

Accepted Manuscript

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PII: S0266-8920(17)30017-6

DOI: <http://dx.doi.org/10.1016/j.probengmech.2017.08.002>

Reference: PREM 2938

To appear in: *Probabilistic Engineering Mechanics*

Received date: 20 January 2017

Accepted date: 3 August 2017

Please cite this article as: J. Liang, Z. Ding, J. Li, A probabilistic analyzed method for concrete fatigue life, *Probabilistic Engineering Mechanics* (2017), <http://dx.doi.org/10.1016/j.probengmech.2017.08.002>

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A Probabilistic Analyzed Method for Concrete Fatigue LifeJunsong Liang ^a, Zhaodong Ding ^b and Jie Li ^{a, c *}

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Abstract:

In this manuscript, a novel analyzed method is proposed for stochastic analysis of concrete fatigue life. Starting from the material randomness and the typical fatigue damage accumulation behavior, a newly developed stochastic fatigue damage model (SFDM) is introduced to calculate the fatigue life. Then, a sensitivity analysis towards SFDM is carried out, based on which, the random model parameters representing the concrete fatigue mechanisms are verified. Based on the collected test data of different material strength levels, the probabilistic distributions of the random model parameters are identified, and these are used for the subsequent probabilistic analysis of concrete fatigue life. To implement the probabilistic analysis, a probability density evolution equation is developed by employing the probability density evolution method (PDEM). Through solving this equation, the probability density functions (PDF) of random concrete fatigue life and the corresponding mean and variance as well as their evolution with different loading levels are obtained.

Keywords: concrete, fatigue life, damage, SFDM, probabilistic analysis, PDEM

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