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Assessment of structural behavior of reinforced concrete slab ceiling under full load test in a residential complex project

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Abstract. This research deals with the process of conducting a reinforced concrete slab loading test of a Residential Complex Project at the Shatt Al Arab District which is located in southern Iraq. The purpose of the test which represents a destructive test is to evaluate the structural behavior of the slab condition state during and after the examination of the test process in order to ascertain the ability of the slab ceiling to withstand the loads generated during the use of the building. The test was carried out accordant to ACI 437.2-13 code. The reason for this test is the postponed 8 years of building project construction. Concrete blocks were used to simulate and conduct a loading test of 30-tons for 3 days. The central point has been installed to measure the slab deflection that occurred during the test. The results showed that both the total deflection and residual deflections were lesser than the permissible values according to the ACI 437.2-13, the RC slab behavior was mainly linear structural behave, and that the purpose of the examination was achieved. Finally, a new method was introduced to the assessment of the slab condition at the support which is found in good condition.

Keywords: compression loading test; destructive test; load distribution; RC slab ceiling; residual deflection; slab deflection

1. Introduction

The load test of RC structures member is extensively used as the final decision for the strength assessment of existing and new structures. This test may be undertaken under many conditions such as:

a- The soundness (integrity) of a structure member is in inquiry;
b- The materials test results are not satisfied the project material test requirement.
c- After extreme loads;
d- If the structure will be used for a new function; and,
e- To evaluate the strengthening and retrofitting of a structure.

The strength and behavior of a structure member through the load test may be evaluated using different ways which means the applied standards of the load test both acceptance limits and procedures are critical to show the engineering conclusion in the strength estimation and to ensure the structure is to be out of construction problems when planned it to be used. The American Concrete Institute (ACI) addresses in-situ load testing in two standards; ACI 318 (Building Code Requirements for Structural Concrete) (2014) adopts a monotonic (24-hour) load test and ACI 437.2 (Code Requirements for Load Testing of Existing Concrete Structures) (2013) which adopts both the cyclic load test (CLT) and a modified version of the monotonic (24-hour) load test. ACI 437.2-13 is referenced by ACI 562 (Code Requirements for Evaluation, Repair, and Rehabilitation of Concrete Buildings) (2013). In this paper, the ACI 437.2-13 is used for the RC loading test which relates to conducting a loading test of a roof of the third floor of one building in Shatt Al-Arab District, Basra, Iraq. The American specification ACI 437.2-13 was adopted in the assessment of the actual structural condition of the roof conditions under the monotonic load.

Testing of Reinforced concrete slab ceiling structures is covered in a large area of researches, studies, and modeling of the structural behavior subject so that the simulation and differences analysis between the theoretical analysis and site tests have been developed for many years. The loading test in most construction applications is a vital and decisive test applicable in different structures which used for evaluating the validity of different facilities because this test is considered as a destructive test and usually represented as the final solution and last decision for the problem of unknown and identification of actual reality of the reinforced concrete structures. The main problem of this test is the high cost and time consuming in addition to the highly safety risks for both workers and structures.

The loading test is often asylum in many cases, regardless of the creation of a new or up-to-date basis, and for many reasons, including inadequate technical tests (etc.) in the knowledge of the slab in the absence of real slab

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