SI International System of Units

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

Reported by ACI Committee 355

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

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American Concrete Institute, 3880 Country Club Drive, Farmington Hills, Michigan 48331.
Telephone: +1.248.848.3700. Facsimile: +1.248.848.3701
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(SI Units)

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

An ACI Standard

Reported by ACI Committee 355

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Christopher La Vine
Nam-Ho Lee
Lee W. Mattis
Robert R. McGlohn
Donald F. Meinheit
Conrad Paulson
Dan R. Stoppenhagen

This Code prescribes testing programs and evaluation requirements for post-installed adhesive anchors intended for use in concrete under the design provisions of ACI CODE-318-25. Testing and assessment criteria are provided for various conditions of use, including seismic loading; sustained loading; aggressive environments; reduced and elevated temperatures; and for determining whether anchors are acceptable for use in uncracked concrete only, or acceptable for service both in cracked and uncracked concrete. Criteria are provided for establishing the characteristic bond strength, reductions for adverse conditions, and the anchor category and associated jobsite quality control requirements.

Keywords: adhesive anchors; cracked concrete; fasteners; post-installed anchors; qualification procedures; uncracked concrete.

CONTENTS

CHAPTER 1—INTRODUCTION, p. 4
1.1—Introduction, p. 4
1.2—Scope, p. 4
1.3—Units of measurement, p. 7

CHAPTER 2—NOTATION AND DEFINITIONS, p. 8
2.1—Notation, p. 8
2.2—Definitions, p. 13

CHAPTER 3—GENERAL REQUIREMENTS, p. 19
3.1—Test organization, p. 19
3.2—Variables and options, p. 19

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3.3—Required tests for qualification, p. 20
3.4—Assessment for multiple anchor element types for adhesive anchors, p. 27
3.5—Assessment for alternative drilling methods, p. 28

CHAPTER 4—REQUIREMENTS FOR TEST SPECIMENS, ANCHOR INSTALLATION, AND TESTING, p. 30
4.1—Testing by ITEA and manufacturer, p. 30
4.2—Test samples, p. 30
4.3—Concrete for test members, p. 31
4.4—Requirements for test members, p. 32
4.5—Anchor installation, p. 38
4.6—Drill bit requirements, p. 40
4.7—Test methods, p. 40
4.8—Tests in cracked concrete, p. 45
4.9—Seismic tests, p. 46
4.10—Changes to products, p. 48

CHAPTER 5—REQUIREMENTS FOR ANCHOR IDENTIFICATION, p. 49
5.1—Basic requirements, p. 49
5.2—Verification, p. 49
5.3—Fingerprinting adhesive materials, p. 49
5.4—Packaging, p. 49

CHAPTER 6—REFERENCE TESTS, p. 50
6.1—Purpose, p. 50
6.2—Required tests, p. 50
6.3—Conduct of tests, p. 51

CHAPTER 7—RELIABILITY TESTS, p. 52
7.1—Purpose, p. 52
7.2—Required tests, p. 52
7.3—Conduct of tests, p. 52
7.4—Reliability tests, p. 52
7.5—Sensitivity to hole cleaning: dry concrete, p. 53
7.6—Sensitivity to hole cleaning: saturated concrete, p. 53
7.7—Sensitivity to hole cleaning: water-filled hole, p. 54
7.8—Sensitivity to hole cleaning: submerged concrete, p. 55
7.9—Sensitivity to mixing effort, p. 55
7.10—Sensitivity to installation in water-saturated concrete, p. 56
7.11—Sensitivity to installation in water-filled hole: saturated concrete, p. 56
7.12—Sensitivity to installation in submerged concrete, p. 56
7.13—Sensitivity to crack width—low-strength concrete, p. 56
7.14—Sensitivity to crack width: high-strength concrete, p. 56
7.15—Sensitivity to crack width cycling, p. 57
7.16—Sensitivity to freezing and thawing, p. 59
7.17—Sensitivity to sustained loading at standard and maximum long-term temperature, p. 60
7.18—Sensitivity to installation direction, p. 63
7.19—Torque test, p. 64

CHAPTER 8—SERVICE-CONDITION TESTS, p. 65
8.1—Purpose, p. 65
8.2—Required tests, p. 65
8.3—Conduct of tests, p. 65
8.4—Tension tests in uncracked and cracked concrete, p. 65
8.5—Tension tests at elevated temperature, p. 65
8.6—Tension tests with decreased installation temperature, p. 66
8.7—Establishment of cure time at standard, minimum, and maximum temperature, p. 69
8.8—Durability assessment, p. 69
8.9—Verification of full concrete capacity in a corner, p. 71
8.10—Determination of minimum spacing and edge distance to preclude splitting, p. 71
8.11—Tests to determine shear capacity of anchor elements with nonuniform cross section, p. 72
8.12—Seismic cyclic tension tests, p. 73
8.13—Seismic cyclic shear tests, p. 75
8.14—Seismic crack cycling tests, p. 77

CHAPTER 9—SUPPLEMENTAL TEST, p. 81
9.1—Round-robin tests, p. 81
9.2—Tests to determine minimum member thickness, p. 82
9.3—Tests for recognition of deformed reinforcing bars as anchor elements, p. 83
9.4—Tests for supplementary recognition of metric threaded rods as anchor elements, p. 84
9.5—Tests for supplementary recognition of fractional threaded rods as anchor elements, p. 85

CHAPTER 10—ASSESSMENT OF ANCHORS, p. 87
10.1—Analysis of data, p. 87
10.2—Normalization of anchor capacities for measured concrete bond and steel strengths, p. 87
10.3—Establishing characteristic values, p. 88
10.4—Assessment of characteristic tension capacity associated with concrete breakout and pullout, p. 88
10.5—Assessment of steel tension capacity, p. 98
10.6—Assessment of steel shear capacity (8.11), p. 98
10.7—Assessment of minimum member thickness (9.2), p. 99
10.8—Assessment of maximum tightening torque (7.19), p. 99
10.9—Assessment of behavior under crack cycling (7.15), p. 100
10.10—Assessment of freezing-and-thawing behavior (7.16), p. 100
10.11—Assessment of sustained load behavior (7.17), p. 100
10.12—Assessment of performance associated with installation direction (7.18), p. 102
10.13—Assessment of performance at elevated temperature (8.5), p. 103

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10.14—Assessment of performance with decreased installation temperature (8.6), p. 103
10.15—Assessment for establishment of cure time at standard temperature (8.7), p. 104
10.16—Assessment of durability requirement (8.8), p. 105
10.17—Assessment of performance in corner test (8.9), p. 105
10.18—Assessment of performance in minimum spacing and edge distance test (8.10), p. 105
10.19—Assessment of seismic tests (8.12, 8.13, 8.14), p. 106
10.20—Determination of seismic characteristic strength, p. 117
10.21—Establishment of hole-cleaning procedures, p. 118
10.22—Establishment of on-site quality control and installation conditions, p. 118
10.23—Assessment based on installation and environmental conditions, p. 119
10.24—Assessment for fire exposure, p. 119

CHAPTER 11—DATA PRESENTATION, p. 120
11.1—General requirements, p. 120
11.2—Contents of the evaluation report, p. 120
11.3—Data presentation, p. 120

CHAPTER 12—INDEPENDENT TESTING AND EVALUATION AGENCY REQUIREMENTS, p. 123
12.1—General requirements, p. 123
12.2—Certification, p. 123

CHAPTER 13—QUALITY CONTROL REQUIREMENTS, p. 124
13.1—Quality assurance program, p. 124
13.2—Quality control manuals, p. 124
13.3—Special inspection, p. 124

CHAPTER 14—REFERENCES, p. 126
Authored references, p. 126

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CODE

CHAPTER 1—INTRODUCTION

1.1—Introduction

This Code prescribes testing and evaluation requirements for post-installed adhesive anchor systems intended for use in concrete under the provisions of ACI CODE-318. Criteria are separately prescribed to determine the suitability of adhesive anchors used in uncracked concrete only, or in both cracked and uncracked concrete. Criteria are prescribed to determine the design parameters and performance category for adhesive anchors. Included are assessments of the adhesive anchor system for bond strength, reliability, service conditions, and quality control. Special inspection (13.3) is required during anchor installation as noted in 10.22. Table 1.1 provides an overview of the scope.

Table 1.1—Overview of anchor system

Anchor type	Embedded part	Assessment criteria	
Adhesive anchor	Threaded rods, deformed reinforcing bars, or internally threaded steel sleeves with external deformations	Uncracked concrete	Table 3.3.1
		Cracked and uncracked concrete	Table 3.3.2a or Table 3.3.2b

1.2—Scope

This Code applies only to post-installed adhesive anchors as defined herein.

1.2.1 This Code applies to anchors with a diameter d_a of 6.35 mm or larger. The drilled hole shall be approximately cylindrical with a diameter $d_o \leq 1.5d_a$. This Code also applies to anchors with an anchor embedment depth h_{ef} not less than four diameters ($4d_a$), or 41 mm, and an embedment depth not exceeding $20d_a$.

COMMENTARY

CHAPTER R1—INTRODUCTION

R1.1—Introduction

This Code prescribes the testing programs required to qualify post-installed adhesive anchor systems for design in accordance with ACI CODE-318 Chapter 17. ACI CODE-318 Chapter 17 requires that anchors be tested either for use exclusively in uncracked concrete or for use in cracked and uncracked concrete conditions, whereby it is understood that the presence of cracking may occur at any time over the service life of the anchors. Test and assessment criteria are provided for various conditions, including loads (seismic and sustained), environmental with regard to humidity and temperature, and determination if anchors are acceptable for use in cracked or uncracked concrete. Refer to Cook and Konz (2001) for a review of factors that influence adhesive anchor behavior. Refer to Fuchs et al. (1995) for background on the concrete breakout design model and to Eligehausen et al. (2006) and Zamora et al. (2003) for a discussion of bond models for adhesive and grouted anchors. For a discussion of issues associated with the qualification and design of systems for post-installed reinforcing bars, refer to Spieth et al. (2001). For background on seismic testing and assessment of anchors, refer to Hoehler and Eligehausen (2008), Hoehler et al. (2011), and Mahrenholtz et al. (2016, 2017).

R1.2—Scope

Adhesive anchors resist tension loads with a combination of adhesion and mechanical bond (micro-interlock). Different anchor designs and adhesive types may exhibit a range of performance characteristics. In particular, the sensitivity of adhesive anchors to variations in installation and service-condition parameters (such as hole cleaning, installation orientation, and cracked concrete characteristics) may vary widely from each system. ACI CODE-318 addresses this situation by matching capacity reduction factors to anchor performance categories that are, in turn, established through a series of reliability tests.

R1.2.1 The minimum diameter of 6 mm is based on practical considerations regarding the limit of structural anchor applications. The upper limit on the ratio of hole diameter to anchor element diameter provides a demarcation between conditions where a single bond strength can be used to evaluate anchor strength and conditions where bond strengths at both the anchor interface and concrete interface must be determined to evaluate anchor strength. In addition, the value of $1.5d_a$ is based on consideration of typical practice whereby most organic adhesives are used with thin bond lines to limit both adhesive shrinkage and creep of

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