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An ACI Standard

Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures (ACI 562-19) and Commentary

Reported by ACI Committee 562

ACI 562-19

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Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary

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ACI 562-19
(SI units)

Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures (ACI 562-19) and Commentary

An ACI Standard

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ACI 562-19, "Code Requirements for Assessment, Repair and Rehabilitation of Existing Concrete Structures," was developed to provide design professionals a code for the assessment of the damage and deterioration, and the design of appropriate repair and rehabilitation strategies. The code provides minimum requirements for assessment, repair, and rehabilitation of existing structural concrete buildings, members, systems and where applicable, nonbuilding structures. ACI 562-19 was specifically developed to work with the International Existing Building Code (IEBC) or to be adopted as a stand-alone code.

Keywords: assessment; bond; corrosion; damage; durability; evaluation; existing structure; fiber-reinforced polymer (FRP); interface bond; licensed design professional; maintenance; rehabilitation; reliability; repair; strengthening.

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PREFACE

This code provides minimum requirements for assessment, repair, and rehabilitation of existing structural concrete buildings, members, systems and where applicable, nonbuilding structures. This code was developed by an ANSI-approved consensus process. This code can supplement the International Existing Building Code (IEBC), supplement the code governing existing structures of an authority having jurisdiction, or act as a stand-alone code in a locality that has not adopted an existing-building code. When this code is adopted as a stand-alone code, Appendix A should be used in place of Chapter 4.

The Code is specifically written for use by a licensed design professional. This code provides minimum requirements for assessment, design and construction, or implementation of repairs and rehabilitation, including quality assurance requirements, for structural concrete in service. This code has no legal status unless it is adopted by the authority having jurisdiction. Where the code has not been adopted, it serves as a standard to provide minimum requirements for assessment, and design and construction of repair and rehabilitation of existing structural concrete. ACI 318 provides minimum requirements for the materials, design, and detailing of structural concrete buildings and, where applicable, nonbuilding structures, and for new construction within existing structures where noted herein.

Key changes from ACI 562-16 to ACI 562-19 include:

(a) Text was added to simplify use of new materials that have the equivalent of an ICC-ES evaluation report in Chapter 1.

(b) The requirements for the basis of design report were simplified in Chapter 1.

(c) Requirements related to detailing of existing reinforcing steel in Chapter 4 have been clarified.

(d) The commentary in Chapter 8 was updated to include a listing of exposure categories that may affect durability.

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CODE

CHAPTER 1—GENERAL REQUIREMENTS

1.1—General

1.1.1 ACI 562, "Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures," is hereafter referred to as "this Code."

1.1.2 *Scope*—This code shall apply to assessment, repair, and rehabilitation of existing concrete structures as:

1. A code supplementing the International Existing Building Code (IEBC)
2. As part of a locally adopted code governing existing buildings or structures
3. Or as a stand-alone code for existing concrete structures

1.1.3 The intent of this Code is to safeguard the public by providing minimum structural requirements for existing structural concrete members, systems, and buildings.

1.1.4 All references in this code to the licensed design professional shall be understood to mean persons who possess the knowledge, judgment, and skills to interpret and properly use this code and are licensed in the jurisdiction where this code is being used. The licensed design professional for the project is responsible for, and in charge of, the assessment or rehabilitation design, or both.

COMMENTARY

R1—GENERAL REQUIREMENTS

R1.1—General

R1.1.2 This code defines assessment, design, construction and durability requirements for repair and rehabilitation of existing concrete structures. Throughout this code, the term "structure" means an existing building, member, system, and, where applicable, nonbuilding structures where the construction is concrete or mixed construction with concrete and other materials.

Chapter 4 provides assessment, repair, and rehabilitation criteria if this code is used as a supplement to the International Existing Building Code (IEBC) for concrete members and systems.

Appendix A provides assessment, repair, and rehabilitation criteria when this Code is adopted, including Appendix A, as a stand-alone code for repair of existing concrete structures.

R1.1.3 The intent of this code is to address the safety of existing structures through assessment requirements that demonstrate an approximation of the structural reliability using demand-capacity ratio limits of Chapter 4 or Appendix A and, if necessary as determined by the assessment, increase the structural capacity by repair or rehabilitation.

Unless prohibited by the authority having jurisdiction, if an existing structure is shown to be potentially dangerous in accordance with 4.3 or A.3, the structure should be rehabilitated using 4.3 or A.3.

Using the demand-capacity ratio limits of 4.5.1 or A.5.1, repair of the existing structural concrete to its predeteriorated state is permitted based on material properties specified in the original construction (per Chapter 6), and substantiated engineering principles of the original design. Where requirements of the original building code are appreciably changed in the current building code, the licensed design professional may consider using 4.5.2 or A.5.2.

Beyond the restoration assessment requirements of 4.5.1 and 4.5.3 or A.5.1 and A.5.3, the structural reliability principles of 4.5.2 or A.5.2 are permitted. These alternative requirements provide acceptable safety if the current building code demand exceeds the original building code demand or if the regulations of the original building code provide an unacceptable level of structural reliability.

CODE

1.1.5 The requirements of this code are provided using strength design provisions for demands and capacities, unless otherwise noted.

1.2—Criteria for the assessment and design of repair and rehabilitation of existing concrete structures

1.2.1 The "existing building code" refers to the code adopted by a jurisdiction that regulates existing buildings or structures.

1.2.2 The "current building code" refers to the general building code adopted by a jurisdiction that regulates new building design and construction.

1.2.3 The "original building code" refers to the general building code applied by the authority having jurisdiction to the structure in question at the time the existing structure was permitted for construction.

COMMENTARY

R1.1.5 When this code permits the original building code regulations to be used and that code uses allowable stress design, the following should be considered: those provisions should be substituted for strength design as noted in 4.5.3 or A.5.3; the licensed design professional is not required to use, but should consider using strength design provisions of this code as a check in the assessment of existing structures originally designed with allowable stress methods.

R1.2—Criteria for the assessment and design of repair and rehabilitation of existing concrete structures

R1.2.1 The code governing existing buildings in the United States is commonly the IEBC developed by the International Code Council (ICC). The IEBC provides regulations for evaluations of damage and the limit for damage to be repaired using the original building code.

R1.2.2 The current building code establishes the design and construction regulations for new construction. Strength design regulations of the current building code include:

(a) Required strengths computed using combinations of factored loads (strength design demands)

(b) Design strengths (capacities) based on testing of materials, members, and systems

(c) Analytical methods used to calculate member and system capacity

(d) Strength reduction factors, which have been established to be consistent with reliability indices used with the strength design demands

The load factors and strength reduction factors in the current building code are obtained through rational design code calibration procedures to achieve the targeted reliability indices which produce historically acceptable structural safety for new structures. The targeted reliability indices are generally based on past structural behavior, engineering experiences, costs and consequences of loss, among other criteria. The resulting demand-capacity ratios for new structures provide the limits that are not to be exceeded if designing new construction, but these demand-capacity ratio limits need not to be the same as those for existing structures as noted in sections 4.5.2 and A.5.2.

The general building code in the United States is usually based on the International Building Code (IBC) published by the ICC. Prior to 2015, Chapter 34 of the IBC included provisions for existing structures. For the design and construction of new concrete structures, the IBC and most other older general building codes often reference ACI 318, Building Code Requirements for Structural Concrete and Commentary, with exceptions and additions.

R1.2.3 This definition of "original building code" is consistent with the building code in effect at the time of original permitted construction per the IEBC. In assessing existing structures, the licensed design professional may need to consider changes in the codes enforced by the local authority