基于韧性需求的供水管网震后修复排序方法

Title: Post-earthquake restoration of pipeline damages to improve seismic resilience of water distribution system.

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**Abstract :** The restoration priority of damaged pipelines after the earthquake is a key factor in the seismic resilience evaluation model of water distribution system (WDS). This paper proposed a dynamic importance sorting method according to the characteristic analysis of the existing methods, which accounts for the time-varying of physical state of pipelines. Firstly, based on the discrete event system model, a time-varying analysis model for post-earthquake functionality of WDS is established to evaluate the WDS seismic resilience. Then three existing sorting methods are analyzed and compared according to the quantitative index of seismic resilience and the computational complexity. Then a dynamic event importance sorting method, which takes account of the time-varying characteristics of the WDS, is proposed for the restoration priority of damaged pipeline. The proposed method calculates the repair efficiency of damaged pipelines at every time-step and selects the damaged pipeline with the highest repair efficiency. In case study, the restoration priorities, obtained by the proposed method and the three existing methods, are utilized to evaluate the seismic resilience of a WDS. The results show that the seismic resilience index obtained by the proposed method is similar to that by the optimal sorting method, whereas the computation complexity of the proposed method is 0.10%~0.34% of the optimal sorting method.

**Keywords:** Water distribution system, Resilience, Post-earthquake restoration, restoration priority