



cvm

ACI 562-19

Adoption into IBC / IEBC – It's time

Presented by: Keith Kesner

Chair – ACI 562

Senior Project Manager – CVM Engineers

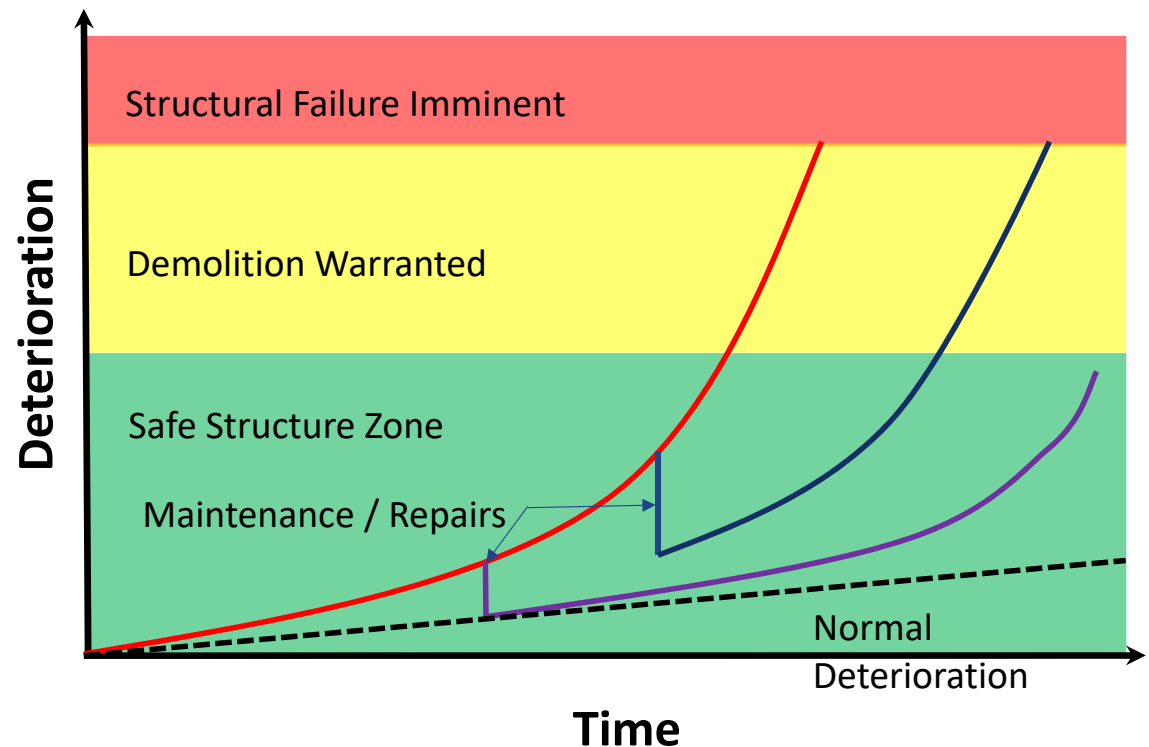


What is wrong with concrete repair practice?

- Focus on new design in education
- Many design professionals do not consider repair a distinct area
 - Limited evaluation of structures
 - Lack of understanding of durability
 - Disdain from “historic preservationists”
- Lack of contractor focus on quality
- US national codes
 - IBC – comprehensive document for new design
 - IEBC – does not establish a clear standard of care for repair

Need for ACI 562

- Why?
 - Standard of care?
 - New design - follow code
 - What is it for repair projects?
 - Protect design professionals
 - Improve practice
 - Longer living structures
 - “Service-life” rarely ends
 - Deterioration does not end
 - Repairs will be required
 - Limited durability
 - Greater exposure
 - Are repaired structures safe?



Adapted from: Extending the Service Life of Parking Structures,
Shiu, K, and Stanish, K. Concrete International V. 30 No. 4

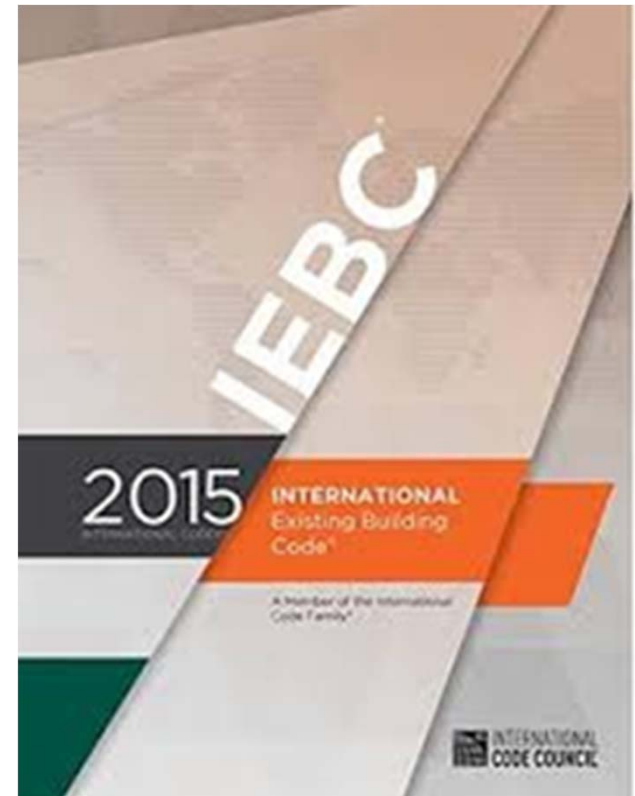
Standard of Care vs. Codes

- Standard of Care - “level of effort a prudent LDP would be expected to provide on a project”
 - Determined from codes, industry standards, guidelines, tradition, etc.
- Codes
 - Minimum requirements for design



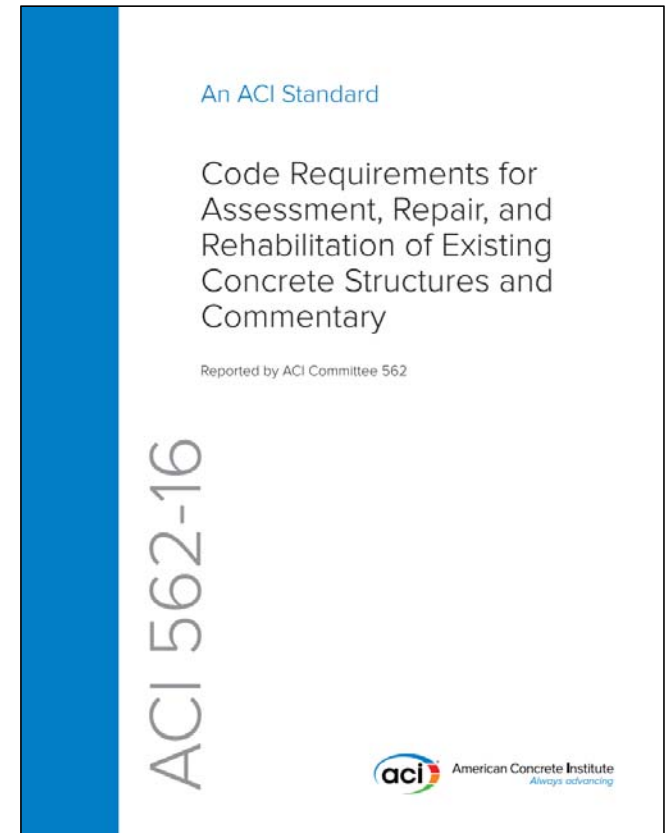
Standard of Care – IEBC???

- Missing from IEBC
 - The how of minimum evaluation requirements
 - How bad is a structure?
 - Analysis considerations?
 - Reliability of repaired structures?
 - Durability considerations?
 - Consideration of service life
 - Construction quality assurance



ACI 562 – Code for Repair of Existing Concrete Structures

- Set minimum requirements for repair
 - ACI Standard
 - Not a guide or suggested practice
- Provides clear requirements for strengthening
 - Based upon damage present
 - New vs. existing code requirements
- Encourage evaluation by LDP
 - Confirm material properties
 - Better evaluation → better repairs
- Sustainable repaired structures
 - Long-term durability of repairs
 - Consistent structural reliability



Confusing Definitions

- Unsafe and Dangerous

UNSAFE. Buildings, structures or equipment that are unsanitary, or that are deficient due to inadequate means of egress facilities, inadequate light and ventilation, or that constitute a fire hazard, or in which the structure or individual structural members meet the definition of “*Dangerous*,” or that are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance shall be deemed unsafe. A vacant structure that is not secured against entry shall be deemed unsafe.

- What is needed?

- Clear path to identify unsafe conditions
- Path forward

[BS] DANGEROUS. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation, or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgement of any portion, member, appurtenance or ornamentation of the building or structure under service loads.

Unsafe Conditions – ACI 562

- Loose materials
 - Make safe
- Falling debris hazards
 - Make safe
- $U_c / \phi R_{nc} > 1.5$
 - Current demand - U_c
 - Gravity and wind loads
 - Current capacity - ϕR_{nc} (include damage)
 - Report consistent with Section. 1.5.2
 - Repairs to current code will typically be required

ACI 562

- ACI Standard
 - Sets the minimum requirements for repair
- Provides clear requirements for strengthening
 - Based upon damage present
 - New vs. existing code requirements
- Encourage assessment
 - Process for evaluation
 - Owner's goals and requirements
- Sustainable repaired structures
 - Structural reliability
 - Long-term durability
- Fully developed supporting documents



Guide to the Use of ACI 562

- Joint ACI / ICRI Document
 - Second version published in March 2016
- Discussion of ACI 562 Chapters
- Worked example problems using ACI 562



An ACI / ICRI Manual
Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures
A Companion to ACI 562-16

aci American Concrete Institute
Always advancing

ICRI INTERNATIONAL CONCRETE REPAIR INSTITUTE

Strategic Development Council
aci Foundation

MNL-3(16)

Concrete International – Article Series

- In-depth explanation of ACI 562
- 11 topics published to date (more in progress)
- Available as .pdf compendium
 - Definitions / Terminology
 - Unsafe conditions / reliability basis
 - Load testing
 - Strength based upon core tests
 - Etc.

Courtesy of the American Concrete Institute, www.concrete.org

Evolution of the ACI 562 Code—Part 1

Standardization of terminology

by Gene R. Stevens and Keith Kesner

Existing Concrete Structures—Learning Lessons and Advancing Solutions

ACI Committee 562, Evaluation, Repair, and Rehabilitation of Concrete Buildings, strives to advance the practice of engineering and improve the repair and rehabilitation of existing concrete structures. The Education subcommittee of Committee 562 (ACI 562-E) is dedicated to helping engineers, building officials, contractors, owners, inspectors, and others by conveying information in more detail than is possible solely through the ACI 562 Code and Commentary. To this end, and in the hope of improving these documents, members of ACI 562 are providing a series of articles under the main theme, “Existing Concrete Structures—Learning Lessons and Advancing Solutions.”

Through this series, the committee members explain the rationale behind some of the upcoming changes in the ACI 562 Code as well as share example problems, ideas, concepts, and the thoughts discussed in ACI 562 Committee meetings. It’s also anticipated the series will help the committee address questions from the engineering and construction sectors, solicit answers to problems, and review areas of needed research.

In each article, a topic related to the evaluation, repair, or rehabilitation of existing concrete structures is addressed. Topics will be selected with the intentions of increasing awareness, improving understanding, and expanding perspectives related to this important theme.

The first set of articles will discuss key features in the updated version of the ACI 562 Code. The updated Code has been reviewed by the ACI Technical Activities Committee (TAC) and is in the public review phase until February 18. The committee members are looking forward to receiving comments on the revised document and the eventual publication of the Code.

Clarity and precision are required in any code or standard. In particular, terminology, definitions, and explanations must be specific. During the drafting of the next edition of “Code Requirements for Evaluation, Repair, and Rehabilitation of Concrete Buildings (ACI 562-13) and Commentary,” ACI Committee 562 extensively debated the terminology used in both the existing and new documents. In particular, the terms **evaluation** and **assessment** garnered close attention.

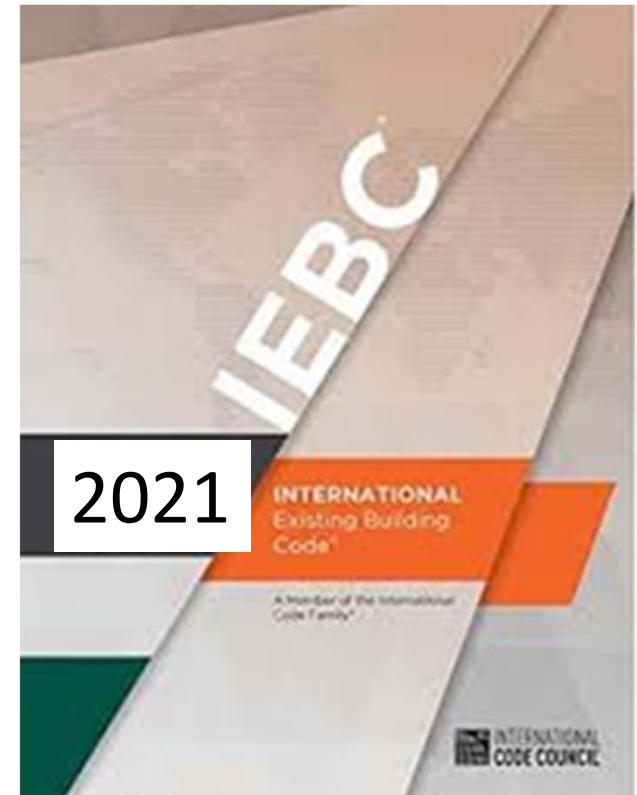
Evaluation or Assessment?

While these terms have been used in a number of existing standards, they have not been consistently defined. For example, the International Code Council’s “International Existing Building Code” (IEBC) has no definitions for these two terms but uses the term “evaluation” extensively. Documents produced by the Federal Emergency Management Agency (FEMA) and the Applied Technology Council (ATC)—such as FEMA-178¹ and ATC-14², respectively—have used “evaluation” when referring to the process of determining the current seismic resistance of existing buildings.

Standards and guidelines produced by the American Society of Engineers (ASCE) include both terms. ASCE/SEI 41-13³ uses a circular definition of evaluation: “An approved process or methodology of evaluating a building for a selected Performance Objective.” However, ASCE/SEI 30-00⁴ defines assessment as: “Systematic collection and analysis of data, documentation, evaluation, and recommendations regarding the various portions of an existing building envelope that are the subject of the investigation.” ASCE/SEI 11-99⁵ also defines the assessment procedure and places structural evaluation under the umbrella of the assessment process. Per this document, **structural evaluation** is: “The process of determining the structural adequacy of the building or component for its intended use and/or performance. Evaluation by its nature implies the use of personal and subjective judgment by those functioning in the capacity of experts.” Also per this document, **structural assessment** is:

ACI 562 – IEBC Adoption Process

- Adoption cycle every 3 years
- Initial efforts in 2013 and 2016
 - Failed – opposition from various **people**
- Process – 4 step process
 - Code change proposal (prepared by ACI)
 - Structural review committee hearing
 - 2013 – passed this step
 - 2016 – failed this set
 - Code official balloting – 2 steps
 - 2013 – failed this step
 - 2016 – failed this step
 - Get past all 4 – **ADOPTION**



ACI 562 Adoption Status

- Limited ACI 562 statewide adoption to date (OH and HI)
- Alternate procedure
- IEBC – 2021
 - Preliminary hearings in April 2019
 - Final hearings in October 2019
 - Support is needed
- Why ACI 562
 - Current practice is not working
 - IEBC is not sufficient
 - Design professionals need help

[A] 104.11 Alternative materials, design and methods of construction, and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design, or method of construction shall be approved where the *code official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method, or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not approved, the *code official* shall respond in writing, stating the reasons the alternative was not approved.

2015 - IEBC

Thank You

Questions?