ;

— geometrical data (only critical dimensions) ;

— conditions for durability against corrosion ;

— conditions for durability against freeze-thaw (for exposed applications) ;

— possible reference to Technical Information (product catalogue) for detailing, durability and geometrical data.

CE 0123	CE conformity marking consisting of the CE symbol given in directive 93/68/EEC
AnyCo Ltd, PO Bx 21, B-1050	Identification of the notified body
02	Name or identifying mark and registered address of the producer
0123-CPD-0456	Last two digits of the year in which the marking was affixed
EN 12843	Number of the FPC certificate
Precast concrete masts and poles POLE (for telecommunication poles)	Number and title of European Standard concerned
Concrete : Compressive strength .....f_{ck} = 40 N/mm^2 Reinforcing steel : Ultimate tensile strength .....f_{tk} = 575 N/mm^2 Tensile yield strength .....f_{yk} = 500 N/mm^2	Generic name and intended use
 Measures in mm Length L = 8000 mm Diameters : D_{min} = 150 mm D_{max} = 250 mm Embedment a ≥ 500 mm Longitudinal bars 6 ϕ 10 Spiral ϕ 6 – pitch = 100 mm Covers : to spiral = 15 mm to bars = 21 mm For detailing and durability see Technical Information Technical Information : Product Catalogue ABC : 2002 – clause ii	Information on product geometry and material characteristics including detailing (to be adapted to the specific product by the producer)

NOTE 1 Numerical values are only as example.

NOTE 2 the sketch may be omitted if equivalent information are available in clearly identified Technical Information (product catalogue) referred to.

Figure ZA.2 — Example of CE marking with Method 1

ZA.3.3 Declaration of product properties

(Method 2 to determine properties relating to essential requirements "mechanical resistance and stability").

For all design data, including models and parameters used in calculation, reference may be made to the technical (design) documentation.

Referring to Table ZA.1 and to the information quoted in the list of ZA.3.1, the following properties shall be declared :

— compressive strength of concrete ;

— ultimate tensile strength of reinforcing steel ;

— tensile yield strength of reinforcing steel ;

— ultimate tensile strength of prestressing steel ;

— tensile 0,1 proof stress of prestressing steel ;

— mechanical ultimate strength of the element (calculated design values for non-seismic situations) with bending moment capacity, shear ou torsional capacity of critical sections ;

— safety factors for concrete and steel used in calculation ;

— other Nationally Determined Parameters NDPs used in calculation ;

— conditions for durability against corrosion (or exposure classes) ;

— exposure class for durability against freeze-thaw (only for exposed applications) ;

— possible reference to Technical Documentation for geometrical data, detailing, durability and other NDPs.

Figure ZA.3 gives, for prestressed or reinforced poles, the model CE marking in the case in which the properties related to mechanical resistance and stability are determined by the producer by means of EN Eurocodes.

The design values of the mechanical ultimate strength of the element shall be computed using, for the Nationally Determined Parameters, either the values recommended in EN 1992-1-1 or the values given in the National annex of the Eurocodes applicable to the works.

CE 0123	CE conformity marking consisting of the CE symbol given in directive 93/68/EEC Identification of the notified body
AnyCo Ltd, PO Bx 21, B-1050 02 0123-CPD-0456	Name or identifying mark and registered address of the producer Last two digits of the year in which the marking was affixed Number of the FPC certificate
EN 12843 Precast concrete masts and poles POLE (for telecommunication lines) Concrete : Compressive strength .....f_{ck} = xx N/mm^2 Reinforcing steel : Ultimate tensile strength .....f_{tk} = yyy N/mm^2 Tensile yield strength .....f_{yk} = zzz N/mm^2 Prestressing steel : Ultimate tensile strength .....f_{pk} = uuu N/mm^2 Tensile 0.1 % proof-stress .....$f_{p0.1k}$ =www N/mm^2 Mechanical resistance (design values): Bending moment capacity (of the foot section) ..... mmm kNm Shear capacity (of the top section) .....vvv kN Torsional capacity (of the top section) .....ttt kNm Material safety factors applied in strength calculation: For concrete ..... γ_c = z.zz For steel ..... γ_s = x.xx For geometrical data, detailing, durability and other NDPs see the Technical documentation Technical Documentation : Position Number..... xxxxxx	Number and title of European Standard concerned Generic name and intended use Information on product mandated characteristics including detailing (to be adapted to the specific product by the producer)

Figure ZA.3 — Example of CE marking with Method 2

ZA.3.4 Declaration of compliance with a given design specification

(Method 3 to determine properties relating to essential requirements "mechanical resistance and stability").

Figure ZA.4 gives, for prestressed or reinforced masts and poles, the model CE marking in the case the product is produced according to a design specification in which the properties related to mechanical resistance and stability are determined by means of design provisions applicable to the works.

Referring to Table ZA.1 and to the information quoted in the list of ZA.3.1, the following properties shall be declared :

— compressive strength of concrete ;

— ultimate tensile strength of reinforcing steel ;

— tensile yield strength of reinforcing steel ;

— ultimate tensile strength of prestressing steel ;

— tensile 0,1 proof stress of prestressing steel.

This method applies also in case of a design made with means other than EN Eurocodes.

CE 0123	CE conformity marking consisting of the CE symbol given in directive 93/68/EEC Identification of the notified body
AnyCo Ltd, PO Bx 21, B-1050 02 0123-CPD-0456	Name or identifying mark and registered address of the producer Last two digits of the year in which the marking was affixed Number of the FPC certificate
EN 12843 Precast concrete masts and poles POLE (for turbine supports) Concrete : Compressive strength.....f_{ck} = xx N/mm^2 Reinforcing steel : Ultimate tensile strength.....f_{tk} = yyy N/mm^2 Tensile yield strength.....f_{yk} = zzz N/mm^2 Prestressing steel : Ultimate tensile strength .....f_{pk} = uuu N/mm^2 Tensile 0.1 % proof-stress $f_{p0.1k}$ = www N/mm^2 For geometrical data, detailing, mechanical strength, fire resistance and durability see the design specifications Design Specification : Order Code xxxxxx	Number and title of European Standard concerned Generic name and intended use Information on product mandated characteristics including detailing (to be adapted to the specific product by the producer)

Figure ZA.4 — Example of CE marking with Method 3

In addition to any specific information relating to dangerous substances, the product should be also accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.
NOTE European legislation without national derogations need not be mentioned.

Bibliography

[1] EN 1990:2002, *Eurocode : Basis of structural design.*

[2] EN ISO 9001:2000, *Quality management systems – Requirements*.

[3] ENV 13670-1:2000, *Execution of concrete structures – Part 1 : Common rules*.

[4] ISO 1803:1997, *Building construction – Tolerances – Expression of dimensional accuracy – Principles and terminology*.

[5] ISO 10544, *Cold – reduced steel wire for reinforcement of concrete and the manufacture of welded fabric*.

[6] prEN 40-4, *Lighting columns – Part 4 : Specifications for reinforced and prestressed concrete lighting columns*

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