IN-LB	Inch-Pound Units
SI	International System of Units

Post-Installed Mechanical Anchors in Concrete—Qualification Requirements and Commentary

Reported by ACI Committee 355

ACI CODE-355.2-24

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An ACI Standard

Reported by ACI Committee 355

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This Code prescribes testing programs and evaluation requirements for post-installed mechanical anchors intended for use in structural applications addressed by ACI CODE-318 and subjected to static or seismic loads in tension, shear, or combined tension and shear. Criteria are prescribed for determining whether anchors are acceptable for use in uncracked concrete only, or in cracked as well as uncracked concrete. Performance categories for anchors are established, as are the criteria for assigning anchors to each category. The anchor performance categories are used by ACI CODE-318 to assign capacity reduction factors and other design parameters.

Keywords: anchors; cracked concrete; expansion anchors; fasteners; mechanical anchors; post-installed anchors; screw anchors; undercut anchors.

CONTENTS

ACI CODE-355.2-24 supersedes ACI 355.2-22 and was approved by the ACI Standards Board for publication June 2024, and published November 2024. This Code was first published in 2001 and revised in 2004, 2007, 2019, and 2022.

CHAPTER 1—GENERAL

1.1—Scope

This Code prescribes testing and evaluation requirements for post-installed mechanical anchors intended for use in concrete designed under the provisions of ACI CODE-318. Criteria are prescribed to determine whether anchors are acceptable for use in uncracked concrete only, or in cracked as well as uncracked concrete. Criteria are prescribed to determine the performance category for each anchor. The anchor performance categories are used by ACI CODE-318 to assign capacity reduction factors and other design parameters.

1.2—General

This Code describes the tests required to qualify a post-installed mechanical anchor or anchor system for use under the provisions of ACI CODE-318.

1.3—Purpose

This Code applies to post-installed mechanical anchors (torque-controlled expansion anchors, displacement-controlled expansion anchors, undercut anchors, and screw anchors) placed into predrilled holes and anchored within the concrete by mechanical means.

1.4—Applicability

This Code applies to expansion, undercut, and screw anchors with a minimum effective embedment depth of 1-1/2 in. (40 mm) and with a nominal diameter of 1/4 in. (6 mm) or larger. Screw anchors are limited to a maximum effective embedment of $10d_a$.

COMMENTARY

CHAPTER R1—GENERAL

R1.1—Scope

This Code prescribes the testing programs required to qualify post-installed mechanical anchors for use with the design method of ACI CODE-318 Chapter 17, where it is assumed that anchors have been tested either for use in uncracked concrete or for use in cracked and uncracked concrete. This testing is performed in concrete specimens controlled by the testing laboratory as a means of simulating concrete, both cracked and uncracked, that might occur in actual structures. Post-installed mechanical anchors exhibit a range of working principles, proprietary designs, and performance characteristics. ACI CODE-318 Chapter 17 addresses this situation by basing capacity reduction factors for anchors on anchor performance categories. This Code is intended to develop the data required by ACI CODE-318 Chapter 17 to confirm an anchor's reliability and place it in the appropriate anchor category.

ASTM E488/E488M includes some details for cracked concrete test members similar to those in this document. ASTM E488/E488M also has detailed test procedures for testing in cracked concrete.

R1.4—Applicability

The design method deemed to satisfy the anchor design requirements of ACI CODE-318 Chapter 17 is based on an analysis of a database of anchors with a maximum diameter of 2 in. (50 mm) and an embedment depth not greater than 25 in. (635 mm). This Code can be used for anchors with those maximum dimensions. While this Code gives no limitations on maximum anchor diameter or embedment depth, for anchors beyond these dimensions, the testing authority should decide if the tests described herein are applicable or if alternative tests and analyses are more appropriate. The minimum diameter of 1/4 in. (6 mm) is based on practical considerations regarding the limit of structural anchor applications. The current database of screw anchors contains products with an embedment up to $h_{ef} = 10d_a$ due to practical limits of manufacturing and ability to install at deep embedments. This database has been shown to satisfy the design requirements of ACI CODE-318 Chapter 17.