Guide for Assessment of Concrete Structures before Rehabilitation

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This guide presents general procedures for assessment of concrete structures before rehabilitation. Among the subjects covered are preliminary assessment, detailed assessment, review of documentation, field observation and condition survey, sampling and material testing, evaluation, and final report. Evaluation to identify seismic or building code deficiencies is beyond the scope of this guide.

Keywords: assessment; condition survey; deterioration; distress; investigation; rehabilitation; sampling; testing.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

The guide outlines the approach and general procedures for the assessment of concrete structures before rehabilitation. This guide should be used in conjunction with ACI 562. An assessment, prior to rehabilitation, is generally performed for one or more of the following purposes:

a) Evaluate the current condition of a structure
b) Evaluate the extent of deterioration due to environmental conditions
c) Evaluate structural damage or distress due to applied loadings and support displacements
d) Verify the structural adequacy and integrity of a structure or selected members within a structure
e) Assess the capacity of a structure to accommodate increased loads
f) Determine the feasibility of changing the use of a structure
g) Modify or restore a structure
h) Change the appearance of a structure
i) Estimate the remaining service life of a structure (ACI 365.1R)
j) To assess the safety and structural capability of the structure to support the repair activities and to identify temporary support requirements.

The objective of the condition assessment is to determine the need, type, and extent of the rehabilitation, and to develop the goals of the project. As the initial planning activity, the assessment can also help identify operational and economic requirements that impact the rehabilitation plan.

1.2—Scope

The purpose of this guide is to provide general procedures for the assessment of concrete structures before rehabilitation. Evaluation of structures other than concrete buildings is beyond the scope of this guide, although the approach for condition assessment for such structures may be similar to those outlined in this guide.

This guide is general in character and intended to provide an approach for assessment of a concrete structure to meet one or more of the objectives listed in 1.1. The owner and licensed design professional should understand and agree on the objectives and goals of the assessment prior to the start of the assessment.

The first step in the assessment is the investigation and concludes with the evaluation, at either a preliminary or detailed level, depending upon the project requirements. After completion of the preliminary assessment, a detailed assessment can proceed if deemed desirable or necessary. Assessments generally involve four major tasks: 1) reviewing available pertinent documents; 2) performing field observations and condition assessments; 3) sampling and material testing; and 4) evaluation and structural analysis. Based on results of the investigation, evaluation and analysis can be performed and the results summarized in a report. The flowchart in Fig. 1.2 identifies the methodology and major tasks that are commonly undertaken in an assessment conducted before rehabilitation.

CHAPTER 2—DEFINITIONS

Please refer to the latest version of ACI Concrete Terminology for a comprehensive list of definitions. Definitions provided herein complement that resource.

assessment—process of investigating by systematically collecting information that affects the performance of an existing structure; evaluating the collected information to make informed decisions regarding the need for repair or rehabilitation; detailing of findings as conclusions and reporting recommendations for the examined structural concrete work area (member, system, or structure).

damage—changes in capacity of an existing structure resulting from events, such as loading and displacements.

deterioration—1) physical manifestation of failure of a material; 2) decomposition of material either during testing or exposure to service.

distress—physical manifestation of cracking and distortion in a concrete structure as a result of stress, chemical action, or both.

evaluation—process of determining and judging the structural adequacy of a structure, member, or system for its current intended use or performance objective.

investigation—collection and review of field data for the structure, such as geometry, material properties, conditions, symptoms of distress, extent of damage, measurement of displacements, environmental factors, and reinforcement sizes and placement. Also includes the collection of background data, such as plans, construction records, original and current codes governing existing buildings, and historical events.

rehabilitation—repairing or modifying an existing structure to a desired useful condition.

repair—reconstruction or renewal of concrete parts of an existing structure for the purpose of its maintenance or to correct deterioration, damage, or faulty construction of members or systems of a structure.