



**Commonwealth of Massachusetts  
Division of Professional Licensure  
Office of Public Safety and Inspections**

1000 Washington Street, Suite 710  
Boston, Massachusetts 02118

**MASSACHUSETTS STATE BUILDING CODE - CODE CHANGE PROPOSAL FORM**

Impacted code:	<input checked="" type="checkbox"/> <b>Base Code</b> <input type="checkbox"/> <b>Residential Code</b>	<b>State Use Only</b>	
Date Submitted:	April 26, 2021	Date Received:	04/27/2021
Code Section:	405.1	Code Change Number:	05-02-2021
Name of proponent:	Kerry Sutton, PE		
Company / Organization represented, if any:	American Concrete Institute (ACI); ACI New England Chapter	Check <input type="checkbox"/> if representing self	
Address (number, street, city, state, ZIP):	38800 Country Club Drive, Farmington Hills, MI 48331		
Telephone number:	734-673-2195		
Email address:	Kerry.Sutton@concrete.org		

**PLEASE CHECK ☒ THE TYPE OF AMENDMENT PROPOSED**

- ☒ **Change existing section language**      ☐ **Add new section**      ☐ **Delete existing section and substitute**  
☐ **Delete existing section, no substitute**      ☐ **Other, Explain:** \_\_\_\_\_

**PLEASE TYPE THE PROPOSED AMENDMENT BELOW.** If you propose to change a section, please copy the original text from either the relevant model code and/or MA amendment and indicate the code edition. Indicate, with a ~~striketrough~~, the text that you propose to delete. Please also indicate any new text in both *italic* and **red** font. Finally, for each proposal submitted, please provide the justification items requested below. Completed code amendment forms may be emailed to Dan Walsh, Director of Code Development and Manufactured Buildings at [Dan.P.Walsh@mass.gov](mailto:Dan.P.Walsh@mass.gov). **Please attach additional pages as necessary. PLEASE SEE ATTACHMENT**

Existing language:	
Proposed changes:	
Background and rationale:	
Pros of the proposed change:	
Cons of the proposed change:	
Estimated impact on life safety:	
Estimated impact on cost:	



# ATTACHMENT

## 780 CMR 2021 IEBC Option for 562

### CHAPTER 4 REPAIRS

### SECTION 405 STRUCTURAL

Section 405.1: Modify Section 405.1 as follows:

**405.1 General.** Structural *repairs* shall be in compliance with this section and Section 401.2.

*405.1.1 Repairs to structural concrete. Repairs to structural concrete elements in accordance with this section and ACI 562 shall be permitted.*

*Exception:*

*ACI 562 shall not be used for the evaluation or design of repairs or rehabilitation of elements of seismic force-resisting system that result in strength, stiffness or ductility of those elements different from the pre-damage condition.*

Add new referenced standard to Chapter 16 as follows:

ACI			American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48331
Standard reference number	Title	Referenced in code section number	
<u><b>562-19</b></u>	<u><i>Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures</i></u>	<u><b>405.1.1</b></u>	

**Background and rationale** - This proposed amendment adds ACI 562: *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures*, to establish minimum requirements for the evaluation, design, construction, repair, and rehabilitation of concrete structural elements in buildings for various levels of desired performance as deemed appropriate for the project. This proposal is intended as a modification where the code is based on the 2021 edition of the ICC *International Existing Building Code*.

In addition to improved life safety, the requirements clearly define objectives and anticipated performance for the code official, owners, designers, contractors and installers. The proposed language is not exclusive as *Section 104.11 Alternative materials, design and methods of construction and equipment* of the 2021 edition of the ICC *International Existing Building Code* allows for alternative design and methods of construction. Citing this reference provides the building official a baseline for considering approval of design requirements and methods of construction. Further, the baseline is beneficial for product suppliers, owners, designers, contractors and most importantly the expectation of a reasonable level of safety for those residing in and working in the Commonwealth of Massachusetts.

ACI 562 complements the Existing Building Code by providing specific direction on how to evaluate, design, and construct repairs to structural concrete and how to address the unique construction methods and problems associated with repair. This standard helps the designer assess the existing structure. The standard then provides the requirements that bridge the inconsistencies and gaps in acceptable criteria that occur from the two following situations that a designer must solve:

1. Repairing a structure according to the original building code used at the time it was built using today's construction methods and materials; or
2. Repairing a structure built according to an older building code but repaired according to the latest building code.

ACI 562 permits flexibility in evaluation, design, construction, and repair materials to provide economies while establishing expected performance for the service-life of the rehabilitation or repairs. Note that ACI 562 does not address the evaluation of lateral-force resisting systems in high seismic areas. ASCE 41 *Seismic Evaluation and Retrofit of Existing Buildings* would be the appropriate standard for this situation as stated in ACI 562.

**Benefits (Pros)** – There are many benefits that ACI 562 provides for the designer, owner, contractor, materials providers, building code official and the citizens residing in and working in the Commonwealth of Massachusetts. A few of these benefits are:

- Provides a level of expectation of life safety to the public in buildings where repairs or rehabilitation is performed on concrete structural elements.
- Provides clearly defined, uniform requirements aimed at extending the service life of existing structures.
- Provides minimum requirements for efficiency, safety, and quality of concrete repair.
- Establishes clear responsibilities between owners, designers, and contractors.
- Provides building code officials with a means to evaluate rehabilitation designs.
- Provides specific repair requirements that often result in less costly repairs compared to repairs required to meet only new construction requirements.
- References standard specifications for materials used in concrete repairs that are not addressed in the code requirements for new construction such as fiber reinforced polymer (FRP) reinforcement and polymer concrete.

It is noteworthy that ACI has been publishing and making available guidance documents on evaluation and repair of concrete for more than five decades and still it is reported that more than 50% of all structural concrete repairs are found to fail in 20 years or less and 20% of repairs to structural concrete fail within 5 years. Recognizing this as putting the public at risk, ACI Committee 562 saw the need for and developed the *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures* as an ACI standard intended for adoption in building codes. ACI continues to maintain and develop additional resources to support assessment, repairs, and rehabilitation of structural concrete in accordance with ACI 562. Among these are:

- [Concrete Repair Manual: Fourth Edition 2013](#)
- [ACI 563-18, Specifications for Repair of Structural Concrete in Buildings](#)
- [MNL-3\(20\) Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures](#)

These resources are readily available to provide greater understanding of assessment, repair and rehabilitation of concrete structural elements. ACI MNL-3 provides case studies demonstrating the ease of use of ACI 562. Numerous technical notes, reports, guides, and specifications that provide background information and technical support are available through other organizations, such as American Society of Civil Engineers, British Research Establishment, Concrete Society, International Concrete Repair Institute, National Association of Corrosion Engineers, Post-Tensioning Institute, Society for Protective Coatings, and US Army Corps of Engineers. Many of these organizations' publications related to concrete repair can be found in the Concrete Repair Manual.

**Challenges (Cons)** – None. The building code official currently has the responsibility to approve the means and method of repair. This code change proposal establishes a baseline for the building official and all other parties involved.

**Estimated impact on life safety** - Spalling concrete and failure of connections and anchors pose a life safety threat to the public. This code will provide minimum requirements for assessment, repair, and rehabilitation of existing structural concrete buildings, members, systems and where applicable, nonbuilding structures, thus having a positive impact on satisfying the intent of the code.

**Estimated impact on cost** - The use of this referenced standard should in many cases reduce the cost of repair. Too often in the process of repair, there is insufficient information to determine acceptance criteria that is amicable to both the owner and the building code official. The result is the determination that the repair must meet the latest building code requirements for new construction. This standard increases the options available for repair and provides the acceptance criteria necessary to permit these options. A case study that illustrates this point: "ACI 562 has been referenced in expert reports for litigation cases, resulting in significantly reduced financial settlements. Denver-based J. R. Harris & Company recently used the code as a standard in several litigation reports assessing damages in existing concrete structures. As an approved consensus standard, according to American National Standards Institute (ANSI) procedures, ACI 562-13 has been accepted as the source standard to use for damage assessment and repair on individual projects by Greenwood Village and Pikes Peak Regional Building Departments in Colorado. Based on this acceptance, the consulting engineer was able to cite the code in their recommendation for structural remediation and determination of damages. In one case involving rehabilitation work on four buildings with faulty construction, J.R. Harris was able to reduce the repair costs from \$12 million to \$3 million, with a repair plan based on the lesser of the demand-capacity ratio based on either the original or current building code per ACI 562."

**Resiliency** – This proposal will increase Resiliency. Use of the ACI 562 standard helps ensure that repairs are properly performed and will satisfy an acceptable service life. Without minimum standards, repairs may not satisfy the intent of the code or the expectations of the owners or public. Proper evaluation and repairs will improve resiliency of the building. News coverage demonstrates the potential risk to life safety due to deteriorating concrete and inappropriate repairs. A [news investigation](#) of parking structures in the City of Pittsburgh, PA is an example of such coverage.

**Sustainability** - Reference of ACI 562 in the *Existing Building Code of Massachusetts* will help improve the confidence of owners, builders, and developers regarding effective repairs, upgrades, and reuse of existing buildings in lieu of demolition and replacement. Typically, extending the life of existing buildings is substantially more sustainable than demolition and new construction. Adoption of ACI 562 by reference is needed to help facilitate efforts that conserve energy and resources while maintaining a minimum level of requirements to ensure reasonable levels of life safety, and welfare are afforded to the public.

**State and Local References** – Several jurisdictions already addressed the need for these requirements. ACI 562 is already being used in several jurisdictions:

**City of Los Angeles, California:** The Structural Engineers Association of Southern California (SEAOSC) has produced a guide entitled [Design Guide Vol. 1, City of Los Angeles Mandatory Earthquake Hazardous Reduction In Existing Non-Ductile Concrete Buildings \(NDC\)](#) which references extensively ACI 562 in Chapter 3 - Structural Analysis and Evaluation Process, and Chapter 4 – Retrofit Design Process.

**Florida:** Language references ACI 562 in the [2020 Florida Building, Code 7<sup>th</sup> Edition:](#) 301.3.4 Concrete evaluation and design procedures. Evaluation and design of structural concrete in compliance with ACI 562 shall be permitted.

Exception: ACI 562 shall not be used to comply with provisions of this code for seismic evaluation and design procedures.

**Hawaii:** Hawaii was the first state to adopt ACI 562 by reference. [Section 3401.6](#) Alternate compliance (see page 27), of the HAWAII STATE BUILDING CODE allows the use of ACI 562 as a supplement to the International Existing Building Code. This became effective on January 1, 2018:

**New York City:** The New York City Buildings Department issued [BUILDINGS BULLETIN 2015- 017](#) in December 2017 Conditions of Acceptance for Fiber Reinforced Cementitious Matrix strengthening systems. FRCM shall comply with the NYC Construction Codes and the applicable provisions for Design which reference ACI 562.

**Ohio:** The Ohio Board of Building Standards Ohio adopted rule changes identified as [Amendments Group 95](#). Included in this group is: 3401.6 Concrete evaluation and design procedures. Evaluation and design of structural concrete repairs and rehabilitation shall be in compliance with Chapter 34 and ACI 562.

#### **Letters of Support:**

[ACI New England Chapter](#)  
[Massachusetts Concrete & Aggregate Producers Association \(MaCAPA\)](#)  
[International Concrete Repair Institute \(ICRI\)](#)  
[ICRI New England Chapter](#)  
[SIKA](#)