# An ACI Technical Publication



Responsibility in Repair Construction



Editors: David VanOcker and Kevin MacDonald



# **Responsibility in Repair Construction**

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# PREFACE

# **Responsibility in Repair Construction**

Preface: The responsibilities for parties involved in a repair project may be significantly different than those traditionally encountered in new concrete construction. The new ACI 562 Code Requirements for Assessment, Repair and Rehabilitation of Concrete Buildings and corresponding ACI 563 Specifications for Repair of Concrete in Buildings identify requirements for the Licensed Design Professional and the contractor's Specialty Engineer during repair programs. Differing lines of authority in repair are presented through industry practice recommendations and case studies, along with identification of industry needs, informing parties engaged in concrete evaluation and repair projects.

David VanOcker and Kevin MacDonald Editors

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#### SP-332: Responsibility in Repair Construction

#### Examining the Standard of Care for the Evaluation of Existing Structures

Keith Kesner, and Kevin Coll

**Synopsis:** Evaluation of an existing structure is a task commonly performed by licensed design professionals. An evaluation can be required by a façade inspection ordinance, as part of a due-diligence process prior to the purchase of a structure, or prior to the development of rehabilitation or repair measures. Each of these project types will have differences in the evaluation protocol and portion of the structure to be examined – but in each example, the licensed design professional is expected to provide a minimum "standard of care" to the client and to protect the public. Therefore, in developing the evaluation protocol, a critical question facing the licensed design professional is how much investigative effort is required to complete the evaluation and ensure the evaluation provides a minimum standard of care.

The standard of care for an evaluation of existing structures can broadly be defined as the level of effort that a reasonable and prudent licensed design professional would be expected to provide under similar circumstances. Given the range of structure types that can be encountered and the varying levels of damage and exposure conditions, determination of the scope of evaluation can be a difficult task for a licensed design professional. The following sections examine approaches used in industry codes and ordinances to help define a minimum standard of care for the evaluation of existing structures. Industry codes and ordinances to be examined will include the ACI 562-16 Code for Assessment, Repair and Rehabilitation of Existing Structural Concrete, FHWA bridge inspection requirements and building façade inspection standards and ordinances. Based upon these documents, items to be considered in establishing a "Standard of Care" in the evaluation of existing structures will be summarized.

Keywords: ACI 364, ACI 562, ASCE, ASTM E2270, standard of care, due diligence, professional liability, façade inspection.

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# BACKGROUND

For several years, ACI Committee 364 – Rehabilitation members had a running discussion on what defines the "standard of care" for the evaluation of existing structures prior to rehabilitation, and what level of evaluation was necessary to satisfy the standard of care. These discussions were held in the context of revising the committee's flagship document "Guide for Evaluation of Concrete Structures before Rehabilitation (ACI 364.1R) [1]." The broad topic of discussion was related to determining how ACI 364.1R and other guide documents for conditions assessments such as ASCE 11-99 [2] helped design professionals to determine the extent of evaluation required, and further how do the evaluation guides help define the standard of care. The following sections review the standard of care.

#### STANDARD OF CARE

Potential sources for standards of care to which design professionals may be exposed include (1) Code of Ethics defined by Professional Societies<sup>1</sup> (2) Legislative standards (codes, ordinances, etc.) (3) Contractual Agreements<sup>2</sup> and finally (4) those developed by the courts on a case by case basis.

The "Standard of Care" as it pertains to the practice of engineering is generally defined as "the degree of care that professionals of ordinary prudence would use under the same or similar circumstances". This concept is rooted in English Common Law doctrine, which holds that the public has the right to expect those providing services do so in a reasonably careful and prudent manner, as tested or established by the actions of one's own peers under like circumstances. (Professional Liability Agents Network , 2003) [3]. It is this definition that professional societies generally cite in their codes of ethics and to which contractual and legal expectations for the services provided by design professional are measured should a claim of professional negligence arise.

Contracts may raise this standard to inappropriately high levels. One recent example from our practice was a contract that included a contractual obligation for the design professional to "...provide professional services that reflect the <u>highest</u> standards of professional care". Verbiage such as this can dramatically increase a client's expectations and should problems arise on a project a design professional's potential exposure. It has been our experience that Clients are amenable to revising these clauses if concern is raised to more standard verbiage. In the case of the above referenced contract the clause was reworded to "in a manner consistent with the level of skill and care used by comparable professional firms".

The concept of understanding client's expectations and defining an appropriate level of professional services is of particular importance for design professionals involved in the evaluation, repair and rehabilitation of existing structures. Unlike new construction, existing structures inherently involve hidden construction and unknown

<sup>&</sup>lt;sup>1</sup> Such as the American Society of Civil Engineers (ASCE) Code of Ethics (2017).

<sup>&</sup>lt;sup>2</sup> Such as the American Institute of Architect (AIA) Document B101 Standard Form of Agreement Between Owner and Architect.

conditions which will require a design professional's judgement to determine what level of assessment is warranted for a specific project. This aspect can be more difficult to define than one might think as the professionals opinion of what level of assessment may be needed to meet the Standard of Care regularly needs to be balanced with competing interests (i.e.; budget, impacts on operations/occupancy and schedule constraints). Recognizing this, different approaches to attempt to standardize the evaluation process have been developed by various parties (ASTM, ASCE, ACI, FHWA, etc.). These approaches for the most part can be categorized as either prescriptive or performance based, with each having relative merits and limitations. The following sections explore considerations unique to the evaluation of existing structures and various approaches to standardize the assessment process.

### **EVALUATION OF EXISTING STRUCTURES**

The evaluation of existing structures is typically motivated by a need to confirm the condition of the structure (e.g. façade ordinance inspection), an observation of some type of damage or deterioration, or prior to rehabilitation. Regardless of the reason for the assessment an understanding of how the structure was <u>intended</u> to function is needed as it pertains to the focus of the assessment (i.e.; structurally, support of exterior cladding, means of water management for the building envelope assemblies, etc.). This is often in contrast to how it is <u>actually</u> functioning.

Development of an evaluation plan for existing structures requires the design professional to integrate available information with information that can be obtained during an investigation to make decisions about a structure. The question for the design professional is how much information and investigation is necessary given that nearly all investigations are limited in scope.

The evaluation plan must consider structural redundancy, potential for the structure to display distress prior to failure and the consequences should a failure occur. Consider the cantilever retaining walls that form a flood control channel shown in Figure 1. The top posts were added as a retrofit due to concerns about the capacity of the wall sections. During probing, significant corrosion of the reinforcing steel was observed at a construction joint near the base of the wall (Figure 2). The structurally significant corrosion was only visible after extensive probing. Previous experience (Kesner, et al. 1999) [4] has indicated these types of wall sections can fail with only limited evidence of displacement or structural distress prior to failure.



Figure 1- Cantilever wall sections forming a flood control channel.



Figure 2 - Reinforcing steel corrosion damage at the base of wall section.

The cantilever retaining wall represents one example of a non-redundant structure, in which significant damage can occur with only limited outwardly visible evidence of structural distress. On these types of structures, an evaluation limited to a visual inspection with material sampling limited to core samples to confirm concrete strength may miss the critical deficiency in the structure. The damage to the structure can only be identified with probes or with extensive use of nondestructive test methods.

A similar situation can exist in façade construction. Terra cotta façade elements [5] are commonly hung from hidden structural supports (Figures 3 and 4). Water infiltration can result in corrosion of the support members with very limited outwardly visible signs of distress on the façade. The condition of internal supports is typically only identified by probing.



Figure 3 - Projected terra cotta façade elements exhibiting damage consistent with failure of internal supporting steel structure.