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Australian STANDARD®

STANDARDS Australia

Design of post-installed and cast-in fastenings in concrete



AS 5216:2026

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Design of post-installed and cast-in fastenings in concrete

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How to read this Standard

This page explains the meaning of the language and structure of this Standard.

Refer to Standards Australia's Standardisation Guide 006 for more details about drafting rules.

Australian and Australian/New Zealand Standards are voluntary unless they are referenced in legislation or called up in contracts.

Requirements

To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

Recommendations, permissions and possibilities

The following words are commonly used in Standards, but statements using them do not have to be followed to conform to the Standard:

(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee ME-029, Fasteners, to supersede AS 5216:2021.

The objective of this document is to provide minimum design requirements for fastenings used to transmit loads to concrete for safety-critical applications.

Standards Australia acknowledges and thanks the European Committee for Standardization—CEN, Rue de la Science 23, B-1040 Brussels, Belgium for permission to reproduce its content in the development of this document.

Standards Australia thanks the ICC Evaluation Service for permission to reproduce Clause 4.3.3.2.1, equations in Figure 4.3.3.2.1.2(A) and (B) and equations in Figure 4.3.3.2.2.2 from AC232:2019, *Anchor Channels in Concrete Elements*. These text and equations are copyright of ICC-ES. All rights reserved.

The major changes in this edition are as follows:

(a) Fasteners under fatigue loading is included in Appendix G.

(b) Added Clause 10 to include durability requirements for fasteners.

(c) Updates to Appendix E to include power actuated fasteners.

(d) Updates to Appendix D, Post-installed reinforcing bar.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

This document includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by “C” preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the document.

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Australian Standard®

Design of post-installed and cast-in fastenings in concrete

Section 1 Scope and general

1.1 Scope

This document specifies minimum requirements for the design of fastenings used to transmit loads to concrete for safety-critical applications.

The fasteners covered in this document are as follows:

(a) Post-installed fasteners:

  (i) Mechanical fasteners (e.g. expansion fasteners, undercut fasteners and concrete screws).

  (ii) Chemical fasteners (e.g. chemical fasteners, chemical expansion fasteners).

(b) Cast-in anchor channel with rigid connection (e.g. forged or welded) between the channel profile and anchor.

(c) Power actuated fasteners (e.g. nails or threaded stud type fasteners).

This document also includes requirements for the testing and assessment of post-installed and cast-in fasteners to establish the necessary design parameters for use with this document.

The design provisions in this document are relevant to static, quasi-static and seismic loading that may include tension, shear, bending or torsion moments, or a combination thereof.

The design provisions in this document do not apply to the following:

(i) Design of fixtures.

(ii) Design of fastenings for exposure to fire.

(iii) Design of anchor channel for seismic actions.

(iv) Fasteners for lifting, transport and erection (e.g. brace inserts, lifting inserts, etc.), headed fasteners, ferrules, headed reinforcement and anchorage for prestressing strands.

NOTE 1 For design actions, fastener products, substrates and applications not covered by the scope of this document, the design engineer should seek technical advice from the fastener supplier in relation to the suitability of the selected fastener for the intended application.

NOTE 2 The default service life is 50 years. However, if the fastener (or the system) has a pre-qualification document in accordance with Appendix A including capacity reduction factors, the document can be used to assess the fastening system for a longer service life as specified in the prequalified document.

C1.1

The design theory for fastenings embodied in this document utilizes the tensile strength of concrete and is closely based on the design procedure published in EN 1992-4.

The design and installation provisions of this document have been developed on the assumption that materials used and their maintenance ensure that the installed fasteners will fulfil their intended function for the intended life of the structure.

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1.2 Application

This document relies upon design parameters and product specifications that define a fastener's suitability for a given application. The testing and assessment of a fastener shall be performed in accordance with the requirements of Appendix A. All necessary design parameters such as characteristic values and product specifications such as geometric and material properties required for Sections 2 to 9 of this document shall be obtained from an assessment report prepared in accordance with Appendix A.

NOTE 1 The design parameters and product specifications required for use with this document may also be obtained from a current European Technical Assessment for the relevant fastener.

NOTE 2 This standard does not cover site testing of fasteners. Guidance on site testing is available in AEFAC Technical Note 05: Guidelines for Site Testing of anchors Vol.1 to Vol.4.

Concrete members shall be composed of normal-weight concrete without fibres. They shall conform to the requirements of Clause 2.4.

Supplementary reinforcement and reinforcing steel inserts in chemical fasteners shall have a ductility class type N in accordance with AS/NZS 4671.

Chemical fasteners intended for applications involving sustained tensile loads shall be qualified for sustained loading applications in accordance with Appendix A.

1.3 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.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1012.9, *Methods of testing concrete, Method 9: Compressive strength tests — Concrete, mortar and grout specimens*

AS 1170.4, *Structural design actions, Part 4: Earthquake actions in Australia*

AS 1379, *Specification and supply of concrete*

AS 3600, *Concrete structures*

AS 4100, *Steel structures*

AS/NZS 1170.0, *Structural design actions, Part 0: General principles*

AS/NZS 4671, *Steel reinforcing materials*

AUSTRALIAN ENGINEERED FASTENERS AND ANCHORS COUNCIL. AEFAC - TN10, *Prequalification and design requirements for fastenings under seismic actions*. 2021.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330008, *Anchor channels*. 2021.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330083-04-0601, *Power-actuated fastener in concrete for redundant non-structural applications*. 2022.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330087-01-0601, *Systems for post-installed rebar connections with mortar*. 2020.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330232-02-0601, *Mechanical fasteners for use in concrete*. 2024.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330250-01-0601, *Post-installed fasteners in concrete under fatigue cyclic loading*. 2023.

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EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330499-02-0601, *Bonded fasteners for use in concrete*. 2022.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 330747-00-0601, *Fasteners for use in concrete for redundant non-structural systems*. 2018.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EAD 332402-00-0601, *Post-installed reinforcing bar (rebar) connections with improved bond-splitting behaviour*. 2018.

EUROPEAN ORGANISATION FOR TECHNICAL ASSESSMENT. EOTA TR 049, *Post-installed fasteners in concrete under seismic action*. 2016.

1.4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

1.4.1
action
set of concentrated or distributed forces acting on a structure (direct action), or deformation imposed on a structure or constrained within it (indirect action)

1.4.2
anchor
headed component of anchor channel

Note 1 to entry: In Australian practice, a fastener installed in concrete may be referred to as an "anchor", such as "mechanical anchor" and "chemical anchor". For clarity in this document, the term "anchor" is reserved for the headed component of the anchor channel.

1.4.3
anchor channel
fastener made of profiled steel element with two or more rigidly connected anchors that are installed into position prior to the casting of concrete

Note 1 to entry: See Figure 1.3(B).

1.4.4
base material
material in which the fastener is installed

1.4.5
bond failure
mode of failure for chemical fasteners characterized by pull-out of the fastener caused by either separation at the interface of the bonding compound and the embedded steel element or between the bonding compound and the base material

1.4.6
capacity reduction factor
factor used to multiply the nominal capacity to obtain the design capacity

1.4.7
cast-in fastener
fastener that is installed into position prior to the casting of concrete

Note 1 to entry: See Figure 1.3(B).

1.4.8
channel bolt
screw or bolt positioned in the steel profile of the anchor channel that is used to connect an element to the anchor channel

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