

University of Zabol Management of graduate education Faculty of Engineering Department of Civil Engineering

Dissertation for obtaining a master's degree in civil engineering

numerical investigation of the effect of enclosing transverse rebars on the behavior of reinforced concrete beams reinforced with external steel rebars

> **Instructors:** Dr. M H. Tabatabai Dr. H A. Rahdar

> > **By:** A. Sancholi

September 1401

Abstract

This research was conducted based on the ACI Code of Practice and its objective is to numerically investigate the effect of confining transverse round bars on the behavior of reinforced concrete beams reinforced with external round bars. The concrete beam in question has a rectangular cross-section of 30 cm in height, 20 cm in width, and 30.2 cm in length, and the concrete cover is 3 cm. The beam design was based on bending and shear. The objective was to investigate the behavior of reinforced reinforced concrete beams, which were reinforced from below with the help of a bar in two states: without post-tensioning and post-tensioning. Based on the process of strengthening the samples and applying post-tensioning, the load-bearing capacity of the samples has been accompanied by an upward trend and reaching the first cracking point. The increase in the percentage of load-bearing capacity between the control samples and the non-post-tensioned reinforced sample is 40%, and between the non-post-tensioned samples and the post-tensioned sample, this growth rate has reached approximately 58%. Finally, the growth rate between the control and post-tensioned reinforced samples has reached 116%. The results of the study show that reinforcement from below increases the load-bearing capacity of the beam, and the increase in percentage in unreinforced and even reinforced samples without backlash is 74% compared to unreinforced samples. According to the graphs obtained in the field of strengthening and strengthening of members, considering the changes in these letters and natural events and incidents that may occur to members such as beams, it is recommended to use the proposed method to increase the loadbearing level, because acceptable results have been obtained by the graphs and their interpretation in the field of stiffness, increased load, and delayed crack propagation, which indicates good results of this external reinforcement method. Another noteworthy point in this study is the increase in stiffness and, as a result, a decrease in stiffness in the elasto-plastic stage, which is important in the serviceability and serviceability of beams. Because the slope of the linear areas indicates the beam's stiffness, so that with an increase in the linear area (elasticity), stiffness increases.

Keywords: Reinforced concrete, reinforcement, bending, shear, external post-tensioning.