Failure Analysis: Shallow and Deep Causes Assessment Methodology

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Abstract

The ability to identify the underlying cause(s) of a structural failure is of essence for the improvement of structural civil engineering practice, and for the structural performance and its resiliency against extreme load and climate conditions. This ability requires forensic expertise along with rigorous and systematic approach due to multiple nature of the potential causes. This paper presents two (2) complementary forensic investigation approaches (Top-Down and Bottom-Up approaches) that will allow engineers to identify the shallow and deep causes and the triggering effect of a structural failure.

While these approaches are complementary, each of them will be best suited for specific failure analysis scenarios that will depend on the severity (extent versus intensity) of the observed damage/pathology.

Keywords: failure analysis; forensic structural engineering; forensic structural assessment.

1 Introduction

Following previous work performed for the Local Government Engineering Department (LGED) in Bangladesh related to the assessment and final diagnosis (Diagnosis Assessment Stage) of typical recurrent structural failure pathologies, the present manuscript presents a proposed Failure Analysis Methodology composed of two (2) complementary forensic investigation approaches in the assessment of Shallow and Deep causes of structural failures, the identification of the triggering effect. While being approaches that are complementary, each of them will be best suited for specific failure analysis scenarios that will depend on the severity (extent versus intensity) of the observed damage/pathology.

The first approach is Top-Down Approach, which is based on a rigorous and systematic engineering investigation, which sets to trace back the structure´s lifetime through the gathering of technical information across the different design stages of the structure, from Governance to Inspection and Maintenance stages, with the

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