



DEPARTMENT OF ADMINISTRATIVE SERVICES

PROPOSED CHANGE OF THE CONNECTICUT STATE
BUILDING CODE AND FIRE SAFETY CODE

DATE SUBMITTED: _____

CODE INFORMATION

Proposed change to: ☐ Building Code ☐ Fire Safety Code

Code section(s): _____

PROPONENT INFORMATION

Name: _____ Representing: _____

Telephone: _____ Email: _____

Address: _____
Street Address Town State Zip Code

PROPOSAL INFORMATION

Description of change and reason for change (attach additional information as needed):

Proposed text change, addition or deletion (attach additional information as needed):

Supporting data and documents (attach additional information as needed)

☐ **This Proposal is original material.** (Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought or research and, to the best of his/her knowledge, is not copied from another source.)

☐ **This Comment is not original material, its source (if known) is as follows:** (such as material / code development proposal from a prior development cycle or proposal submitted to model code committee etc.)

☐ **I would like to make an in-person presentation of my proposal.**

Release

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Kenny Satter

Proponent's Signature

Printed Name

PLEASE EMAIL (PREFERRED) TO DAS.CodesStandards@CT.GOV OR MAIL OR FAX (SEE BELOW)

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12/29/16

ATTACHMENT

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 Section 401.2 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>562-19</u>	<u><i>Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures</i></u>	<u>405.1.1</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* 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 State of Connecticut.

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.

Benefits – 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 State of Connecticut. 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.

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. One example from a [news investigation](#) of a parking structures in the City of Pittsburgh, PA is representative of such coverage.

Sustainability - Reference of ACI 562 in the *Connecticut State Building Code* 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 7th 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](#)

[International Concrete Repair Institute \(ICRI\)](#)

[ICRI New England Chapter](#)

[CVM](#)



May 18, 2021

Department of Administrative Services
Office of the State Building Inspector
450 Columbus Boulevard, Suite 1303
Hartford, CT 06103

Subject: Support for Adoption by Reference of ACI 562 in the Connecticut State Building Code

Codes and Standards Committee Members:

This letter is in support of approval of adoption by reference of ACI 562 *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures* in the Connecticut State Building Code as presented in the code change proposal submitted by the American Concrete Institute.

The American Concrete Institute New England Chapter represents organizations and individuals involved in concrete design, production, construction, and repair. The concrete and cement industry employ more than 3,500 people in Connecticut and contribute more than \$328 million to the Connecticut economy annually.

We find that it is increasingly more important to establish minimum requirements for evaluation, repair, and rehabilitation of structural concrete in existing buildings undergoing alternations, additions, renovations, or changes in occupancy to safeguard the public and minimize disruption of businesses. The requirements provided in ACI 562 improve the clarity of expectations by owners, designers, contractors, officials, material providers, and other relevant parties regarding repairs and rehabilitation of structural concrete and, where appropriate, provide a benchmark for use by building officials responsible for approving other means and methods.

Helping to assure that delivery of products and services are consistent with the expectations of all parties involved saves costs associated with unnecessary direct costs and indirect costs associated with due to construction delays when there are discrepancies in the various expectations.

Adoption by reference of ACI 562 helps ensure minimum levels of life safety, health and general welfare are being provided for the public. In addition, adoption of ACI 562 will improve the confidence for building owners, developers, and officials regarding the extended life and re-use of concrete buildings. This is not only important for the specific project but also is typically more sustainable than demolition and replacement.

The use of ACI 562 provides an increased level of anticipated outcome associated with repairs and rehabilitation regarding the ability to satisfy the intent of the code and provides information that can facilitate the efforts of officials involved in the project. Where repairs meet minimum requirements for life safety, for businesses will have increased confidence that they may be able to safely operate with less frequent interruptions while remaining in or relocating to existing buildings.

Other jurisdictions have adopted ACI 562. ACI 562 has been adopted in Hawaii, Ohio, and Florida. It is also referenced by the New York City building department.

While this proposal simply establishes a minimum level of expected performance of structural concrete for a design service life specified for the project, the change does not specify a design service life. Selection of a design service life continues to reside with the owners, owner's representatives, and where applicable, officials of the authority having jurisdiction. Also, the proposal is permissive and does not exclude other means and methods approved by the building official.

We have reviewed the code change proposal submitted by ACI and recommend the code change proposal be approved as submitted. We believe that this addition to the Connecticut State Building Code will help ensure repairs to structural concrete will satisfy the intent of the code, result in affordable repairs with reasonable minimum levels of life safety, and support business operations with minimal disruption. The latter is important, not just for business operations, but also to maintain a consistent flow of revenue to the state resulting from these businesses.

Thank you in advance for your consideration of this recommendation.

Sincerely,

A handwritten signature in blue ink, reading "R. Brett Holland". The signature is fluid and cursive, with the first name "R." followed by "Brett" and "Holland".

R. Brett Holland, Ph.D., P.E. (MA, AL, NY, TX, GA, RI), S.E. (IL)
President of the Board of Directors, ACI New England Chapter



cvm

March 12, 2021

Department of Administrative Services
Office of the State Building Inspector
450 Columbus Blvd., Suite 1303
Hartford, CT 06103

**RE: Support for Adoption by Reference of ACI 562 into
the Connecticut State Building Code**

Dear Code and Standards Committee Members:

I am writing this letter in support of the proposal from the American Concrete Institute to adopt by reference ACI 562-19 into State of Connecticut Building Code. As the chair of the ACI 562 committee that developed ACI 562-19, I strongly believe that design professionals and building code officials in State of Connecticut will benefit from the use of ACI 562-19 for the repair of existing concrete structures. The goal of the ACI 562 standard is to improve the structural reliability and durability of repaired concrete structures and provide clear guidance to building code officials regarding the need for possible strengthening of existing structures. To date, ACI 562-19 has been adopted by reference into the building code of several states and has been used nationwide as a standard for repair of existing concrete structures.

I began my engineering career after graduating from the University of Connecticut with a BSE in Civil Engineering in 1992. After graduation, I began working with a small engineering firm in So. Norwalk, CT that had a focus on existing structures. During this time, I initially began working on existing concrete structures and became aware of the challenges of developing durable repairs in existing structures. When I began my career, it was never my intention to become the chair of a committee responsible for the development of an ACI Standard on repair of concrete structures. I initially got involved with the American Concrete Institute to improve my technical knowledge related to repair and rehabilitation of existing structures. Hearing, and witnessing the variations in repair practice, I soon recognized a need for minimum standards for the repair and rehabilitation of existing concrete structures.

The ACI 562-19 Standard provides minimum code requirements for evaluation of existing structures and provisions that will improve the repair design practice, and the durability and reliability of repaired structures. These requirements have the potential to improve repair practice and decrease the likelihood of repair failure. Further, by encouraging evaluation of existing structures, use of ACI 562-19 on concrete repair projects will potentially reduce repair scope uncertainty. Premature repair failure and changes in scope are major sources of cost uncertainty.

As mentioned above, the State of Connecticut will benefit from adoption of by reference of ACI 562-19. As an example, I am sure you are familiar with the saga of the office building at 25 Sigourney St. in Hartford. In addition to the building envelope issues, the parking structure had to be closed as a direct result of the poor performance of concrete repairs resulting in concerns about the integrity of the structure. There are numerous other examples across the state where poor performance of concrete repairs has resulted in either the premature closure of a structures or a significant cost to keep an existing structure in operation.



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In my opinion, use of ACI 562-19 will be cost-neutral or potentially reduce the total cost of concrete repairs. In examining the cost of concrete repairs, the greatest risk to the owner is having to re-repair a structure due to a repair failure. ACI 562-19 implementation has the potential to mitigate the widespread premature failure of repairs. Use of ACI 562-19 for repair also provides design professionals a standard to follow, potentially allowing existing structures to be repaired rather than replaced.

Please feel free to contact me if you have any comments regarding the material discussed in this letter.

Sincerely,



Keith Kesner, PhD, PE, SE, FACI
Former Chair ACI 562
Senior Project Manager – CVM Engineers





CONCRETE REPAIR
Restore | Repurpose | Renew

April 19, 2021

Department of Administrative Services
Office of the State Building Inspector
450 Columbus Boulevard, Suite 1303
Hartford, CT 06103

RE: Support for Adoption by Reference of ACI 562
in the Connecticut State Building Code

Codes and Standards Committee Members:

I am writing this letter as President of the International Concrete Repair Institute (ICRI) in support of approval of adoption by reference of ACI 562-19 *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures* into the *Connecticut State Building Code* as presented in the code change proposal submitted by the American Concrete Institute (ACI).

ICRI is the only non-profit organization that is dedicated solely to the repair of concrete structures. ICRI has over 2500 members and 38 local chapters across the United States and Canada, with a local chapter serving Connecticut.

For the past 33 years, ICRI has developed and promoted best practices for concrete repair and has developed consensus document guidelines for the repair of deteriorated concrete structures. These guidelines have been published and used to result in more durable concrete repairs. It has been proven that poor performance of concrete repairs is a serious issue in the industry, and improvements are needed in concrete repair practices. Several studies indicate that **less than 50%** of concrete repairs perform satisfactorily, posing a significant danger to the health, safety and welfare of the public. This is a tremendous burden on owners, municipalities and the economy.

As a repair industry professional and the President of an organization that represents contractors, design professionals and material manufacturers that are involved in the repair of existing concrete buildings, both I and ICRI as an organization recognize the need for standards that will help design professionals and contractors improve the design, implementation and performance of concrete repairs.

The ACI 562-19 code provides minimal requirements for assessment, design and construction, and implementation of repairs and rehabilitation, including quality assurance requirements, for structural concrete **in service**. ACI 562 encourages evaluation of the structure, and a better evaluated structure is potentially less risky to repair. ACI 562 also requires consideration of durability in design, likely leading to better repair performance and less premature repair failure.

The concrete repair industry utilizes many unique repair strategies. The Code provides latitude and flexibility to the licensed design professional to prepare a design to address the specific issues encountered on an existing building while still meeting the requirements of ACI 562. The ACI 562 code will serve to unify and strengthen concrete evaluation, repair, and rehabilitation projects while accommodating the diverse and unique repair strategies and materials used in the repair industry, making existing structures safer. All of these goals are consistent with the mission of ICRI.

In examining the cost of concrete repairs, the greatest cost to the owner is having to remove and replace previous repairs to a structure due to premature repair failure. I believe the adoption of the ACI 562-19 code has the potential to significantly reduce the long-term life cycle cost of maintaining a structure. I also believe it will provide safer structures with minimal impact on initial cost of repairs.

Any standard that improves the quality of the completed repair work will be a welcome addition to the building code and the concrete repair industry. Use of ACI 562 also contributes to increased sustainability, increasing the probability that a concrete structure will be restored rather than demolished and replaced.

Many leaders in the repair industry support the ACI 562 code and other states, including Hawaii, Ohio and Florida, and jurisdictions have already adopted it. It is also referenced by the New York City building department. This code complements the *Connecticut State Building Code* by providing specific direction on how to evaluate and design concrete repairs and how to address the unique construction methods and issues associated with repair. In addition, ACI 562 provides building code officials with a means to evaluate rehabilitation designs.

On behalf of the Board of Directors and members of ICRI, I recommend and hope that Connecticut will also realize the benefit of this code and adopt the code change proposal into the Connecticut State Building Code.

If you have any questions regarding my comments or would like to discuss my viewpoints in more detail, please feel free to contact me at your convenience.

Thank you in advance for your time and consideration of this recommendation for support of the proposed code change.

Sincerely,



Elena Kessi
2021 ICRI President
410-392-2300
elena@aquafin.net



May 17, 2021

Department of Administrative Services
Office of the State Building Inspector
450 Columbus Boulevard, Suite 1303
Hartford, CT 06103

Subject: Support for Adoption by Reference of ACI 562 in the Connecticut State Building Code

Dear Codes and Standards Committee Members:

Please accept this letter of recommendation for the International Concrete Repair Institute (ICRI) Connecticut Chapter Board of Directors for incorporation of ACI-562-19 *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures* in the *State of Connecticut Building Code: Existing Building Code* as presented in the building code change proposal submitted by the American Concrete Institute.

The ACI 562 Code provides important information and direction to design professionals, contractors, materials, manufacturers, and testing agencies. ACI 562, which was written and maintained by industry experts, will help the design professionals and contractors improve the design and execution of concrete repairs. This ultimately will deliver safer structures and will also reduce the life cycle costs of concrete structures.

ICRI is the only non-profit organization that is dedicated solely to the repair of concrete structures. ICRI has over 2500 members nationwide and 39 local chapters across the United States and Canada, with a local chapter in the state of Connecticut. The ICRI Connecticut Chapter members include Connecticut registered Professional Engineers, contractors, technicians, materials manufacturers, and material distributors. We are all dedicated to improving the quality of concrete restoration, repair and protection, through the education and communication among the members and those who use their services.

Other states and jurisdictions have supported the ACI 562 code and adopted it. The ICRI Connecticut Chapter recommends that the State of Connecticut also realize the benefit of this code and adopt the proposed code to Connecticut Building Code: Existing Building Code.

If you have any questions, please feel free to contact me at your convenience.

Respectfully submitted,

ICRI Connecticut Chapter Board

A handwritten signature in blue ink that reads "David J. Mastay".

David J. Mastay
President, ICRI Connecticut Chapter
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mastay.david@us.sika.com