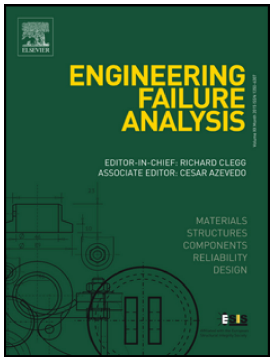

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Spatial-Temporal Reliability Analysis of Corroding Cast Iron Water Pipes

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ABSTRACT

Destructive effects of pipeline structural failure on the worldwide social, environmental and financial aspects reveal the importance of accurate reliability assessment of these infrastructures. In this research, the structural integrity of water cast iron pipes is assessed by a spatial-temporal reliability analysis. Random field representation is used for taking the spatial variability of corrosion depth into account. A probabilistic model for correlation length of corroded cast iron surfaces is developed using the data collected from in-service pipe samples in the West of Melbourne, Australia. To this aim, the randomness associated with involved parameters in the deterioration process is acknowledged by Monte Carlo simulation, and limit states criteria are checked for individual failure mode and also for combination of them in order to execute a multi-failure mode reliability assessment for finding the likelihood of the time of pipeline failure.

KEYWORDS

Correlation length, corrosion, probability of failure, multi-failure mode assessment, Random field

LIST OF SYMBOLS

a	Multiplying constant	P_W	Hydrostatic pressure (kPa)
b	Exponential constant	R_w	Water buoyancy factor