Experimental Investigation on Flexural and Torsional Failure in Reinforced Concrete Beams

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ABSTRACT

Every year, earthquake threats lots of lives, leads to lots of failures, confronts governments with lots of costs and challenges structural and earthquake engineers all around the world. Iran as a potent place of earthquake experiences several quakes each year. Therefore, retrofitting of civil structures is essential worldwide, especially in Iran. No need to say, before starting the process of retrofitting structures either in design phase or construction, we need to evaluate them against different kinds of loading and observe their failure mechanisms. Due to the some operational difficulties in constructing the reinforced concrete structures, their behavior under loading is usually different from what it is supposed to be theoretically. Hence, it is important to experimentally test reinforced concrete samples in the laboratories and compare the experimental and analytical results. This paper presents experimental investigation on flexural failure in reinforced concrete beams.

Also, Nowadays by increasing the number of complicated reinforced concrete structures and their intricate behavior especially against seismic loading, need for investigation of their behavior in pure torsion failure is strongly felt. Therefore, observing the behavior of reinforced concrete beams in pure torsion failure and comparing the experimental results with theoretical assumptions are another goal of this paper.

Key Words: Retrofit, Flexural, Pure Torsion, Reinforced concrete

1 INTRODUCTION

The tensile strength of concrete is about 10 percents of the compressive strength, but in the design of reinforced concrete structural elements, this strength is neglected. The rapid deterioration of infrastructure is becoming a principal challenge facing concrete and bridge industries world-wide. Traditional structural rehabilitation methods such as external post tensioning and bonded steel plates often suffer from inherent disadvantages ranging from difficult application procedures to lack of durability, leaving the growing repair and rehabilitation market in need of cost-effective and efficient restoration techniques [1].

Steel reinforcement is provided to carry the tensile stresses in a member due to applied loads. It is expected that cracks will develop in a reinforced concrete member under service loads (the expected loads during the lifetime of the structure). However, the designer has some control over the width and distribution of structural cracks. Due to its brittle behaviour and low tensile strength, concrete can crack when loaded. The consequences of concrete cracking are aesthetical defects on concrete surfaces, increase of Permeability, reduction of mechanical section and reduction of steel reinforcement protection that can compromise concrete durability [2].