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Design of fastenings for use in concrete - Part 4-4: Post-installed fasteners - Mechanical systems

Conception-calcul des éléments de fixation pour béton -Partie 4-4 : Chevilles de fixation - Systèmes mécaniques Bemessung von Befestigungen in Beton - Teil 4-4: Dübel mechanische Systeme

This Technical Specification (CEN/TS) was approved by CEN on 20 October 2008 for provisional application.

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Foreword

This Technical Specification (CEN/TS 1992-4-4:2009) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This Technical Specification CEN/TS 1992-4-4 — Post-installed fasteners — Mechanical systems, describes the principles and requirements for safety, serviceability and durability of post-installed fasteners with mechanical anchorage systems for use in concrete. Furthermore bonded expansion anchors and bonded undercut anchors are covered.

This Technical Specification does not provide information about the use of National Determined Parameters (NDP).

CEN/TS 1992-4-4 is based on the limit state concept used in conjunction with a partial factor method.

CEN/TS 1992-4 'Design of fastenings for use in concrete' is subdivided into the following parts:

- Part 1: General
- Part 2: Headed fasteners
- Part 3: Anchor channels
- Part 4: Post-installed fasteners Mechanical systems
- Part 5: Post-installed fasteners Chemical systems

Connection to Part 1 of this Technical Specification TS

The principles and requirements of Part 4 of this CEN/TS are additional to those in Part 1, all the clauses and sub-clauses of which also apply to Part 4 unless varied in this Part. Additional information is presented under the relevant clauses/sub-clauses of Part 1 of the CEN/TS. The numbers for the clauses/sub-clauses of Part 4 continue from the number of the last relevant clauses/subclauses of Part 1.

The above principles also apply to Figures and Tables in Part 4.

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

1 Scope

1.1 General

1.1.6 This document relies on characteristic resistances and distances which are stated in a European Technical Specification. The characteristic values shown in Table 1 should be obtained from the relevant European Technical Specification as base for the design methods of this CEN/TS.

Characteristic	Design method			
	Α	В	С	
$N_{\rm Rk,p}$, $N_{\rm Rk,s}$, $V_{\rm Rk,s}$	x			
M ⁰ _{Rk,s}	x	x	x	
$F_{\rm Rd}$, uncracked concrete	0.	x	x	
$F_{\rm Rd}$, cracked concrete ^{a)}	0	x	x	
C _{cr,N} , S _{cr,N}	x			
C _{Cr,sp} , S _{cr,sp}	x			
C _C r, S _C r		×	x	
C _{min} , S _{min}	x	×		
h _{min}	x	×	x	
limitations on concrete strength classes of base material	x	x	X	
$k_{\rm cr}, k_{\rm ucr}, k_2, k_3, k_4$	x	2		
d _{nom} , h _{ef} , l _f	x	0		
^у мі ^{b)}	x	x	x	

Table 1 -- Characteristics used for the design of fasteners given in the European Technical Specification

^{a)} only for products suitable to applications in cracked and non-cracked concrete

^{b)} recommended partial factors for material see also CEN/TS 1992-4-1:2009, clause 4

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.

NOTE The following references to European standards and European Prestandards. These are the only European documents available at the time of publication of this TS. National documents take precedence until Eurocodes are published as European Standards.

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

CEN/TS 1992-4-1:2009, Design of fastenings for use in concrete — Part 4-1: General

3 Definitions and symbols

Definitions and symbols are given in CEN/TS 1992-4-1.

4 Basis of design

4.5.4 The following assumptions in respect to installation have been made in this CEN/TS. The installation instructions should reflect them:

- 1) Concrete has been compacted adequately in the area of the fastening. This should be checked prior and during installation via visual check.
- 2) Requirements for drilling operation and bore hole:
 - Holes are drilled perpendicular to the surface of the concrete unless specifically required otherwise by the manufacturer's instructions.
 - Drilling is carried out by method specified by the manufacturer.
 - When hard metal hammer-drill bits are used, they should comply with ISO or National Standards.
 - When diamond core drilling is permitted, the diameter of the segments should comply with the
 prescribed diameter.
 - Reinforcement in close proximity to the holes position is not damaged during drilling. In prestressed concrete structures it is ensured that the distance between the drilling hole and the prestressed reinforcement is at least 50mm; for determination of the position of the prestressed reinforcement in the structure a suitable device e.g. a reinforcement detector is used.
 - Holes are cleaned according to the instructions given in the European Technical Specification.
 - Aborted drill holes are filled with high strength non-shrinkage mortar.
- 3) Inspection and approval of the correct installation of the fasteners is carried out by appropriately qualified personnel.

NOTE Many drill bits exhibit a mark indicating that they are in accordance with ISO or National Standards. If the drill bits do not bear a conformity mark, evidence of suitability should be provided.

5 Determination of action effects

The determination and analysis of the condition of the concrete – cracked or non-cracked – serving as base material for the fastener and of the loads acting on the fastener is given in CEN/TS 1992-4-1:2009, clause 5.