SLOVENSKI STANDARD
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Projektiranje pritrjevanja za uporabo v betonu - Statično nedoločeni nekonstrukcijski sistemi

Design of fastenings for use in concrete - Redundant non-structural systems

Bemessung der Verankerung von Befestigungen in Beton - Redundante nicht tragende Systeme

Conception-calcul des éléments de fixation pour béton - Systèmes redondants non-structurels

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21.060.01	Vezni elementi na splošno	Fasteners in general
91.080.40	Betonske konstrukcije	Concrete structures

SIST-TP CEN/TR 17079:2018 **en**

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

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Design of fastenings for use in concrete - Redundant non-structural systems

Conception-calcul des éléments de fixation pour béton - Systèmes redondants non-structurels

Bemessung der Verankerung von Befestigungen in Beton - Redundante nicht tragende Systeme

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 17079:2018) 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

EN 1992-4 provides a design method for fastenings (connection of statically determinate and statically indeterminate structural elements and non-structural elements to structural components), which are used to transmit actions to the concrete. EN 1992-4 assumes that with appropriate degree of reliability (see EN 1990) fasteners:

— sustain all actions and influences likely to occur during execution and use (ultimate limit state),

— do not deform to an inadmissible degree (serviceability limit state),

— remain fit for the use for which they are required (durability),

— are not damaged by accidental events to an extent disproportional to the original cause.

This Technical Report provides design guidance for post-installed fasteners for fixing statically indeterminate non-structural light weight systems with at least three fixing points. The fixing may be into normal weight concrete or precast prestressed hollow core slabs.

The proposed design model assumes that load transfer to adjacent fixing points takes place when excessive slip or failure of a fastener occurs under extreme conditions (e.g. large crack width). The suitability of the fasteners should be stated in a European Technical Product Specification for at least multiple use for non-structural applications in concrete (see e.g. assessment guideline developed under the CPD that is ETAG 001-6 [3]).

It is intended that this document is used in conjunction with EN 1992-4.

The numerical values for reliability parameters are recommended values and may be changed in a National Annex, if required. The recommended values apply:

— for post-installed fasteners in accordance with EN 1992-4:2018, 1.2;

— when the installation complies with the requirements of EN 1992-4 2018, 4.6 and Annex F.

1 Scope

1.1 General

This Technical Report provides design rules for fasteners used to connect statically indeterminate non-structural light weight systems (e.g. suspended ceilings, pipe work, ducting) to concrete members such as walls or floors (see Figure 1)).

The proposed design model may be applied to post-installed mechanical and bonded anchors covered by EN 1992-4:2017, 1.2. Their suitability is given in a European Technical Product Specification.

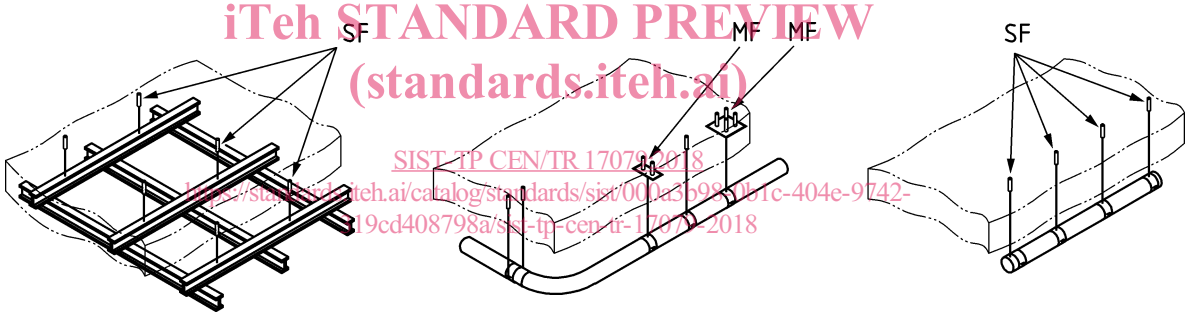
The design rules assume the following:

— under extreme conditions (e.g. large crack width) excessive slip or failure of a fastener might occur;

— elements or systems are attached with at least three fixing points with one or more fasteners at each fixing point;

— where more than one fastener is used at a fixing point (MF, see Figure 1), only fasteners of the same type, size and length are used;

— the attached system is sufficiently stiff to transfer the load at any fixing point to adjacent fixing points without significantly impairing the performance characteristics of the system both at serviceability and ultimate limit states.



Key

SF one fastener per fixing point

MF two or more fasteners per fixing point

Figure 1 — Statically indeterminate non-structural systems with one or more fasteners per fixing point — Examples

This Technical Report applies to non-structural applications in structures covered by EN 1992-1-1. In applications where special considerations apply, e.g. nuclear power plants or civil defence structures, modifications may be necessary.

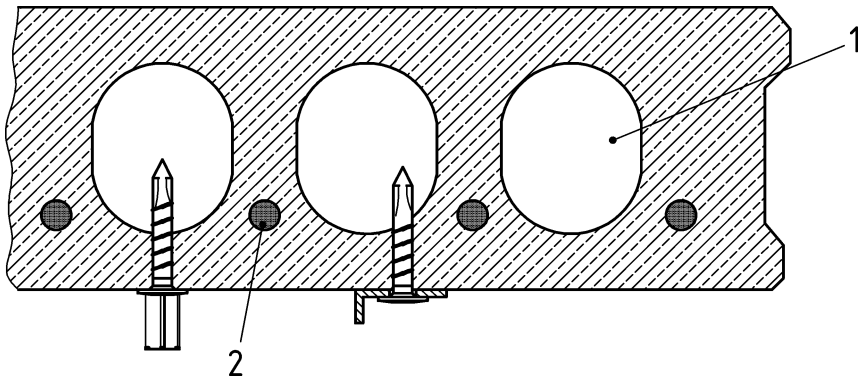
This document does not cover the design of the fixture. The design of the fixture will be carried out to comply with the appropriate Standards.

1.2 Type of fasteners

Post-installed fasteners according to EN 1992-4.

1.3 Fastener dimensions and materials

EN 1992-4:2018, 1.3 applies with the following addition: In precast pre-stressed hollow core elements the minimum embedment depth may be reduced to a value to ensure proper functioning if placed in a flange (wall) of minimum thickness of 17 mm. In this case the minimum embedment depth and the admissible position of the fastener in the hollow core slab given in the relevant European Technical Product Specification will be observed (Figure 2).



Key

1 hollow core

2 prestressing steel

Figure 2 — Example of fasteners in a precast prestressed hollow core slab

1.4 Fastener loading

Loading on the fastenings will only be quasi static. Fatigue, impact and seismic loads are not covered.

Any axial compression on the fixture will be transmitted to the concrete either without acting on the fastener or via fasteners suitable for resisting compression.

1.5 Concrete strength

EN 1992-4 applies.

1.6 Concrete member loading

EN 1992-4 applies. However, fatigue, impact and seismic loads are not covered.

1.7 Concrete member dimensions

The minimum thickness of members in which fasteners are installed is at least 80 mm unless otherwise specified in the European Technical Product Specification. For precast pre-stressed hollow core elements, the minimum wall thickness is 17 mm.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
attached element
non-structural component that is connected by post- installed fasteners to the concrete

3.1.2
fastening
assembly of fixture and fasteners used to transmit loads to concrete

3.1.3
fixing point
fastening or single fastener

3.1.4
number of fixing points
n_1
number of positions where an attached element (e.g. piping, light suspended ceiling or facade) is fixed with one or more fasteners

3.1.5
number of fasteners
n_2
number of fasteners per fixing point

3.1.6
redundant system
statically indeterminate system of at least 3 fixing points and attached element

3.2 Symbols

F_{Ed}	design force acting on a fixing point with one or more fasteners
F_{Rd}	design resistance of a fixing point (consisting of one or more fasteners), given in the relevant European Technical Product Specification depending on the boundary conditions
$F_{Ed,lim}$	limiting design action on a fixing point (consisting of one or more fasteners)

4 Basis of design

4.1 General

The design model given in this document is based on research described in [4].

The verification of the fixing points after redistribution of loads is not required since it is taken into account by limiting the design load on a fixing point. The background of this assumption is given in the above mentioned reference.

The design method is valid only if the design load on a fixing point is limited to the values given in 4.5.