CHALLENGES OF RANKING NEWLY BUILT RC BUILDINGS IN TERMS OF SEISMIC SAFETY IN IRAN

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A residential, office or commercial building unit is one of the most expensive commodities in the consumer goods market basket. Nowadays, every commodity comes with a reference manual, specifications list, and guarantee or warranty documents. In most parts of the world, including Iran, buildings as expensive commodity lack such critical documentation. In the past few years, a technical identification document (technical property document) is introduced as a requirement for obtaining a construction permit. However, the authorities issuing permits have failed to implement this rule throughout the country. Therefore, it is essential to simplify the effort to assess a building's performance by reviewing and clarifying the required metrics, methods and steps in the process. The seismic performance of a building is a critical metric for assessing its quality. The seismic safety rank of a building is a crucial indicator in the identification document to quantify the building's quality especially in seismic region. A potential buyer, the insurance company, construction permit issuance authority and centre for seismic codes and standards are interested in using such indicators for their corresponding objectives as it pertains to purchasing a property. In the long run, the use of seismic safety rank enhances the construction quality indirectly. Additionally, such an indicator provides a more transparent assessment of the current state of an existing building. Finally, it assists with a more accurate prediction of a future building's seismic performance concerning the objectives envisioned in its design.

Predicting the seismic performance of a building in the event of a potential earthquake is an immensely complicated computation due to random uncertainties in the process. Hence, a probabilistic approach to this problem is inevitable. In the case of Iranian buildings, this issue is more pronounced compared to other countries like the United States. Deficiencies in the construction process mechanisms, especially in urban constructions, significantly complicates the prediction of seismic performance. Despite these complications, the methods and systems used in other countries for such indicators are still an advantageous starting point and guidance for Iranian engineers. For example, the USRC Building Rating System provides star ratings over three separate dimensions corresponding to the following selected consequences: safety, damage (expressed as repair cost), and recovery (expressed as the time to regain basic functions). The following tables provide descriptions of what each dimension covers as well as explanations of each star rating threshold.

Table 1. Safety Rating Criteria (USRC Manual, 2019).

Safety Rating	
*****	Injuries and blocking of exit paths unlikely
****	Serious injuries unlikely
***	Loss of life unlikely
**	Loss of life possible in isolated locations
*	Loss of life likely in the building

Table 2. Damage Rating Criteria (USRC Manual, 2019).

	Damage Rating
*****	Minimal Damage Repair Cost likely less than 5% of building replacement cost
****	Moderate Damage Repair Cost likely less than 10% of building replacement cost.
***	Significant Damage Repair Cost likely less than 20% of building replacement cost.
**	Substantial damage Repair Cost likely less than 40% of building replacement cost.
*	Severe Damage Repair Cost likely greater than 40% of building replacement cost.
NE	Not Evaluated Repair Cost has not been evaluated.

Table 3. Recovery Rating Criteria (USRC Manual, 2019).

	Recovery Rating
*****	Immediately to days
****	Within days to weeks
***	Within weeks to months
**	Within months to a year
*	More than one year
NE	Not Evaluated Time to regain basic function has not been evaluated.

In this paper, we thoroughly review the available literature on the seismic vulnerability of RC buildings and the experiences of leading countries in this field, such as the USRC in the United States. We use the findings of this review to examine the challenges of leveraging such a seismic ranking system for buildings in Iran.

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