SAFETY ASSESSMENT IN THE REHABILITATION OF RC STRUCTURES

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To My Great parents,

My Brothers, and Sister,

My Wife,

and, My Beloved Son; "Mohammed".

بسم الله الرحمن الرحيم

..... وَقَالَ رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأَدْخِلْنِي بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ

. (سورة النَّمْل: اية 19)

ABSTRACT

After the earthquake of 1992, the performance of wide range of concrete structures that had been built in the 1970s and before was influenced. Therefore, many researches concentrated on developing proper repairing and retrofitting programs. Others oriented to the use of new composite materials for rehabilitation process. But, there is a lack in studying the Safety assessment of these structures and how to prepare emergency programs.

The present research aims at introducing a rational methodology for assessing rehabilitation projects, especially those concerning the retrofitting of reinforced concrete buildings. The traditional methods depend upon subjective assessment of the defective structures regarding the apparent symptoms of distress (e.g., instability, cracks, and excessive deflection). Moreover, heuristic (descriptive) method cannot satisfy the demand for Quantitative determination of the degree of damage or deterioration.

This research focuses on developing the traditional techniques of evaluating damage of RC structures, suggesting newer techniques for diagnosis and prognosis by merging both subjective and quantitative assessment of RC buildings. The objectives can be summarized as;

1- Rationalize the evaluation of the existing defective RC Structures, with a view to avoiding unnecessary strengthening or replacement of parts that are in practice adequately safe.

2- Develop a methodology for determining a proper level of safety for specified RC buildings (using an existing civil project as a full scale Model is part of this methodology).
3- Develop new mathematical techniques can that satisfy the most common deterioration mechanisms.
4- Selecting the Appropriate Testing techniques, Survey on the testing equipment used to investigate Structural Integrity and Safety Assessment of RC members/structures.
5- Utilizing the progress achieved in Bridge Assessment Techniques in field of RC buildings.
6- Investigating the validity of well-known stochastic approaches like MCMC and using both statistical and deterministic methods in life prediction of RC structures.

Finally, it's seen how diagnosing RC building through systematic procedure simplifies the issue, better-enhance the contribution of deterioration agents, commensurate with well-known theories of evaluating damage, and provide tolerant predictions of building behavior with the passage of time. More advantages of applying the proposed technique are:

- It requires less number of field tests to compromise visual inspection and primary evaluation of structure.
- It correlates syndromic - aspects of deterioration like correlating the degree of reinforcement corrosion with concrete surface condition this helps in predicting past and future behavior of structure.

- It modifies using heuristic methods, *MCMC*, by defining specific coefficients of transformation matrices and not adopting the default coefficients of traditional matrices.
- It considers unforeseen parameters by involving empty set for the unknown causes in hypotheses set.
- The technique is easy to handle, based on active excel sheets that can be modified to whatever varying parameters; it is applicable when different deterioration mechanism is introduced.
- It can be used in monitoring RC structures to evaluate their performance and indicate damages or predict their future performance.

Key Words:

RC structures, rehabilitation, retrofitting, assessment, safety, diagnosis, prognosis, deterioration, scaling, corrosion, strength, interpretation, model, monitoring, repair.

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