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Dimensionering av infästningar till betong – Ankarkanaler – Tilläggsregler

Design of fastenings for use in concrete – Anchor channels – Supplementary rules

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This Technical Report is not a Swedish Standard. This document contains the English language version of CEN/TR 17080:2018, edition 1.

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Information about the content of this document is available from the SIS, Swedish Standards Institute, telephone +46 8 555 520 00. Standards may be ordered from SIS, who can also provide general information about national and international standards.

Dokumentet är framtaget av kommittén för Betongkonstruktioner, SIS/TK 556.

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 17080

September 2018

ICS 21.060.01; 91.080.40

English Version

Design of fastenings for use in concrete - Anchor channels - Supplementary rules

Bemessung der Verankerung von Befestigungen in Beton - Ankerschienen - Ergänzende Regelungen

This Technical Report was approved by CEN on 9 April 2017. It has been drawn up by the Technical Committee CEN/TC 250.

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European foreword

This document (CEN/TR 17080:2018) 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 shall not be held responsible for identifying any or all such patent rights.

Introduction

CEN/TR 17080 provides supplementary rules for the design of anchor channels for cases not currently covered by EN 1992-4:2018, namely,

— the design of anchor channels subject to shear force acting in the longitudinal direction of the channel;

— the design for the combined action of longitudinal shear, transverse shear and tension load acting on the anchor channel; and

— the design of supplementary reinforcement for anchor channels subject to shear force in longitudinal direction.

The proposed design rules follow closely the design model for headed fasteners. They have been derived from the results of current research.

In addition, rules alternative to EN 1992-4 for the design of supplementary reinforcement to carry shear loads transverse to the longitudinal axis of the channel are given.

This Technical Report is intended to be used in conjunction with EN 1992-4.

The numerical values for partial factors and other reliability parameters are recommended values and may be changed in a National Annex of EN 1992-4, if required. The recommended values apply when:

a) the anchor channels comply with the requirements of EN 1992-4:2018, 1.2, and

b) the execution complies with the requirements of EN 1992-4:2018, 4.6 and Annex F.

NOTE The proposed design method for shear loading acting in longitudinal direction of the channel can be realized only if the relevant parameters as specified in this CEN/TR, e.g. characteristic resistances and product dependent partial factors are given in a European Technical Product Specification.

1 Scope

EN 1992-4:2018 covers anchor channels located in cracked or uncracked concrete subjected to tensile loads and/or shear loads transverse to the longitudinal channel axis as well as combinations of these loads. Shear loads acting in direction of the longitudinal axis of the channel and combinations of shear loads acting transverse and in direction of the longitudinal axis of the channel, combinations of tensile loads and shear loads acting in direction of the longitudinal axis of the channel and combinations of loads in all three directions are excluded.

This Technical Report provides design rules for anchor channels under static and quasi-static shear loads acting in direction of the longitudinal channel axis and all possible combinations of shear and tension loads acting on the channel as well as design rules for anchor channels with supplementary reinforcement to take up shear loads, additional and alternative to the provisions of EN 1992-4:2018. All relevant failure modes are considered and will be verified. Fatigue, impact and seismic loads are not covered.

The design rules in this document are only valid for anchor channels with a European Technical Product Specification. The design provisions for shear loads acting in direction of the longitudinal axis of the channel cover the following anchor channels and applications:

— Anchor channels with 2 or 3 anchors.

— Anchor channels where the shear load in the longitudinal axis of the channel is transferred to the channel by corresponding locking channel bolts creating mechanical interlock by means of a notch in the channel lips or serrated channel bolts which interlock with serrated lips of the channel (Figure 1).

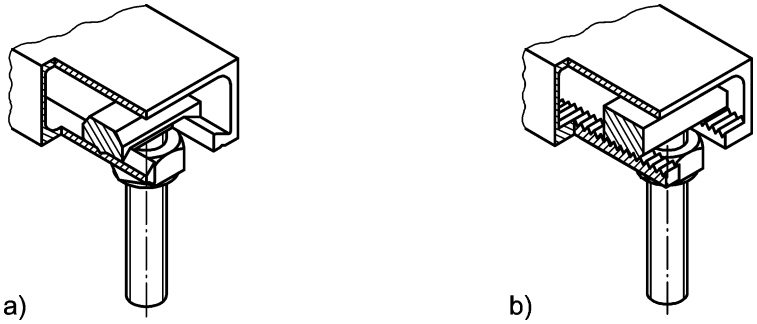
— Anchor channels produced from steel with at least two metal anchors rigidly connected to the back of the channel (e.g. by welding, forging or screwing). The anchor channels are placed flush with the concrete surface. A fixture is connected to the anchor channel by channel bolts with nut and washer.

— Anchor channels close to the edge placed either parallel or transverse to the edge of the concrete member. The design provisions for concrete edge failure do not cover channel orientations inclined to the concrete edge.

The design method for anchor channels loaded in shear in direction of the longitudinal axis of the channel follows closely the existing design model for headed fasteners. For reasons of simplicity modifications specific for anchor channels are used where necessary.

The design provisions for the supplementary reinforcement to take up shear loads in case of anchor channels situated parallel to the edge and loaded in shear transverse to the longitudinal axis apply to anchor channels with unlimited number of anchors.

Examples of anchor channels and channel bolts ensuring mechanical interlock are given in Figure 1.



Key

a) notching channel bolt creating a notch in the channel

b) channel with serrated lips and matching locking channel bolt

Figure 1 — Anchor channels with mechanical interlock - Examples

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings*

EN 1992–1-2, *Eurocode 2: Design of concrete structures — Part 1-2: General rules — Structural fire design*

EN 1992-4:2018, *Eurocode 2 — Design of concrete structures — Part 4: Design of fastenings for use in concrete*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms and definitions given in EN 1992-4 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

NOTE This clause includes only terms, definitions and symbols supplementary to EN 1992-4.

3.1 Terms and definitions

3.1.1
notching channel bolt
channel bolt (EN 1992-4:2018, 3.1.10) creating a notch in the channel lip to transfer a shear load by mechanical interlock in the longitudinal axis of the channel (Figure 1a))

3.1.2
locking channel bolt
channel bolt (EN 1992-4:2018, 3.1.10) interlocking with serrated channels lips by means of matching serrations (Figure 1b))

3.1.3
serrated channel
anchor channel (EN 1992-4:2018, 3.1.2) with special serrations formed into the lips of the channel. The channel bolts used to fix to this channel have matching serrations (Figure 1b))

3.1.4
direction x
direction in the longitudinal axis of the channel

3.1.5
direction y
direction transverse to the longitudinal axis of the channel

3.2 Symbols:

N_{Ed}^{a}	design tension force acting on the anchor
N_{Ed}^{cb}	design tension force acting on the channel bolt
N_{Ed}^{ch}	design tension force acting on the channel
$N_{Rd,i}$	design tension resistance for a certain failure mode
$N_{Rd,s}$	design tension resistance for steel failure modes, in general
$N_{Rd,s,a}$	design tension steel resistance of the anchor
$N_{Rd,s,c}$	design tension steel resistance of the connection between channel and anchor
$N_{Rd,s,cb}$	design tension steel resistance of the channel bolt
$N_{Rd,s,l}$	design tension steel resistance of the channel lip and mechanical interlock
$N_{Rk,hook,i}$	characteristic tension resistance of the hooked part of a rebar
$N_{Rk,bond,i}$	characteristic tension bond resistance of a rebar
$V_{Ed,x}^{a}$	design shear force acting on the anchor in direction of the channel axis
$V_{Ed,y}^{a}$	design shear force acting on the anchor transverse to the channel axis
$V_{Ed,x}^{cb}$	design shear force acting on the channel bolt in direction of the channel axis
$V_{Ed,y}^{cb}$	design shear force acting on the channel bolt transverse to the channel axis
$V_{Rd,s}$	design shear resistance for steel failure modes, in general
$V_{Rd,s,a}$	design shear steel resistance of the anchor
$V_{Rd,s,a,x}$	design shear steel resistance of the anchor in direction of the x-axis
$V_{Rd,s,a,y}$	design shear steel resistance of the anchor in direction of the y-axis
$V_{Rd,s,c,x}$	design shear steel resistance of the connection between anchor and channel in direction of the x-axis
$V_{Rd,s,c,y}$	design shear steel resistance of the connection between anchor and channel in